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Speaker Adaptation using Context-dependent Continuous Density Hidden Markov Models

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Abstract

This report proposes a method of speaker adaptation using Pec-based environment-dependent continuous density single gaussian Hidden Markov Models. This method of adaptation is based on a state-by-state modification of the mean vectors of a set of environment-dependent HMMs, using information extracted from adapting data (a set of words uttered by an unknown speaker). The experiment has been implemented for a set of environment-dependent HMMs trained with a male speaker, and this set has been adapted by three different speakers (two males, one female). Significant improvements of phoneme recognition rates for the unknown speakers have been observed after using this method of adaptation.

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Foreword

This report is the result of a 6 month internship in *ATR Interpreting Telephony Laboratories* as a student from the *National Institute of Telecommunications*, Evry, FRANCE. The study carried out in ATR consists of two parts:

- Phoneme recognition using PEC-based context dependent continuous single gaussian Hidden Markov Models.
- Speaker adaptation using PEC-based context dependent continuous single gaussian Hidden Markov Models.

The first study was a preliminary approach to the techniques of speech recognition, with which the author was not familiar, and was used to test the speaker adaptation system.

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Part I
Short Overview of Speech Recognition

1 Introduction

The problem of speech recognition is the problem of any attempt at modeling a complex phenomenon which escapes a trivial mathematical formulation. The subject, though widely studied since the 1950's, is still in its infancy, and has proved to be a challenge that branch off into a large spectrum of scientific disciplines. The entire problem boils down to finding a set of techniques that will allow us to design a system capable of extracting linguistic information from a speech signal with a sufficient reliability. The fields of application of such a system are almost as wide and mind-challenging as the research itself. A natural language-based communication with computers would certainly modify considerably our working and living environment. [1]

2 Present Approaches

Speech signal contains uncertainties which range from acoustic disturbances (ambient noise, quality of the speaker's voice...) to physiological and psychological factors (illness, stress...) and cultural components (language, accent...). A successful speech recognition system should combine interactively acoustical, lexical, syntactic, semantic, and any knowledge able to minimize these uncertainties.

The research in speech recognition has so far followed two main directions: knowledge-based approach and statistically data-based approach. Here follows a brief description of the main techniques that has been investigated in this field.

2.1 Pattern-matching approaches

A set of prototypical speech patterns (templates) is created as a reference set representing the dictionary of candidate words. Recognition can then be carried out by comparing an unknown utterance with each of the reference templates and selecting the best matching pattern, most of the time on grounds of acoustical criteria.

2.2 Knowledge-based approaches

This approach involves the direct and explicit incorporation of experts' knowledge into a recognition system. This knowledge is usually derived from the peruse of spectrograms and is incorporated through a set of rules and procedures. This kind of approach has been motivated by the interest and research in expert systems.

2.3 Stochastic approaches

This approach is based on modelling the speech signal by some well-defined statistical algorithms that can automatically extract kmowledge from speech data. The most famous stochastic approach is *Hidden Markov Modeling*, a technique that was used in this study and that will be described below.

2.4 Connectionist approaches

This is the most recent development in speech recognition. In connectionist models, knowledge—or constraint—is not represented in distinct units, rules or procedures, but distributed across many simple computing units. Uncertainty is not modeled in a probabilistic way (likelihoods, probability density functions) for a single unit, but by the very distribution of activity across the numerous units. These kinds of networks, because they somehow bear a resemblance with the activity of the nervous system are commonly called "Neural Networks", but also "Parallel Distributed Processing Networks" and "Massively Distributed Processing Networks".

Part II
Hidden Markov Modeling

3 Introduction

The *Hidden Markov Models* theory is based on Markov processes, in which a set of states with output probabilities representing random events is associated with a transition probability matrix; these two sets of probabilities model the variability in time and in observation space of speech signal. The particularity of HMMs is that the sequence of states is "hidden", that is to say only the output symbols (either discrete or continuous) associated to each hidden state can be known.[2] [3] [4]

4 Definitions

A HMM is defined by the following parameters:

T: length of the observation sequence $(O_t)_{1\leq t\leq T}$

N: number of states in the model

S: set of states $\{s_t\}$

V: set of output symbols

A: state transition probability matrix; $A = \{a_{ij}|a_{ij} = Pr(s_{t+1} = j|s_t = i)\}$

B: output probability matrix; $B = \{b_j(O_t)|b_j(O_t) = Pr(O_t|s_t = j)\}$. If the observation sequence consists in symbols from a finite L-sized alphabet, the HMM is said to be "discrete". In that case, B is a matrix $\{b_{ij}\}_{1\leq i\leq N, 1\leq j\leq L}$ where b_{ij} represents the probability that symbol j occurs if the current state is i.

If the observed values can belong to a continuous set, the HMM is said to be "continuous"; in such a case, B is a one-dimensional matrix $\{b_j(\mathrm{x})\}$, where $b_j(\mathrm{x})d\mathrm{x} = Pr(\mathrm{x} \leq O_t \leq \mathrm{x} + d\mathrm{x})$ and x is a d-dimensional observation vector.

π: an initial state distribution. Generally, π is set to (1,0,0,...,0) since the entry state is the first one.

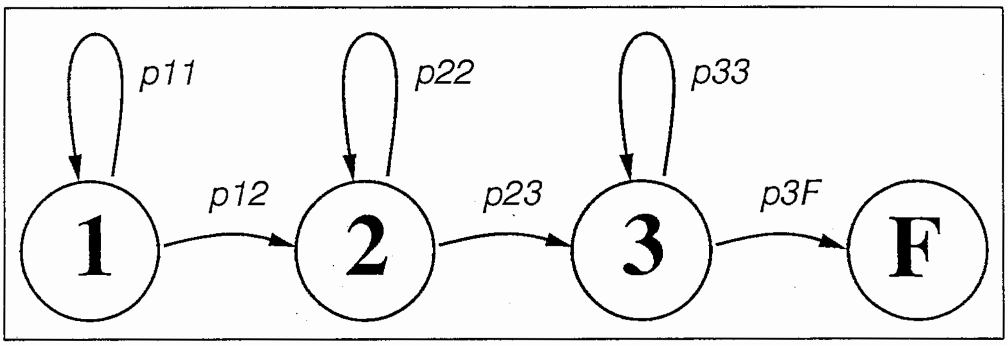

Figure 1: 3 state left-to-right HMM

We must make two assumptions about the HMMs we will use:

- The transition probability from state i to state j only depends on state i (*Markov assumption*).

- The output probability related to one state only depends on that state, no matter when or how the state is reached (*output-independance assumption*).

We will now refer to λ as the set $(A,\ B,\ \pi)$ which defines the model.

5 Basic algorithms

Once the model is defined, three types of problems have to be solved.

5.1 The Evaluation Problem

Given a model λ and an observation sequence (O_t), how can we easily compute $Pr(O|\lambda)$, which is the probability that the model λ will produce these observations ? The model which will eventually be chosen will have to maximise this probability.

If $S = \{s_t\}$ is a possible state sequence, we can write:

$$Pr(O|\lambda) = [\sum_{all S} Pr(O|S, \lambda)Pr(S|\lambda)] \tag{1}$$

Moreover,

$$Pr(O|S, \lambda) = [\prod_{t=1}^{T}(b_{s_t}(O_t))], and Pr(S|\lambda) = \prod_{t=1}^{T}(a_{s_{t-1}s_t}) \tag{2}$$

Consequently,

$$Pr(O|\lambda) = \sum_{all S}\prod_{t=1}^{T} a_{s_{t-1}s_t}b_{s_t}(O_t) \tag{3}$$

A straightforward calculation shows that such a computation is of the order of $O(N^T)$, which is quite huge. A more efficient algorithm should then be found.

The following *Forward-backward algorithm* can reduce that computational cost.

First, we define the forward-variable as:

$$\alpha_t(i) = Pr(O_1, O_2, ..., O_t, s_t = i|\lambda) \tag{4}$$

which represents the probability of getting the observation sequence $(O_1, ..., O_t)$ and being in state i at time t, given the model λ.

We can then compute $Pr(O|\lambda)$ this way:

- Step 1 : $\forall i \in \{1, 2, ...N\}, \alpha_1(i) = \pi_i b_i(O_1)$
- Step 2 : $\forall j \in \{1, 2, ...N\}, \forall t \in \{1, 2, ..., T\}, \alpha_t(j) = [\sum_{i=1}^{N} \alpha_{t-1}(i)a_{ij}]b_j(O_t)$
- Step 3 : $Pr(O|\lambda) = \sum_{i \in S_F} \alpha_T(i)$ where S_F is the set of all possible final states.

The computational cost is now reduced to the order of $O(N^T)$.

We can easily consider a backward-variable $\beta_t(i) = Pr(O_{t+1}, O_{t+2}, ..., O_t|s_t = i, \lambda)$, which would represent the probability of getting the sequence $(O_{t+1}, O_{t+2}, ..., O_T)$, given the state i at time t and the model λ. A similar algorithm can be processed to compute $Pr(O|\lambda)$.

5.2 The Estimation Problem (Baum-Welch)

The parameters A, B, π of the model λ should then be adjusted to maximise $Pr(O|\lambda)$. The algorithm which is ordinarily used on that purpose is the Baum-Welch re-estimation algorithm. Assuming that the initial parameters can be chosen randomly, or judiciously guessed, this algorithm solves the HMM-training problem.

We can define $\gamma_t(i,j) = Pr(s_t = i, s_{t+1} = j|O,\lambda)$ as the probability of being in state i at time t and in state j at time $t+1$, given the observation sequence O and the model λ (γ_{ij} is in fact an a *posteriori* transition probability from state i to state j.)

Thus,

$$\gamma_t(i,j) = \frac{\alpha_t(i)a_{ij}b_j(O_{t+1})\beta_{t+1}(j)}{Pr(O|\lambda)} = \frac{\alpha_t(i)a_{ij}b_j(O_{t+1})\beta_{t+1}(j)}{\sum_{k\in S_F}\alpha_T(k)} \tag{5}$$

We can also define an a *posteriori* probability of being in state i at time t, given O andλ:

$$\gamma_t(i) = Pr(s_t = i|O,\lambda) = \frac{\alpha_t(i)\beta_t(i)}{\sum_{k\in S_F}\alpha_T(k)} \tag{6}$$

We can notice that $\gamma_t(i) = \sum_j \gamma_t(i,j)$.

Moreover, a_{ij} is the general transition probability from state i to state j, no matter the time those states are reached. Therefore, an estimate of a_{ij} can be:

$$\bar{a}_{ij} = \frac{\sum_{t=1}^{T-1}\gamma_t(i,j)}{\sum_{t=1}^{T-1}\sum_j \gamma_t(i,j)} = \frac{\sum_{t=1}^{T-1}\gamma_t(i,j)}{\sum_{t=1}^{T-1}\gamma_t(i)} \tag{7}$$

Besides, the coefficient of the matrix $\{B\}$ (in case of a dicrete HMM, for instance) $b_j(k)$ represents the probability of observing the symbol $v_k \in V$, while in state j. From the training data, we can consider as an estimate of $b_j(k)$ the frequency of occurrence of v_k relative to the frequency of occurrence of any symbol while in state j.

Thus, an estimate of $b_j(k)$ is:

$$\bar{b}_j(k) = \frac{\sum_{t\in O_t=v_k}\gamma_t(j)}{\sum_{t=1}^{T}\gamma_t(j)} \tag{8}$$

Eventually, an estimate of the initial state probability can be given by $\bar{\pi}_i = \gamma_1(i)$.

We can show that:

- either the initial model was the optimal one, in which case the estimates would be equal to the initial probabilities;
- either the replacement of λ by $\bar{\lambda} = (\bar{A},\bar{B},\bar{\pi})$ increases the probability $Pr(O|\lambda)$.

5.3 The Decoding Problem (Viterbi)

We want to know the best state sequence $S = s_1 s_2 ... s_T$ according to the observation sequence. In other words, we have to choose the states which maximize $Pr(O,S|\lambda)$. It can be a means of interpreting the hidden state sequence of the HMM. One famous method for that purpose is the *Viterbi algorithm*. Here are the outlines of this algorithm:

Step 1: Initialisation. $\forall i \in \{1,2,...,N\}$,
$\delta_t(i) = \pi_i b_i(O_1)$
$\psi_1(i) = 0;$

Step 2: Recursion. $\forall t \in \{2,...,T\}, \forall j \in \{1,2,...,N\}$,
$\delta_t(j) = \max_i[\delta_{t-1}(i)a_{ij}]b_j(O_t)$
$\psi_t(j) = \arg\max_i[\delta_{t-1}(i)a_{ij}]$

Step 3: Termination. $\bar{P} = \max_{s \in S_F}[\delta_T(s)]$
$\bar{s_T} = \arg\max_{s \in S_F}[\delta_T(s)]$
where $\bar{P}$ and $\bar{s}$ represent the optimized values.

Step 4: Path backtracking. for $t = T-1$ to $t = 1, \bar{s_t} = \psi_{t+1}(\bar{s_{t+1}})$

This algorithm is used in speech recognition (Viterbi recognizer).

5.4 Continuous HMMs

The previous explanations considered a *discrete HMM*, that is to say the observation was a symbol from a L-sized finite alphabet. But all those algorithms can be adapted to the *continuous HMM*, which has been used in this study. In that case, the observation **X** can be any point of a d-dimensional vectorial space to which we assign an occurrence probability.

Let **X** be the observation sequence from the continuous set. The goal is then to maximize $f(\mathbf{X}|\lambda)$ over all the parameters of the model λ.

By using the same kind of formulas as in the discrete case:

$$f(\mathbf{X}|\lambda) = \sum_{all S} f(\mathbf{X}, S|\lambda) = \sum_{all S} \prod_{t=1}^{T} a_{s_{t-1}s_t} b_{s_t}(\mathbf{x}_t) \quad (9)$$

Using continuous HMMs enables to get rid of Vector Quantization; matching an observation to the closest element of a finite codebook according to a given distance indeed implied some quantization errors, which were one drawback of discrete HMMs.

If the vectors are scattered in the observation space, it can be necessary to define several density probabilities and to consider the global density function as a summation of M densities which are assigned some weights. We thus have a mixture density HMM, for each state j of which we can write:

$$b_j(\mathbf{x}_t) = \sum_{k=1}^{M} c_{jk} b_{jk}(\mathbf{x}_t) \quad (10)$$

c_{jk} is the weight of mixture k in state j.

The c_{jk} coefficients must verify the essential condition:

$$\sum_{k=1}^{M} c_{jk} = 1 \quad (11)$$

in which case:

$$\int_R b_j(\mathbf{x}) d\mathbf{x} = 1 \quad (12)$$

for $b_j(\mathbf{x})$ is a density probability.

Therefore:

$$f(X, S|\lambda) = \prod_{t=1}^{T} a_{s_{t-1}s_t} b_{s_t}(\mathbf{x}_t) \quad (13)$$

Several kinds of density probabilities can be used; nevertheless, the most common ones are the Gaussian distributions. As a matter of fact, from the *central limit theorem* , we know that the probability density function of a sum of independant random variables tende to a Gaussian distribution if the number of these variables tends to infinity. We can thus consider as a Gaussian distribution the function $b_j(x)$ if the number of mixtures is large enough.

Using a large number of mixtures can improve the accuracy of the model (especially if the training vectors are sparse in the vector space), but it also requires a great amount of training data; otherwise, all the parameters of the model cannot be well-estimated.

In order to reduce the computational complexity of such a model and the number of free parameters to be estimated, we have to make some assumptions about the mixtures; for example, we can suppose that the random variables represented by each mixture are independant. In such a case, the covariance matrix of these variables is diagonal. Of course, on the other hand, this simplification can reduce the accuracy of the model.

In the following study, single gaussian HMMs with diagonal covariance matrix will be used.

Part III

Phoneme recognition using context-dependent Hidden Markov Models

6 Introduction

In this part, we will describe the first part of the study carried out in *ATR Interpreting Telephony Research Laboratories*. This study, as a first contact with the techniques of Speech Processing and a way to get used to the ATR computing environment, consisted in adapting a phoneme recognition system written by Mr TAKAMI to a software set released by the Cambridge University: HTK (Hidden Markov Models ToolKit). This phoneme recognizer is based on the use of n environment-dependent HMMs trained with word data uttered by a male speaker: MAU (Male). The context-dependent models were defined with the Phoneme Environment Clustering (PEC) method.

7 The Phoneme Environment Clustering method (PEC)

7.1 Outline

When dealing with large-vocabulary word recognition or continuous speech recognition, the variation of phoneme patterns is highly dependent on the phonetic environment. An *allophone* can then be defined as a sub-phonetic unit including information on preceding and following phonemes. It has been shown in [5] that the statistical distribution of feature parameters of environment-dependent models is closer to gaussian distribution than those of environment independent models. Nevertheless, there is a serious problem when one wants to split one's set of context-independent models into a set of allophonic models. The variety of contexts is often too large to be fully represented in the training data. The number of samples for each allophone is sometimes very small, sometimes null, the latter resulting in dramatic problems for a recognition system. In order to adapt the complexity of the allophonic representation to a set of training data, the PEC algorithm has been created and has proven to be successfull in speech recognition experiments.

7.2 Definitions

Let E be the space of environments, each environment being the combination(cartesian product) of environmental factors. Each allophone is an element e of the space E. Simultenaously, its acoustic pattern is represented as a vector $\vec{v}$ in a vectorial space $\vec{V}$ (after normalization of pattern durations). Let ϕ be a mapping function from E to $\vec{V}$. The acoustic pattern of each sample e, denoted as $\vec{v} = \phi(e)$ varies from sample to sample. Let d be a function of $\vec{V}$ called *distortion* (for example a averaged euclidian distance from the centroid).

Allophon Clustering can be defined as finding the optimal set of n subspaces $\{E_i\}_{i=0}^{n-1}$ to cover all the variations of acoustic segments with minimal distortion. It is defined as the minimalization of

$$D = \sum_{i=1}^{n} d(\phi(E_i)) \tag{14}$$

with

$$E = E_1 \cup E_2 \cup \cdots \cup E_n \; and \; E_i \cap E_j = \emptyset (i \neq j) \tag{15}$$

7.3 The PEC Tree

When applying the PEC algorithm on a database, we split every phoneme space into subspaces of allophones. The number n of allophones can be adapted to the size of the database and the number of data files available. In all the following study, this number was set at 500, which is a good compromise between preciseness and data availability for the databases used.

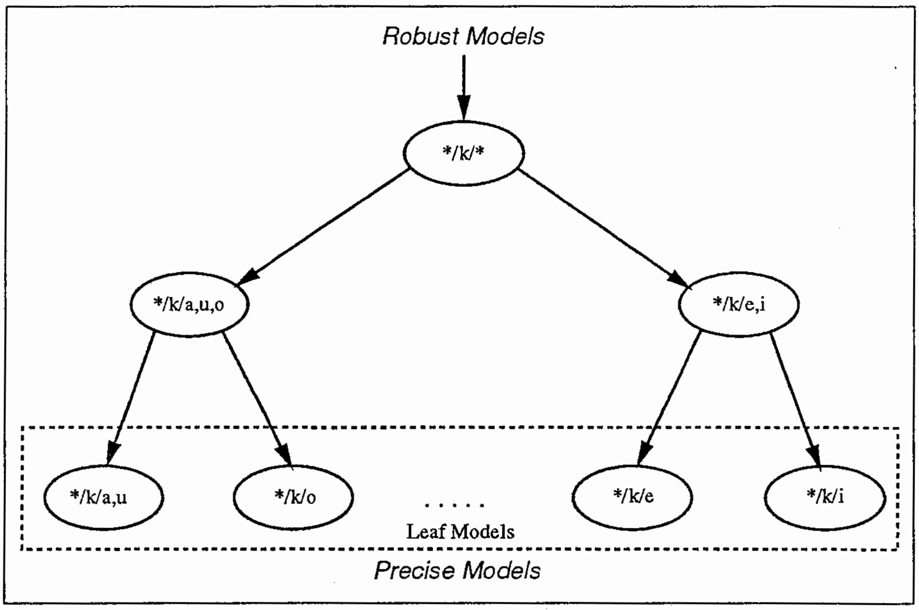

Figure 2: Part view of a PEC Tree

8 Phoneme Recognition using PEC-based context-dependent continuous HMMs

This context-dependent modelization has been used for carrying out a phoneme recognition experiment. This subject had already been studied by Mr TAKAMI. In order to get used to the techniques of speech recognition and to the computer environment, Mr TAKAMI proposed me to rewrite this study for HTK (HMM ToolKit, a new set of software modules released by the University of Cambridge, Great Britain).

8.1 Data format

In the following study, 34 dimension data vectors have been used. They contain power and cesptral information. For the definition of the *cepstrum*, see [1] [2].

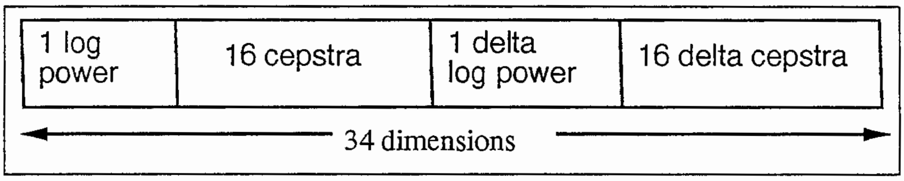

Figure 3: data vector

8.2 Training

The MAU_1 database is a standard japanese word database uttered by a male speake containing 5240 words. Half of this database (2620 even utterances) was used for training 500 context-dependent models.

The process of training context-dependent phoneme models consists in the following points:

- Determining the environment of each phoneme using the PEC tree.
- Finding a set of initial estimation parameters for each allophone using the occurences of this allophone in the training database.
- Computing the final values of the HMM parameters using the Baum-Welch Reestimation Algorithm with all the occurences of this allophone in the training database.

8.3 Phoneme recognition algorithm

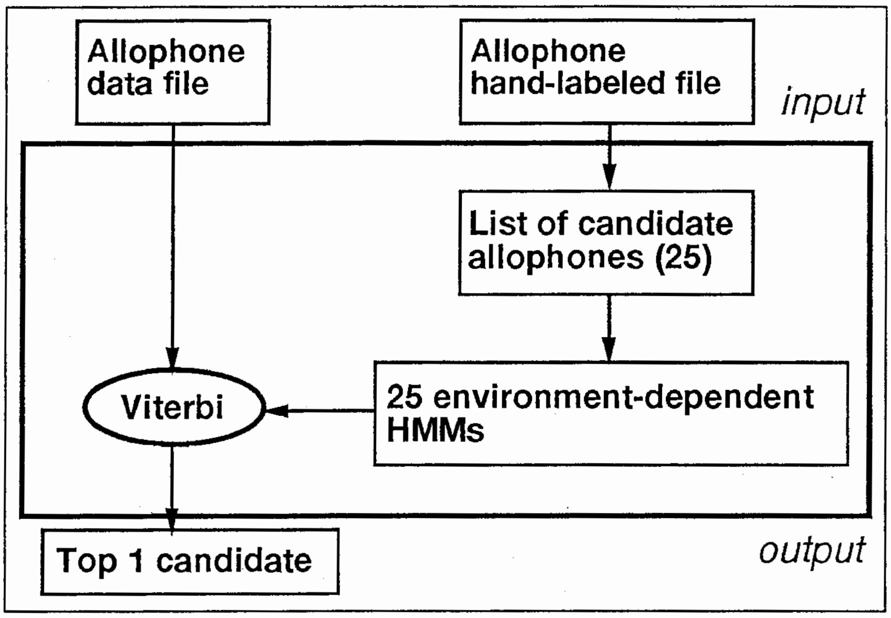

Figure 4: context-dependent phoneme recognition

The basic phoneme recognition method using HMMs consists in performing the Viterbi algorithm on a binary data file using a set of HMMs and a rule of grammar. Instead of using the whole set of 500 context-dependent models, by reasons of computing time economy, we will use only a restriction of this set of allophones. In this case, a set of HMMs is created for each utterance of an allophone x/c/y . This set is composed with the 25 *candidate allophones* which are the 25 allophones from the leaf models set with the format x/c'/y where c' is in the set of 25 standard japanese phonemes. The rule of grammar specifies that we must find *one* of these candidates as the recognition result.

8.4 Results

Here are the results of the phoneme recognition experiment carried out with the MAU_1 and MAU_B databases. The test on the MAU_1 database (odd utterances) is a test of the preciseness of the modelization. The test using the MAU_DSB database is a robustness test, since this database contains *bunsetsu*, a grammatical entity in Japanese, uttered at a fastest rate (7.14 mora/s) than the words from the MAU_1 database (5.68 mora/s).

	MAU_1	MAU_DSB
o	99.0	89.9
a	99.9	97.2
u	97.1	82.7
i	98.0	84.1
k	99.2	71.6
e	98.0	85.2
r	96.7	85.9
s	99.8	100
j	95.8	81.8
m	94.0	77.8
t	95.4	70.7
sh	99.3	93.1

	MAU_1	MAU_DSB
N	96.5	61.0
n	94.9	50.3
h	97.8	89.5
g	90.3	67.8
b	97.0	85.4
ts	98.7	66.1
zh	94.8	100
d	97.2	88.6
ch	96.5	95.5
z	97.6	100
w	100	60.9
p	78.6	34.5

	MAU_1	MAU_DSB
All	97.7	83.1

Figure 5: phoneme recognition results (%)

Part IV

Speaker adaptation using context-dependent Hidden Markov Models

9 Introduction

This is the description of the second part of the study carried out in *ATR Interpreting Telephony Research Laboratories.* After having realized the phoneme recognition experiments, I was proposed to try to create a speaker adaptation system.

10 Speaker adaptation

10.1 Purpose of speaker adaptation

The aim of every speech recognition system is to recognize speech regardless to the identity of the speaker. Unfortunately, the stochastic modelization in speech recognizers is basically speaker-dependent, and on the other hand imposes the use of a great number of training data files to be reliable enough. It is then impossible to train again the models for every new speaker willing to use this recognition system. *Speaker Adaptation* stands for every technique whose aim is to adapt a pre-trained model to a new speaker using few information about this new speaker (for example a standard set of words uttered by the new speaker before any recognition application).

10.2 Modelization

For this study, we have used the same kind of HMMs and data format as used in the former phoneme recognition experiment. Since the main problem of context-dependent models is their low robustness, we have also used 25 context-independent models (the 24 japanese phonemes plus the silence) along with 500 context-dependent models. All of these models have been trained using the MAU_1 database.

10.3 Main idea of this speaker adaptation system

This speaker adaptation system is based on a *mean vector* modification. There are several ways to adapt a set of already trained HMMs to new data. In this method, only the mean vector of the HMMs was modified. And, since the HMMs are single gaussian, this modification is only a replacement of an "old" vector by a "new" one. The basic principle of this method is to use in a joint way context-independent models for their robustness, and context-dependent models for their accuracy. The unknown speaker's word utterances will be automatically segmented using context-independent models, which we assume will give reliable enough segmentation results. The extracted information from the unknown data will be fed into the segmentation system itself to improve its accuracy by shifting its characteristics towards those of the unknown speaker. At the same time, since it has been proven that context-dependent models are more accurate than independent ones, the whole context-independent modelization will be shifted little by little towards a totally context-dependent one.

11 Algorithm

This is the algorithm of speaker adaptation that has been used for the following experiments

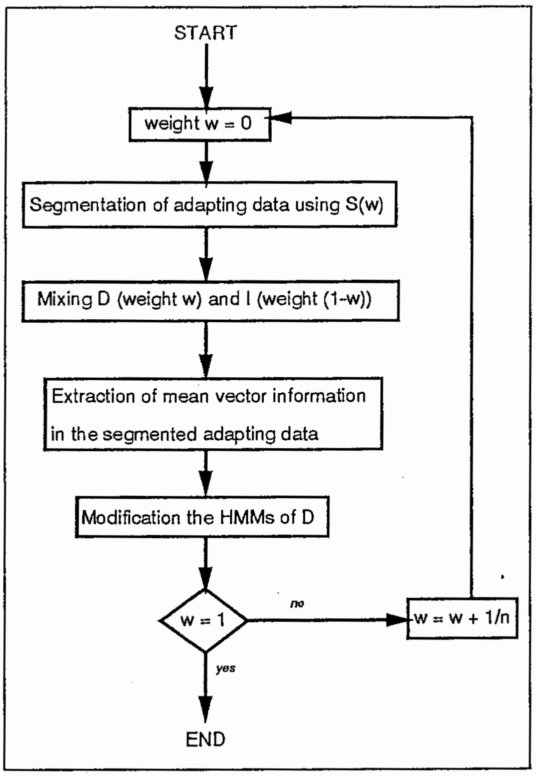

Figure 6: Speaker Adaptation Algorithm

This algorithm is a simple loop which begins with a segmentation of the unknown data using I (context-independent HMM set). The results of this segmentation allow us to extract mean-vector information which is introduced in D (context-dependent HMM set). The whole process is run again but this time, the mixing weight of this new context-dependent set is not zero, so that the whole segmentation system has become a little more context-dependent, a little more accurate for the unknown speaker. This loop is iterated $n+1$ times until the last segmentation which this time is the most context-dependent possible one (the mixing weight of I is equal to zero). Let's now detail every part of this algorithm.

11.1 Mixing step

The mixing of two sets of I and D is realized in the following way. For each context-dependent HMM

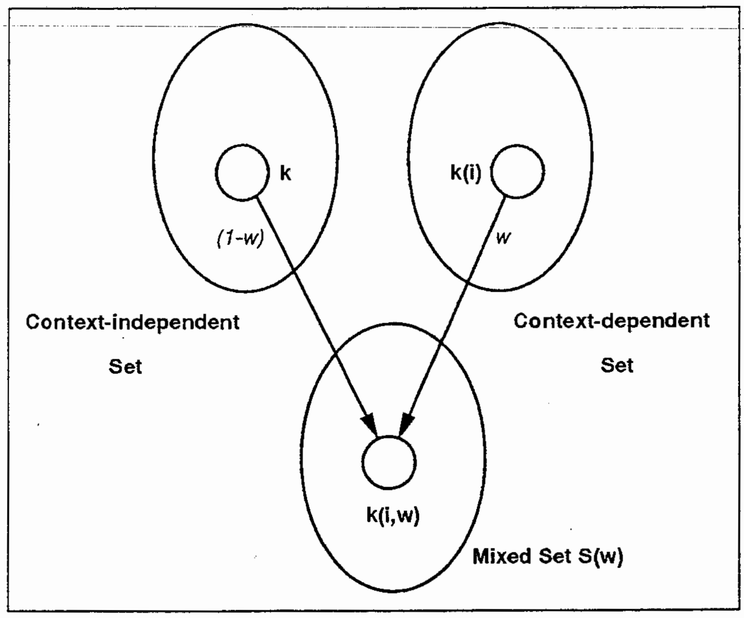

Figure 7: mixing of two HMM sets

$\{p(i)\}$ where i is an environment index and p is one of the 25 japanese phonemes (24 phonemes plus silence), we find the corresponding context-independent HMM $\{p\}$ and we compute a linear combination of all the parameters of these two HMMs. Let $(x_j)_{1 \le j \le N}$ be the set of parameters of a HMM $\{x\}$ (Mean vectors, variance vectors, transition matrix). The combination of two HMMs $\{x\}$ with the weight w, $0 \le w \le 1$ and $\{y\}$ with the weight $1-w$ is the HMM $\{z\}$ with

$$z_j = wx_j + (1-w)y_j \ , \ 1 \le j \le N \tag{16}$$

Using this combination formula for all the context-dependent HMMs $\{p(i)\}$ and the context-independent HMMs $\{p\}$, we obtain the mixed set of all the HMMs $\{p(i,w)\}$.

11.2 Segmentation step

This step of the algorithm carries out the automatic segmentation of a word binary data file, using the corresponding label file (the contents of this data file, i.e. the sequence of phonemes). The inner boundaries of the unknown speaker's word utterances are unknown, but we know what words have been uttered. It is possible then to use the Viterbi algorithm with a suitable rule of grammar to segment this unknown data. Since the modifications of the HMM mean vector must be applied state by state, we must perform a state-by-state segmentation. This was done easily by splitting every three state HMM into three single state HMMs bearing the same characteristics.

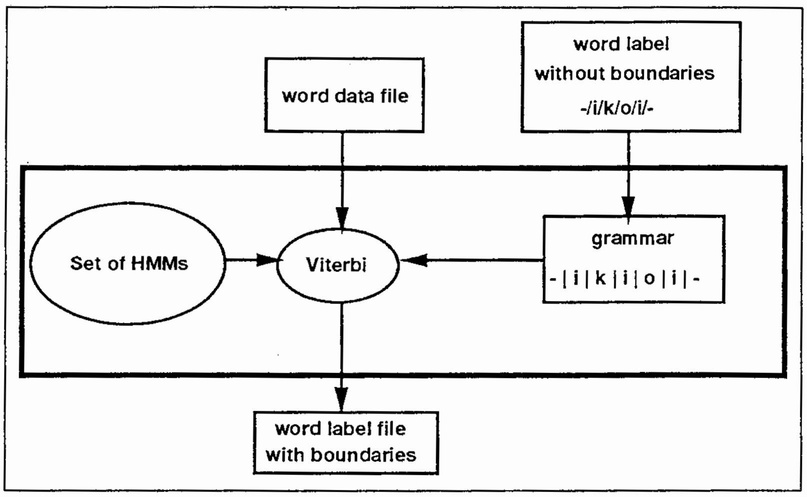

Figure 8: segmentation of a word binary file

11.3 Modification step

Thereafter, for every state of every model, the mean vector has been computed over all the frames included in the automatically obtained segmentation boundaries. This new mean vector has been then used to replace the previous one in the HMM definition file. Thus, for all the models, the mean vectors of the three states have been modified according to the information contained in the unknown speaker's word data.

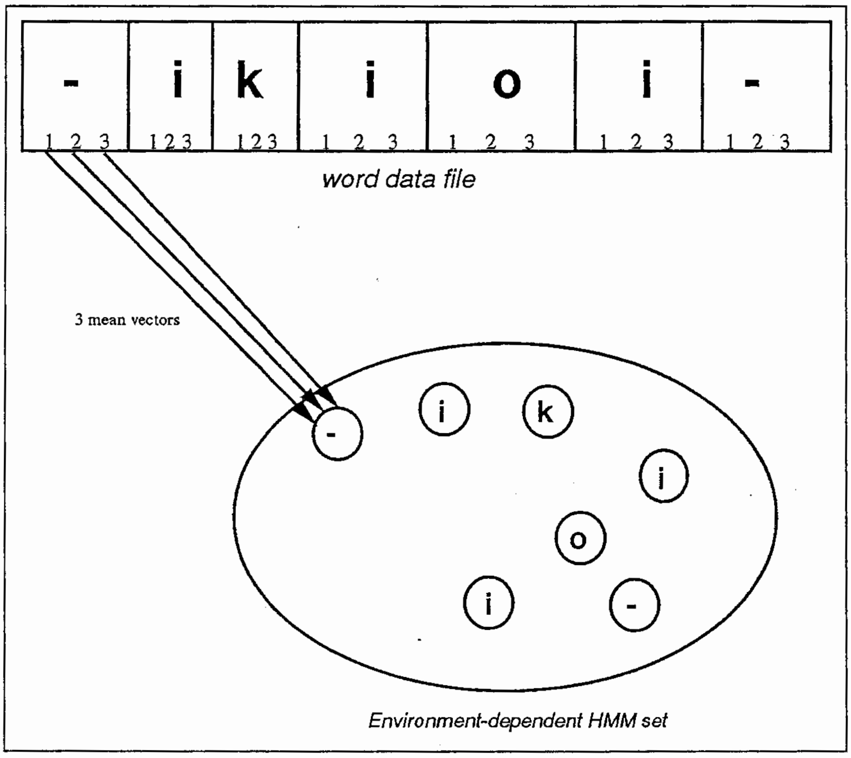

Figure 9: modification of the context-dependent HMM set

12 Interpolation and Smoothing

Since the number of adapting words is limited, only a part of the total number of models can be adapted by the previous method. The remaining models should also be modified according to the unknown speaker's data. We have tried during this study two different methods for the completion of the adaptation: *interpolation* and *smoothing.*

12.1 Interpolation

In the process called *interpolation*, we use all the adapted models to modify the unadapted ones. The already adapted models will not be modified. Let S be the standard set of HMM states (splitted HMMs)

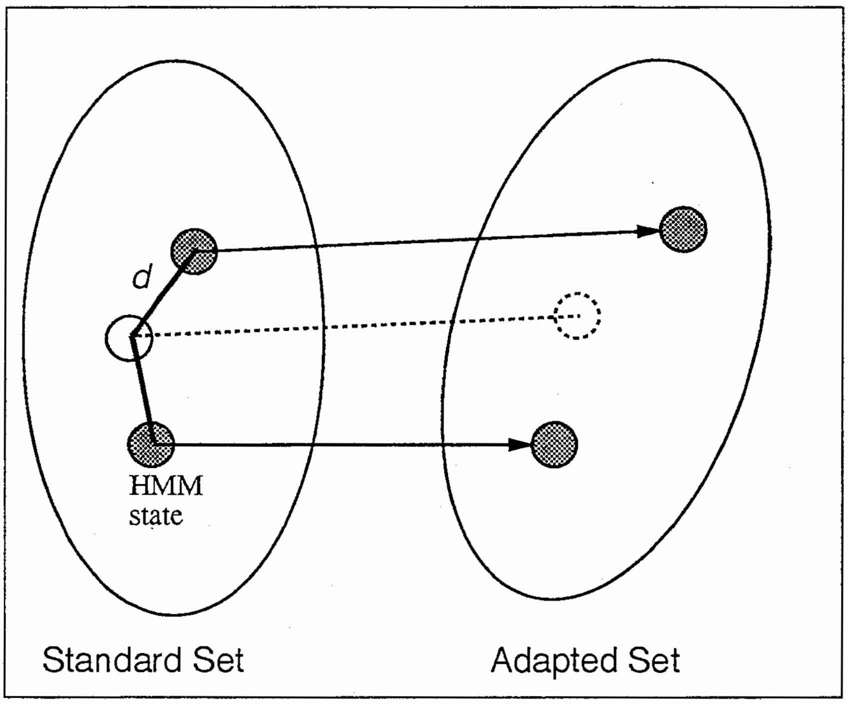

Figure 10: interpolation

and A the adapted one. Let S_a be the subset of S that contains all the adapted states. For each x of S_a, there exists a vector $\vec{m}$ called the moving vector which is the vector

$$\vec{m} = \vec{\mu}_{x_A} - \vec{\mu}_{x_S} \tag{17}$$

where $\vec{\mu}_{x_S}$ is the mean vector of the HMM state x in the standard set S, and $\vec{\mu}_{x_A}$ is the correponding mean vector in the adapted set A. For each y in $S - S_a$, we compute the moving vector

$$\vec{m}_y = \sum_{x \in S_a} \omega(y, x) \vec{m}_x \tag{18}$$

where ω is a weight function. We define this weight function in order to quantify the influence of each adapted state in the computation of the moving vector of an unadapted state. This weight function is based on the use of a distance defined in a set of HMM states.

$$\omega(y, x) = e^{-\frac{d(y,x)}{a}} \tag{19}$$

where a is called the *aperture window.* Let x and y be two HMM states, each characterized by a couple mean-variance $(\vec{\mu}, \vec{\sigma})$. Should we define a euclidean distance between x and y, it would only express a distance between the biggest vector components. In our case, the log power and cepstra have totally different orders of size. It is reasonable to think that the cepstra information carries information as well as the log-power information and then should not be ignored in the computation of the distance. We will then normalize the mean vectors by dividing every i^{th} coordinate by the corresponding i^{th} coordinate of the variance vector. Thus, if N is the dimension of our data vectors, we define the distance between x and y as

$$d(y,x) = \sum_{i=1}^{N} \frac{(\mu_{xi} - \mu_{yi})^2}{\sigma_{xi}^2} \tag{20}$$

12.2 Smoothing

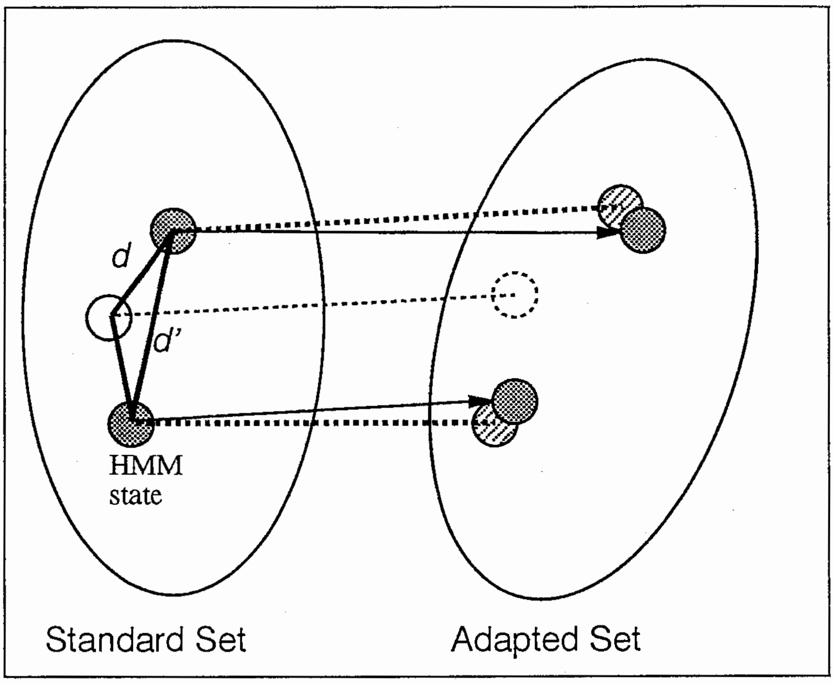

Figure 11: smoothing

Concerning the unadapted vectors, the process of smoothing is identical to interpolation. But the smoothing method modifies as well each adapted state taking into account all the other adapted states. This stems from the assumption that some of the adapted states have been modified with very few data. Smoothing them will simulate a more robust training, since they will benefit from the training of all the neighbouring states, the closest the neighbour, the biggest the influence. Thus, for every state y in S_a, we compute a new moving vector

$$\vec{m'}_y = \sum_{x \in S_a} \omega(y,x)\vec{m}_x \tag{21}$$

13 Experiments

13.1 Modelization

In this part of the study, we have used the same HMM models as those used in the phoneme recognition experiments. 500 context-dependent models and 25 context-independent models have been trained by the even word utterances of the database MAU_1.

13.2 Speakers

The system has been used to adapt the models trained by MAU to three different speakers: 2 male ones (MHT and MXM) and a female one (FSU). For each of these three speakers, the *phonetically balanced word set* (MHT_B, MXM_B, FSU_B) has been partially used.

13.3 Adaptation conditions

For each of these three speakers, the standard models have been adapted using:

- 25 and 50 adaptation words
- 7 and 10 iterations in the algorithm
- the interpolation and smoothing methods
- window apertures of 10, 20, 30

13.4 Testing conditions

After each adaptation experiment, a context-dependent recognition test has been carried out to evaluate the method. 24 phonemes have been tested (the silence has not been tested). In order to limit the computation time, the number of testing data files has been limited to one hundred maximum per phoneme.

Segmentation results for the unknown data have also been computed for every iteration of the algorithm. These segmentation results are computed by comparing the automatic segmentation results with hand segmentation data about the unknown speakers.

14 Results

Here we present the top phoneme recognition results for three speakers: MHT, MXM (males) and FSU (female), which have been adapted using the method described above.

		MHT	MXM	FSU
Raw		63.0%	64.1%	22.2%
Interpolation	25	76.2%	72.8%	52.6%
	50	76.1%	67.0%	52.2%
Smoothing	25	82.4%	81.3%	53.7%
	50	84.5%	81.6%	59.1%

Figure 12: speaker adaptation results

And here follow the segmentation rates of the unknown data before interpolation or smoothing. We computed for the start and end points of each segmented phoneme the difference between automatically-found boundaries and hand-determined ones. The segmentation rate for a window of 30ms is the percentage of these differences under 30ms.

number of words & iterations		MHT	MXM	FSU
25	7	87.55%	91.60%	83.4%
25	10	**88.00%**	**92.50%**	**83.4%**
50	7	90.50%	92.32%	82.05%
50	10	**90.94%**	**93.20%**	**82.50%**

Figure 13: segmentation results (30ms window)

15 Discussion

15.1 Interpolation and smoothing

The results show us clearly that the interpolation method is not appropriate to this method of adaptation. The top recognition results undergo a degradation when 50 adapting words are used instead of 25. This degradation is in contradiction with the segmentation results which are better for 50 adaptating words than for 25. On the other hand, the smoothing method seems more appropriate since the recognition rates improve when more adapting words are used.

15.2 Sex-dependent system

The results of segmentation and recognition show clearly than a good adaptation cannot be carried out from a male speaker to a female one. The speech features are too different to allow a reliable enough adaptation. Female-trained models should be used when an adaptation toward a female speaker is needed.

15.3 The aperture window

The top results for the male speaker have almost always been obtained for an aperture window of 20. This value is empirical and can be modified to optimize the smoothing. A modification of this value by 10 up or down results in a 1% size order variation of the recognition rates for male speakers, but can result in dramatic drops for female speakers (around 10% of recognition rate).

16 Further research

The influence of the number of context-dependent models has not been studied here (500 models were used during all the study). The HMMs were single gaussian and only the mean vectors were modified. It could be interesting, though difficult, to try to adapt the variances vectors as well, or to investigate the multi-mixture case. Multi-speaker training using several mixtures can give very good results of segmentation. These results could be used in a process of speaker adaptation.

17 Conclusion

This algorithm, combined with the smoothing method, can achieve significant improvements of recognition rates for unknown speakers. The use of context-dependent continuous HMMs for their preciseness and of context-independent HMMs for their robustness can allow the realisation of a speaker adaptation system whose results can be compared with other existing methods.

References

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[5] S.Sagayama: *Phoneme Environment Clustering for Speech Recognition*, Proc. ICASSP89, pp.397-400, 1989.

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I would like to thank here Dr Kurematsu and Mr Sagayama to have welcomed me in the Speech Processing Department of ATR, Mr Takami, my supervisor for 6 months and to whom I am indebted for this study. Thanks to Harald Singer for his friendly help. I also thank all the people from ATR who made my stay in Japan as convenient as possible.

Part V
Appendix A

These are the overhead projector slides used during the final talk at ATR.

Speaker Adaptation

Using

Continuous Hidden Markov Models

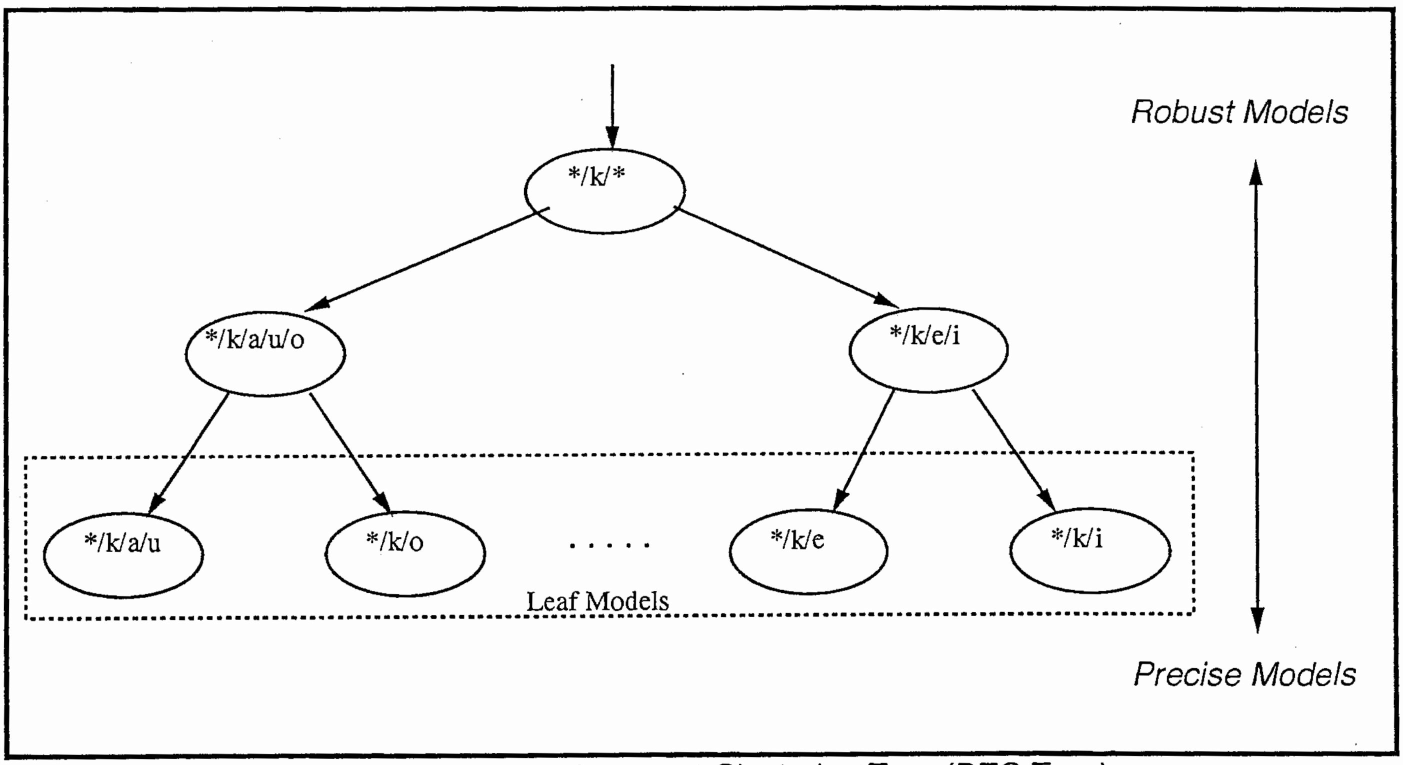
1- Phoneme Recognition

- Continuous Single Gaussian HMMs
- Context-dependent Allophone Models

2- Speaker Adaptation

- Context-independent Phoneme Models
- Context-dependent Allophone Models

Environment-dependent Models (Allophones)



Phoneme Environment Clustering Tree (PEC Tree)

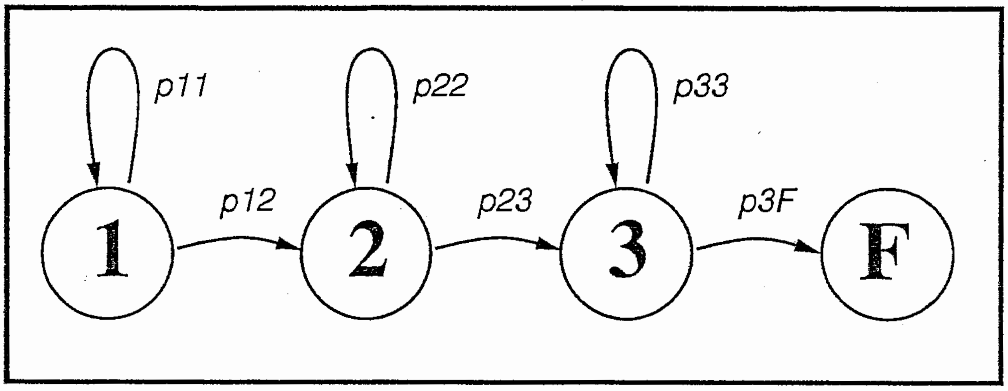
n = number of leaf models

The HMM model

3 states

Continuous density output probability

Single gaussian

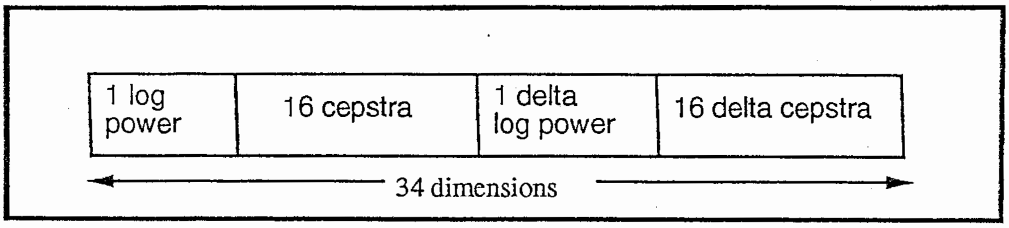


3 state Hidden Markov Model

Data Format

Power and cepstra

Extracted from speech data sampled at 12 kHz



Data Vector (5ms)

Phoneme recognition experiment

Training

2620 words (even utterances) from MAU_1 database

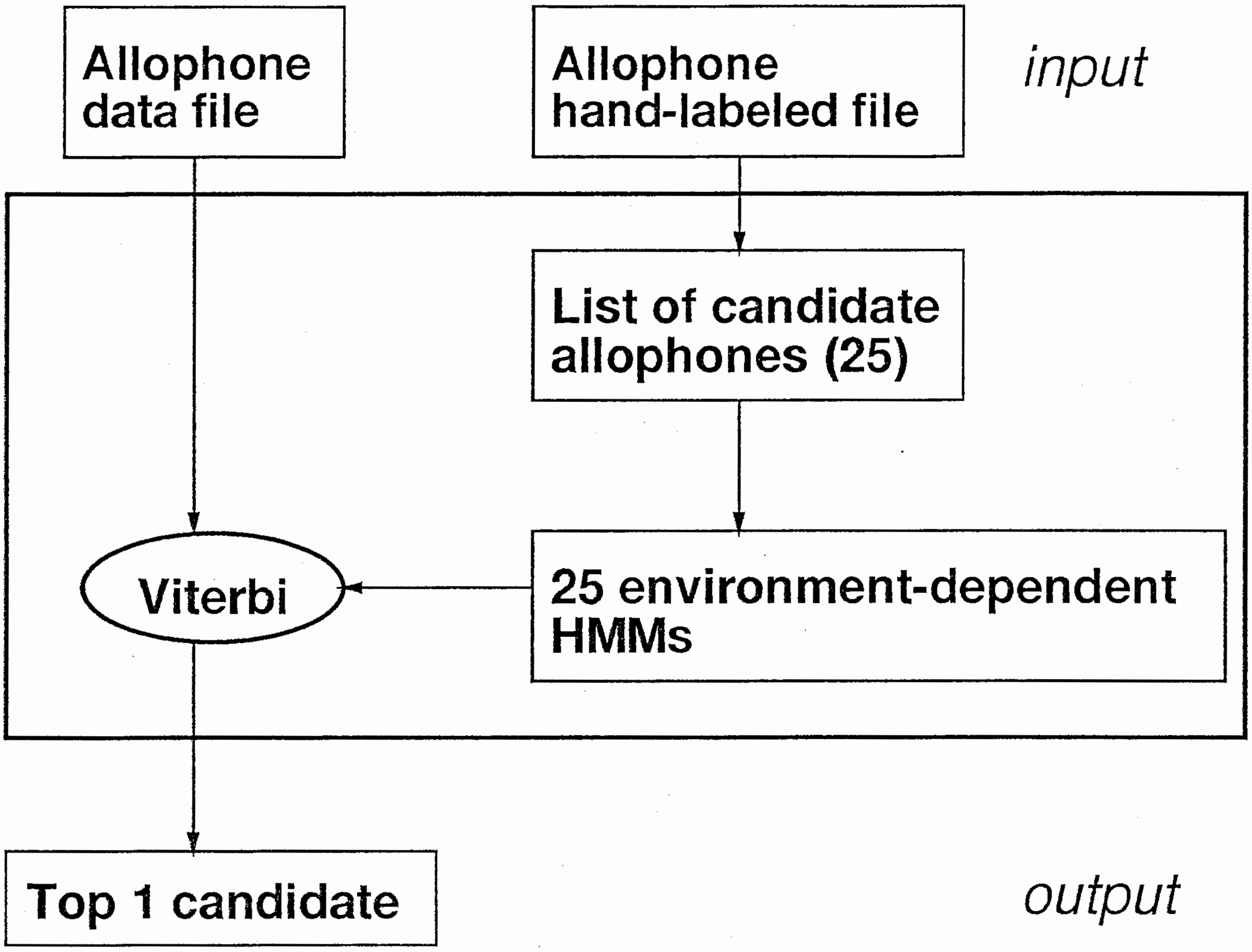
⟶ 500 context-dependent models

Recognition

Phonemes from 2620 words (odd utterances) from MAU_1 database

Phonemes from 251 sentences from MAU_DSB (bunsetsu) database

Phoneme recognition method



Candidate allophone

allophone from the leaf models set

allophone with the same environment as the input allophone

Phoneme Recognition Results

MAU_1 (words)	97.7%
MAU_DSB (bunsetsu)	83.1%

Speaker Adaptation

Hidden Markov Models

3 states

Continuous density output probability

Single gaussian

Modelization

500 allophones (context dependent)

25 phonemes (context independent)

(trained with the even utterances (2620 words)

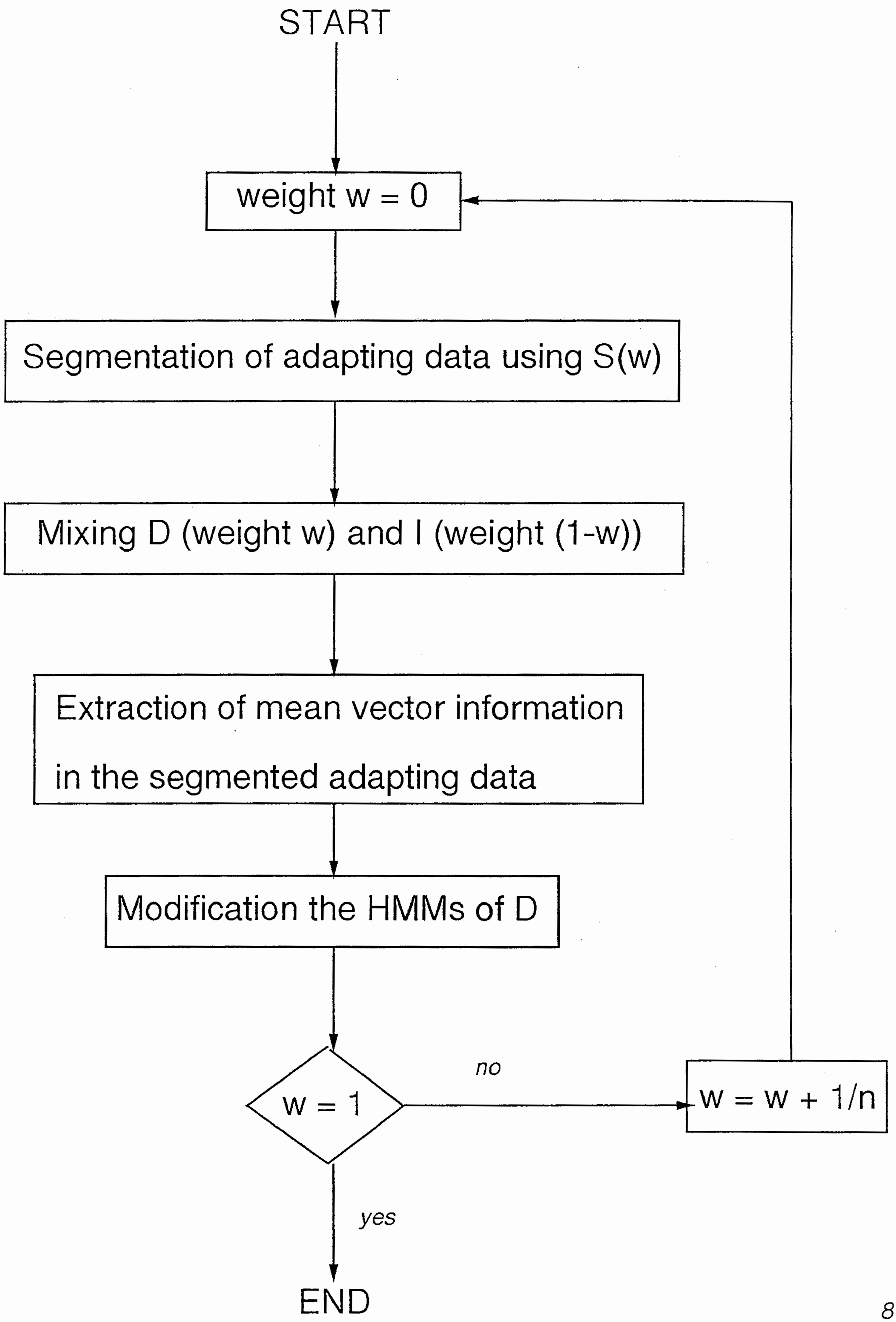
of the MAU_1 database)

Main idea

HMM state by HMM state mean vector modification

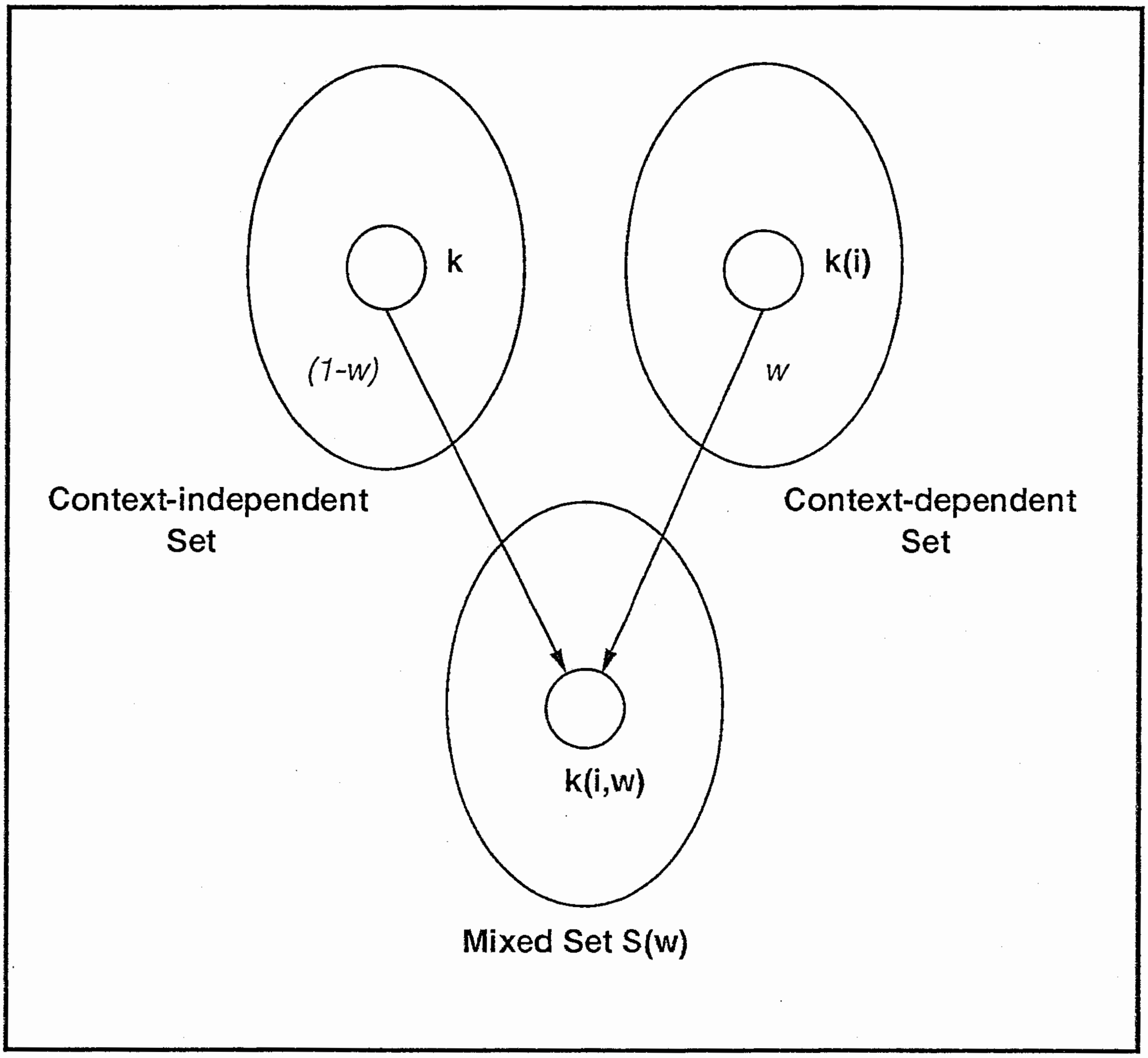
using information extracted from the automatic

segmentation of the adapting data


START
weight w = 0
Segmentation of adapting data using S(w)
Mixing D (weight w) and I (weight (1-w))
Extraction of mean vector information
in the segmented adapting data
Modification the HMMs of D
w = 1
no
w = w + 1/n
yes
END

Speaker adaptation algorithm (1)

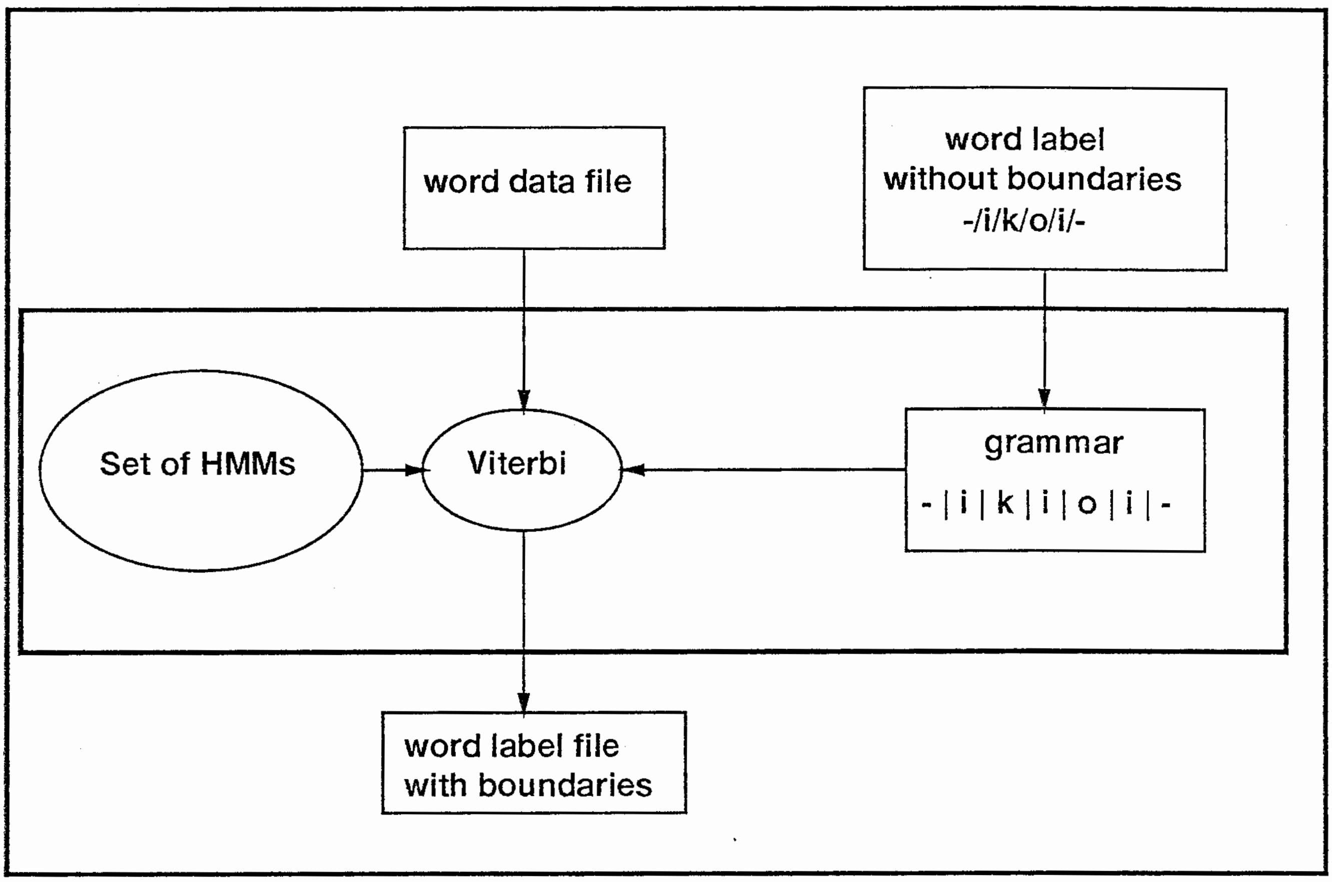
MIXING STEP



creation of the mixed model k(i,w)

Speaker adaptation algorithm (2)

SEGMENTATION STEP



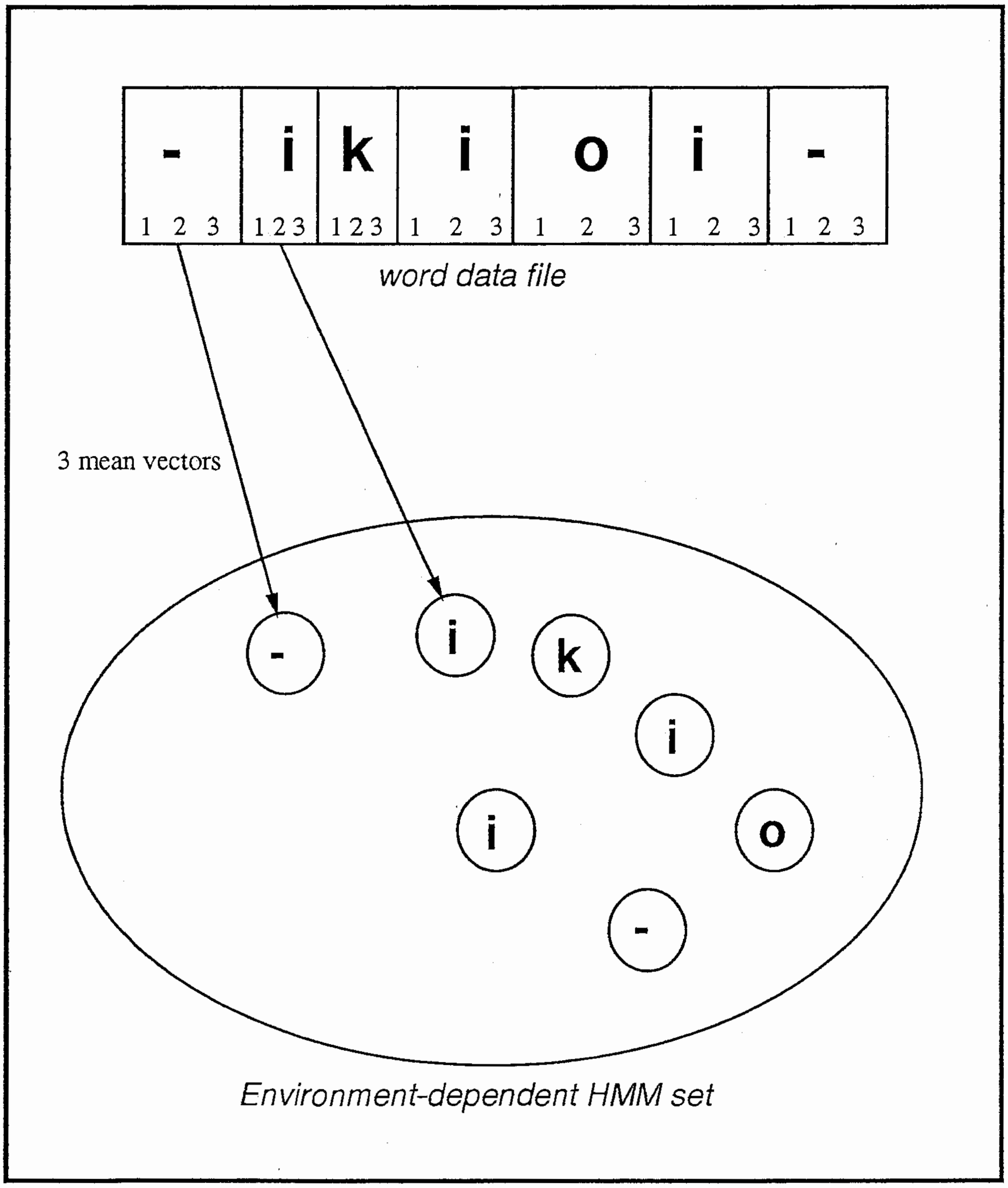
Segmentation of a word file

The segmentation gives state-by-state boundaries

-1, -2, -3, i1, i2, i3, k1, k2, k3, ...

Speaker Adaptation Algorithm (3)

MODIFICATION STEP



Completion of the adaptation

Insufficient adapting data (25 words ~ 150 models)

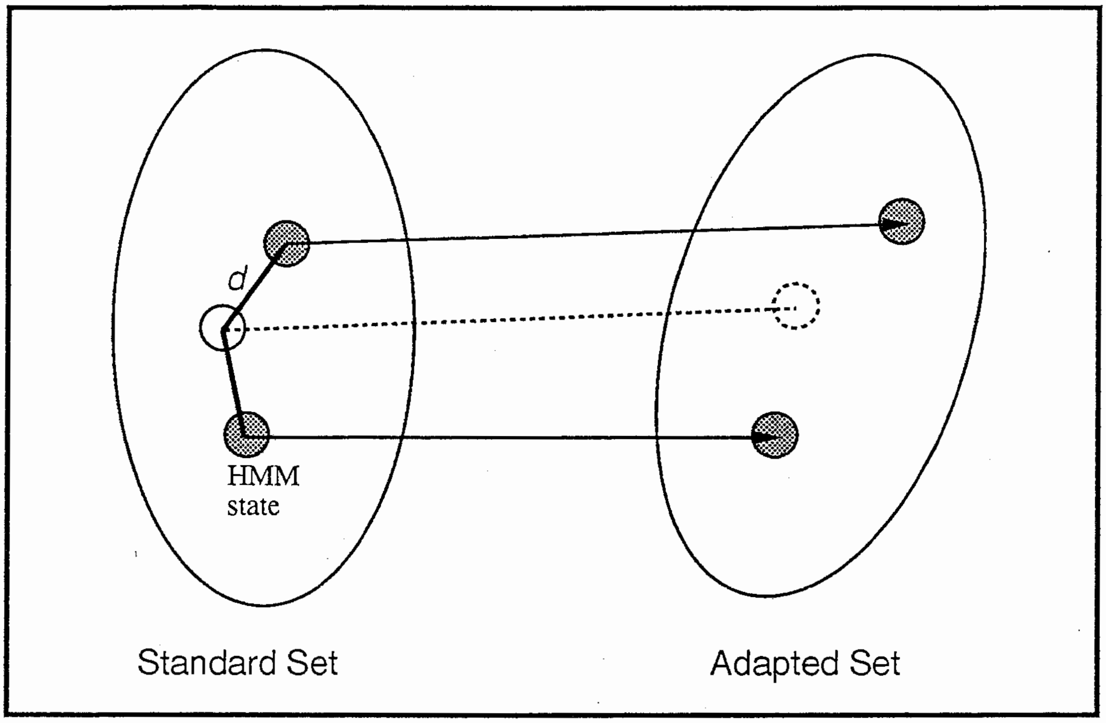
The remaining models must also be adapted

Methods

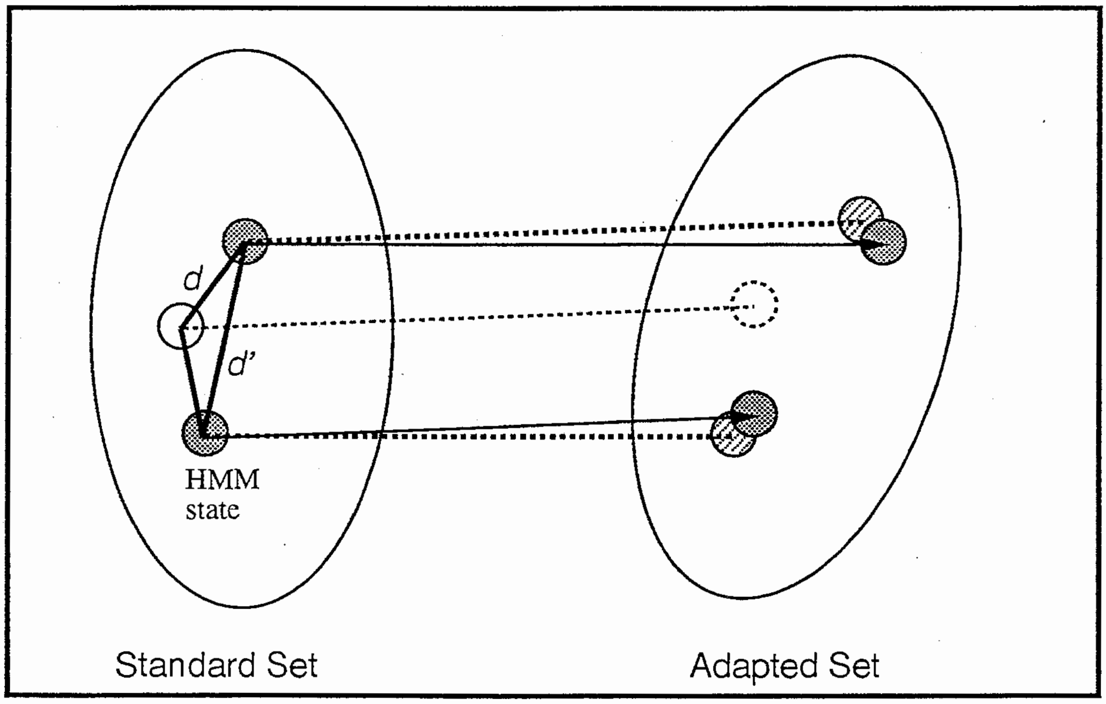
Translation of the parameters of the unadapted models

⟶ Interpolation & Smoothing

Interpolation and smoothing methods



Interpolation



Smoothing

distance:

smoothing window:

a = window aperture

Experiments

Training

MAU_1 (2620) words

500 context-dependent models

25 context-independent models

Adapting speakers

MHT_B (phonetically balanced word set)

MXM_B

FSU_B

Adaptation conditions

25 and 50 words

7 and 10 iterations

window aperture 10, 20, 30

Testing conditions

Phoneme recognition (24 phonemes) using allophones

100 data files max for each phoneme (after randomization)

Top Results

		MHT	MXM	FSU
Raw		**63.0%**	**64.1%**	**22.2%**
Interpolation	25	**76.2%**	**72.8%**	**52.6%**
	50	76.1%	67.0%	52.2%
Smoothing	25	82.4%	81.3%	53.7%
	50	**84.5%**	**81.6%**	**59.1%**

Discussion

Influence of the number of iterations and of words in the training data

Segmentation rate (< 30 ms)

			MHT	MXM	FSU
number of words	25	7	87.55%	91.60%	83.4%
		10	88.00%	92.50%	83.4%
	50	7	90.50%	92.32%	82.05%
		10	90.94%	93.20%	82.50%

Importance of the aperture window

MHT and MXM top results are obtained for a window around 20

(can result in about 1% difference of recognition rate)

FSU top results are obtained for a window less or equal to 10

(can result in a 10% difference on segmentation rate)

Part VI

Appendix B

Here can be found all the confusion matrixes and segmentation results for the experiments carried out in ATR.

An experiment has the following name format:

MXM500_25_10s_w20

This label stands for

- Speaker MXM
- 500 context dependent models
- 25 words used for adaptation
- 10 iterations
- s for smoothing, nothing for interpolation
- w20 means an aperture window of 20

MHT_raw

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	88	1	4				4										2					1				100	12	88.00
d	16	75															9									100	25	75.00
g	3	2	62				11	1	9								5					6		1		100	38	62.00
p				25	2																				1	28	3	89.29
t				68	28							4														100	72	28.00
k				42		48					2	8														100	52	48.00
m	9		16				35	5	9								16					10				100	65	35.00
n	2	2	9				5	54	6								9					13				100	46	54.00
N			1					18	70							1						10				100	30	70.00
sh										69		31														100	31	69.00
ts											50	50														100	50	50.00
ch											2	98														100	2	98.00
zh	1	1	7					1			1		86			1	2									100	14	86.00
h						15				6	3	15		61												100	39	61.00
s											11	9			79	1										100	21	79.00
z		5											6			82						7				100	18	82.00
r	14	12	11				1	5					1				54					2				100	46	54.00
w	10		17				7										15	18				1		21		89	71	20.22
j			4						2			1	42						31		12	6	2			100	69	31.00
a			3			1			1		7			7						65		5	3	8		100	35	65.00
i			4				1		1				15			1			2		72	3				99	27	72.73
u			5					3	4				2									81	2	3		100	19	81.00
e			11				1	6	4				5	14					1			8	49			99	50	49.49
o			2				17															3		76		98	22	77.55
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2313	857	62.95
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			63.55

MHT500_25_7_w10_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	71	6	8				2	1					1				10		1							100	29	71.00
d	10	84	1													1	4									100	16	84.00
g	2	2	55				13	14	6								6				1			1		100	45	55.00
p				7	10	6																			5	28	21	25.00
t				25	68	4					3															100	32	68.00
k				3	4	93																				100	7	93.00
m	7		19				43	9	5								12		1			4				100	57	43.00
n	4	3	3				8	49	8				4				16		1				1	3		100	51	49.00
N		1	1				3	25	66				1									2	1			100	34	66.00
sh										96		3			1											100	4	96.00
ts											99					1										100	1	99.00
ch						32					22	46														100	54	46.00
zh			4								1		91				4									100	9	91.00
h						10				1	4	9		75	1											100	25	75.00
s											2				97	1										100	3	97.00
z	1										4		8		3	83	1									100	17	83.00
r	26	6	1										1				66									100	34	66.00
w			15				4						1				4	46				3		16		89	43	51.69
j												1	7						69		15	6	2			100	31	69.00
a			1											1						95		2		1		100	5	95.00
i			1										1						1		94	2	1			100	6	94.00
u	2		5					2	3					1		1						81	2	3		100	19	81.00
e														4					2	2	2	4	86			100	14	86.00
o							2	2	1									2				3		90		100	10	90.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	567	75.53
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			73.90

MHT500_25_7_w20_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	70	11	5				2									1	10		1							100	30	70.00
d	11	84	1													1	3									100	16	84.00
g	4	2	56				13	11	7								6							1		100	44	56.00
p				7	12	4																			5	28	21	25.00
t				34	59	4					2														1	100	41	59.00
k				5	4	90					1															100	10	90.00
m	8		13				57	9	3								5		1			4				100	43	57.00
n	3	3	2				6	50	9				4				17		1			1	1	3		100	50	50.00
N			1				2	21	68				1									3	4			100	32	68.00
sh										96		3			1											100	4	96.00
ts											99					1										100	1	99.00
ch						32					20	48														100	52	48.00
zh	1		5								1		88				4		1							100	12	88.00
h						9				2	4	8		76	1											100	24	76.00
s										1	1				97	1										100	3	97.00
z											3		7		3	86	1									100	14	86.00
r	25	7	1										1				66									100	34	66.00
w	1		16				2										3	47				3		17		89	42	52.81
j												1	7						71		13	6	2			100	29	71.00
a			1								2			1						95				1		100	5	95.00
i			1										2						1		95		1			100	5	95.00
u	2		3					3	4			1				1						80	3	3		100	20	80.00
e														4					2	2	2	2	87	1		100	13	87.00
o																		4				3		93		100	7	93.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	552	76.18
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			74.53

MHT500_25_7_w30_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	69	11	5				4									1	9		1							100	31	69.00
d	11	84	1													1	3									100	16	84.00
g	4	3	54				13	10	7				1				6				1			1		100	46	54.00
p				7	13	4																			4	28	21	25.00
t				33	59	4					3														1	100	41	59.00
k				9	5	85					1															100	15	85.00
m	9		13				55	10	4								4					5				100	45	55.00
n	3	2	1				7	50	8				5				18		1			1	1	3		100	50	50.00
N			1				1	19	71				1									4	3			100	29	71.00
sh										96		3			1											100	4	96.00
ts											99					1										100	1	99.00
ch						30					21	49														100	51	49.00
zh	1		5									1	88				4		1							100	12	88.00
h						10				3	4	8		74	1											100	26	74.00
s										1	2				97											100	3	97.00
z	1	3									3		7		2	84										100	16	84.00
r	25	7	1										1				66									100	34	66.00
w	1		16				1										3	48				3		17		89	41	53.93
j												1	7						71		13	6	2			100	29	71.00
a											3									96				1		100	4	96.00
i			1										1						1		96		1			100	4	96.00
u	2		1					3	4			1								1		80	3	5		100	20	80.00
e														5					2	2	2	2	86	1		100	14	86.00
o																		3				3		94		100	6	94.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	559	75.87
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			74.25

MHT500_25_10_w10_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	51	5	5										1				6		1							69	18	73.91
d	10	84	1													1	4									100	16	84.00
g	2	2	54				13	15	6								6				1			1		100	46	54.00
p				7	10	6																			5	28	21	25.00
t				25	68	4					3															100	32	68.00
k				3	4	93																				100	7	93.00
m	6		19				44	9	5								12		1			4				100	56	44.00
n	5	3	3				8	49	7				4				16		1				1	3		100	51	49.00
N		1	1				3	25	66				1									2	1			100	34	66.00
sh										96		3			1											100	4	96.00
ts											99					1										100	1	99.00
ch						32					22	46														100	54	46.00
zh			4								1		91				4									100	9	91.00
h						10				1	4	9		75	1											100	25	75.00
s											2				97	1										100	3	97.00
z	1										4		8		3	83	1									100	17	83.00
r	26	5	1										1				67									100	33	67.00
w			15				4						1				4	46				3		16		89	43	51.69
j												1	6						71		14	6	2			100	29	71.00
a			1											1						95		2		1		100	5	95.00
i			1										1						1		94	2	1			100	6	94.00
u	2		5					2	3					1		1						81	2	3		100	19	81.00
e														4					2	2	2	4	86			100	14	86.00
o							2	2	1									2				2		91		100	9	91.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2286	552	75.85
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			74.19

MHT500_25_10_w20_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	70	11	5				2									1	10		1							100	30	70.00
d	10	85	1													1	3									100	15	85.00
g	4	2	54				13	11	7								7				1			1		100	46	54.00
p				7	12	4																			5	28	21	25.00
t				34	59	4					2														1	100	41	59.00
k				5	4	90					1															100	10	90.00
m	8		13				58	9	3								4		1			4				100	42	58.00
n	3	3	2				6	50	9				4				17		1			1	1	3		100	50	50.00
N			1				2	21	68				1									3	4			100	32	68.00
sh										96		3			1											100	4	96.00
ts											99					1										100	1	99.00
ch						32					20	48														100	52	48.00
zh	1		5								1		89				4									100	11	89.00
h						9				3	4	8		75	1											100	25	75.00
s										1	1				97	1										100	3	97.00
z											3		7		3	86	1									100	14	86.00
r	25	6	1										1				67									100	33	67.00
w	1		15				3										3	47				3		17		89	42	52.81
j												1	6						72		13	6	2			100	28	72.00
a			1								2			1						95				1		100	5	95.00
i			1										2						1		95		1			100	5	95.00
u	2		3					3	3			1				1				1		80	3	3		100	20	80.00
e														4					2	2	2	3	86	1		100	14	86.00
o																		4				2		94		100	6	94.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	550	76.26
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			74.62

MHT500_25_10_w30_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	69	11	5				4									1	9		1							100	31	69.00
d	11	84	1													1	3									100	16	84.00
g	4	3	53				13	11	7								7				1			1		100	47	53.00
p				7	13	4																			4	28	21	25.00
t				33	59	4					3														1	100	41	59.00
k				9	5	85					1															100	15	85.00
m	8		12				56	10	4								5					5				100	44	56.00
n	3	2	1				7	50	8				5				18		1			1	1	3		100	50	50.00
N			1				1	19	70				1									4	4			100	30	70.00
sh										96		3			1											100	4	96.00
ts											99					1										100	1	99.00
ch						30					21	49														100	51	49.00
zh	1		5									1	88				4		1							100	12	88.00
h						10				3	4	8		74	1											100	26	74.00
s										1	2				97											100	3	97.00
z	1	3									3		7		2	84										100	16	84.00
r	25	6	1										1				67									100	33	67.00
w	1		16				1										3	48				3		17		89	41	53.93
j												1	6						72		13	6	2			100	28	72.00
a											3									96				1		100	4	96.00
i			1										1								97		1			100	3	97.00
u	2		1					3	4			1								1		80	3	5		100	20	80.00
e														5					2	2	2	2	86	1		100	14	86.00
o																		3				2		95		100	5	95.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	556	76.00
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			74.37

MHT500_50_7_w10_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	76	13	4				3				1						2		1							100	24	76.00
d	6	72	3					1								1	17									100	28	72.00
g	3	1	56				10	19	5								5							1		100	44	56.00
p				9	11	5						2													1	28	19	32.14
t				27	55	3					12	3														100	45	55.00
k				2	13	81					2	2														100	19	81.00
m	1		18				60	12	4													5				100	40	60.00
n	1	4	2				7	62	6				3			1	11					3				100	38	62.00
N			2				1	34	59											1		3				100	41	59.00
sh										85		14		1												100	15	85.00
ts											99	1														100	1	99.00
ch						4					8	88														100	12	88.00
zh	1		5								1		89				4									100	11	89.00
h						14				4	4			77	1											100	23	77.00
s											11				88	1										100	12	88.00
z		1									3		8			88										100	12	88.00
r	8	12	3								1						76									100	24	76.00
w	3		21				1											45				10		9		89	44	50.56
j										1			3						76		10	8	2			100	24	76.00
a							1													91			1	7		100	9	91.00
i			1								1		1						6		89		2			100	11	89.00
u		1	3					1	5					2		1	3		1		1	78	2	2		100	22	78.00
e			2						1					5					4	1	7	9	70	1		100	30	70.00
o							1															3		96		100	4	96.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	552	76.18
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			74.74

MHT500_50_7_w20_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	76	12	4				5				1						1		1							100	24	76.00
d	8	71	4					1								1	15									100	29	71.00
g	5		52			1	11	18	7								5							1		100	48	52.00
p				10	11	4						1													2	28	18	35.71
t				28	55	1					13	3														100	45	55.00
k				2	13	80					2	3														100	20	80.00
m	3		14				56	17	4													6				100	44	56.00
n	3	4	1				6	63	7				3			1	10		1			1				100	37	63.00
N			2				1	34	59								1					3				100	41	59.00
sh										85		14		1												100	15	85.00
ts											97	3														100	3	97.00
ch						4					5	91														100	9	91.00
zh	1	1	4					1			1		88				3		1							100	12	88.00
h						12				6	3			78	1											100	22	78.00
s											11				88	1										100	12	88.00
z		1									3		7			89										100	11	89.00
r	8	15	2								1						74									100	26	74.00
w	2		22				1											47				8		9		89	42	52.81
j										1			3						76		10	8	2			100	24	76.00
a							1				1									91			1	6		100	9	91.00
i			1								1		1						5		90		2			100	10	90.00
u		1	5					1	5					2		1	3		1			77	2	2		100	23	77.00
e			2						1					6					4	1	7	9	69	1		100	31	69.00
o																		1				3		96		100	4	96.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	559	75.87
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			74.56

MHT500_50_7_w30_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	76	10	4				5				1		1				2		1							100	24	76.00
d	8	71	3					1								1	16									100	29	71.00
g	5		51			1	13	15	8				2				4							1		100	49	51.00
p				11	9	4						2													2	28	17	39.29
t				27	55	1					12	3													2	100	45	55.00
k				3	15	77					2	3														100	23	77.00
m	3		15				55	16	4													7				100	45	55.00
n	3	4	1				8	60	7				4			1	10		1			1				100	40	60.00
N			2					34	59								1					4				100	41	59.00
sh										85		14		1												100	15	85.00
ts											97	3														100	3	97.00
ch						3					5	92														100	8	92.00
zh	1	1	5					1			1		87				3		1							100	13	87.00
h						12				5	5	1		76	1											100	24	76.00
s											9				91											100	9	91.00
z		3									2		6			89										100	11	89.00
r	8	13	2								1						76									100	24	76.00
w	2		22				2											47				7		9		89	42	52.81
j										1			3						76		11	7	2			100	24	76.00
a							1				2									92			1	4		100	8	92.00
i			1								1		2						5		89		2			100	11	89.00
u		1	5					1	5					2			1					79	3	3		100	21	79.00
e			1						1					8					5	1	7	9	67	1		100	33	67.00
o																		1				3		96		100	4	96.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	563	75.70
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			74.50

MHT500_50_10_w10_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	76	13	4				3				1						2		1							100	24	76.00
d	6	72	3					1								1	17									100	28	72.00
g	3	1	53				10	19	5								8							1		100	47	53.00
p				8	11	5						2													2	28	20	28.57
t				27	55	3					12	3														100	45	55.00
k				2	13	81					2	2														100	19	81.00
m	1		15				60	12	4								3					5				100	40	60.00
n	1	4	2				7	62	6				3			1	11					3				100	38	62.00
N			2				1	34	59													3		1		100	41	59.00
sh										85		14		1												100	15	85.00
ts											99	1														100	1	99.00
ch						4					7	89														100	11	89.00
zh	1		5								1		89				4									100	11	89.00
h						14				4	4			77	1											100	23	77.00
s											11				88	1										100	12	88.00
z		1									3		7			89										100	11	89.00
r	9	12	3								1						75									100	25	75.00
w	3		21				1											45				10		9		89	44	50.56
j										1			4						75		10	8	2			100	25	75.00
a							1													91			1	7		100	9	91.00
i			1								1		1						6		89		2			100	11	89.00
u		1	3					1	5					2		1	3		1		1	78	2	2		100	22	78.00
e			2						1					5					4	1	7	9	70	1		100	30	70.00
o							1															2		97		100	3	97.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	555	76.05
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			74.51

MHT500_50_10_w20_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	76	12	4				5				1						1		1							100	24	76.00
d	8	71	4					1								1	15									100	29	71.00
g	5		52			1	11	18	7								5							1		100	48	52.00
p				10	11	4						1													2	28	18	35.71
t				28	55	1					13	3														100	45	55.00
k				2	13	80					2	3														100	20	80.00
m	3	1	10				56	17	4								3					6				100	44	56.00
n	3	4	1				6	63	7				3			1	10		1			1				100	37	63.00
N			2					34	59								1					4				100	41	59.00
sh										85		14		1												100	15	85.00
ts											98	2														100	2	98.00
ch						4					5	91														100	9	91.00
zh	1	1	4					1			1		88				3		1							100	12	88.00
h						12				7	3			77	1											100	23	77.00
s											11				88	1										100	12	88.00
z		1									3		6			90										100	10	90.00
r	9	15	2								1						73									100	27	73.00
w	2		21				2											47				8		9		89	42	52.81
j										1			3						76		10	8	2			100	24	76.00
a							1				1									92			1	5		100	8	92.00
i			1								1		1						6		89		2			100	11	89.00
u		1	5					1	5					2		1	3		1			77	2	2		100	23	77.00
e			2						1					6					4	1	7	10	68	1		100	32	68.00
o																		1				2		97		100	3	97.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	559	75.87
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			74.56

MHT500_50_10_w30_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	76	10	4				5				1		1				2		1							100	24	76.00
d	8	71	3					1								1	16									100	29	71.00
g	5		50			1	13	15	8				2				5							1		100	50	50.00
p				11	9	4						2													2	28	17	39.29
t				27	55	1					12	3													2	100	45	55.00
k				3	15	77					2	3														100	23	77.00
m	3	1	11				55	16	4								3					7				100	45	55.00
n	3	4	1				8	60	7				5				10		1			1				100	40	60.00
N			2					34	59								1					4				100	41	59.00
sh										85		14		1												100	15	85.00
ts											97	3														100	3	97.00
ch						4					5	91														100	9	91.00
zh	1	1	5					1			1		87				3		1							100	13	87.00
h						11				6	5	1		76	1											100	24	76.00
s											9				91											100	9	91.00
z		3									2		5			90										100	10	90.00
r	8	13	2								1						76									100	24	76.00
w	2		22				2											47				7		9		89	42	52.81
j										1			3						76		11	7	2			100	24	76.00
a							1				2									92			1	4		100	8	92.00
i			1								1		2						5		89		2			100	11	89.00
u		1	5					1	5					2			1					79	3	3		100	21	79.00
e			1						1					7					5	1	7	10	67	1		100	33	67.00
o																		1				2		97		100	3	97.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	563	75.70
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			74.50

MHT500_25_7_w10s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	93	2	3				1												1							100	7	93.00
d	9	88															3									100	12	88.00
g	1	7	59				9	6	7								4				1	5		1		100	41	59.00
p				21	4	1																			2	28	7	75.00
t				48	50	2																				100	50	50.00
k				14		82						4														100	18	82.00
m	5		21				46	3	5							1	8					11				100	54	46.00
n	1		12				11	49	6				3			2	12					4				100	51	49.00
N							2	16	73							2					1	5	1			100	27	73.00
sh										92		7			1											100	8	92.00
ts											92	8														100	8	92.00
ch						1					2	97														100	3	97.00
zh		1	4								1		89				5									100	11	89.00
h						13					3	16		68												100	32	68.00
s											2	1			96	1										100	4	96.00
z	1										4					95										100	5	95.00
r	17	11	5										1				66									100	34	66.00
w	2		9				2										4	56				3		13		89	33	62.92
j										1			9						71		14	4	1			100	29	71.00
a														1						99						100	1	99.00
i			1						1				2								96					100	4	96.00
u			3					1	3				2									88	2	1		100	12	88.00
e			1										5								1	4	89			100	11	89.00
o							2	1														1		96		100	4	96.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	466	79.89
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			79.66

MHT500_25_7_w20s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	92	1	2				2										2		1							100	8	92.00
d	10	85															5									100	15	85.00
g	1	5	58				9	5	4								8					9		1		100	42	58.00
p				22	4																				2	28	6	78.57
t				44	52	3						1														100	48	52.00
k				16	1	78					1	4														100	22	78.00
m	2		7				67	5	3							1	3					12				100	33	67.00
n	1	3	6				4	53	5				2			1	11		1			12	1			100	47	53.00
N								18	70							2					1	7	2			100	30	70.00
sh										89		10			1											100	11	89.00
ts											88	12														100	12	88.00
ch											2	98														100	2	98.00
zh	1	1	5								1		88				4									100	12	88.00
h						13				2	2	11		72												100	28	72.00
s											2	1			96	1										100	4	96.00
z											2		1			96						1				100	4	96.00
r	12	15	5										1				67									100	33	67.00
w	1		1														3	81						3		89	8	91.01
j										1			5						77		14	1	2			100	23	77.00
a														1						99						100	1	99.00
i			1						1				2								96					100	4	96.00
u			3					1	2				2			1						87	3	1		100	13	87.00
e																					1	1	98			100	2	98.00
o							1															1		98		100	2	98.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	410	82.30
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			82.23

MHT500_25_7_w30s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	90	1	2				4										2		1							100	10	90.00
d	10	83															7									100	17	83.00
g	2	1	60				9	5	4								8					10		1		100	40	60.00
p				21	4																				3	28	7	75.00
t				45	52	2						1														100	48	52.00
k				21	3	71					1	4														100	29	71.00
m	2		9				62	9	4							1	2					11				100	38	62.00
n	1	3	5				3	54	5				2			1	11		1			13	1			100	46	54.00
N								19	68							2					1	9	1			100	32	68.00
sh										90		8			2											100	10	90.00
ts											81	19														100	19	81.00
ch											2	98														100	2	98.00
zh	1	1	5									1	88			1	3									100	12	88.00
h						14				2	2	13		69												100	31	69.00
s											3	1			96											100	4	96.00
z		2									2		1			93						2				100	7	93.00
r	13	15	5					1									66									100	34	66.00
w	1		1														3	81						3		89	8	91.01
j			1							1			7						72		14	1	4			100	28	72.00
a																				100						100	0	100.00
i			1						1				1								97					100	3	97.00
u			2					1	2				2							1		87	3	2		100	13	87.00
e													1								1	1	97			100	3	97.00
o							1															1		98		100	2	98.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	443	80.88
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			80.75

MHT500_25_10_w10sres

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	93	2	3				1												1							100	7	93.00
d	9	88															3									100	12	88.00
g	1	7	59				9	6	7								4				1	5		1		100	41	59.00
p				21	4	1																			2	28	7	75.00
t				48	50	2																				100	50	50.00
k				14		82						4														100	18	82.00
m	4		20				48	3	5							1	8					11				100	52	48.00
n	1		12				11	49	6				3			2	12					4				100	51	49.00
N							2	16	73							2					1	5	1			100	27	73.00
sh										92		7			1											100	8	92.00
ts											92	8														100	8	92.00
ch						1					2	97														100	3	97.00
zh		1	4								1		89				5									100	11	89.00
h						13					3	16		68												100	32	68.00
s											2	1			96	1										100	4	96.00
z	1										4					95										100	5	95.00
r	17	11	5										1				66									100	34	66.00
w	2		11				2										3	55				3		13		89	34	61.80
j										1			9						73		12	4	1			100	27	73.00
a														1						99						100	1	99.00
i			1						1				2								96					100	4	96.00
u			3					1	3				2									88	2	1		100	12	88.00
e													4								1	3	92			100	8	92.00
o							2	1														1		96		100	4	96.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	460	80.15
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			79.91

MHT500_25_10_w20s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	92	1	2				2										2		1							100	8	92.00
d	9	86															5									100	14	86.00
g	1	5	58				9	5	4								8					9		1		100	42	58.00
p				22	4																				2	28	6	78.57
t				44	52	3						1														100	48	52.00
k				16	1	78					1	4														100	22	78.00
m	2		7				68	5	3							1	2					12				100	32	68.00
n	1	3	6				4	53	5				2			1	11		1			12	1			100	47	53.00
N								18	70							2					1	7	2			100	30	70.00
sh										89		10			1											100	11	89.00
ts											88	12														100	12	88.00
ch											2	98														100	2	98.00
zh	1	1	5								1		88				4									100	12	88.00
h						13				2	2	11		72												100	28	72.00
s											2	1			96	1										100	4	96.00
z											2		1			96						1				100	4	96.00
r	12	15	5										1				67									100	33	67.00
w	1		1														3	81						3		89	8	91.01
j										1			5						77		14	1	2			100	23	77.00
a														1						99						100	1	99.00
i			1						1				2								96					100	4	96.00
u			2					1	2				2			1				1		87	3	1		100	13	87.00
e																					1	1	98			100	2	98.00
o							1															1		98		100	2	98.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	408	82.39
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			82.32

MHT500_25_10_w30s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	90	1	2				4										2		1							100	10	90.00
d	10	83															7									100	17	83.00
g	2	1	60				9	5	4								8					10		1		100	40	60.00
p				21	4																				3	28	7	75.00
t				45	52	2						1														100	48	52.00
k				21	3	71					1	4														100	29	71.00
m	2		9				62	9	4							1	2					11				100	38	62.00
n	1	3	5				3	54	5				2			1	11		1			13	1			100	46	54.00
N								19	67							2					1	9	2			100	33	67.00
sh										90		8			2											100	10	90.00
ts											81	19														100	19	81.00
ch											2	98														100	2	98.00
zh	1	1	5									1	88			1	3									100	12	88.00
h						14				2	2	13		69												100	31	69.00
s											3	1			96											100	4	96.00
z		2									2		1			93						2				100	7	93.00
r	13	15	5					1									66									100	34	66.00
w	1		1														3	81						3		89	8	91.01
j			1							1			7						72		14	1	4			100	28	72.00
a																				100						100	0	100.00
i			1						1				1								97					100	3	97.00
u			2					1	2				2							1		87	3	2		100	13	87.00
e																					1	1	98			100	2	98.00
o							1															1		98		100	2	98.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	443	80.88
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			80.75

MHT500_50_7_w10s_re

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	94	1	2				2												1							100	6	94.00
d	9	78															13									100	22	78.00
g	2	5	54				10	14	7								3				1	4				100	46	54.00
p				22	4	2																				28	6	78.57
t				41	59																					100	41	59.00
k				4		92					1	3														100	8	92.00
m			9				63	12	5								4					7				100	37	63.00
n		1	2				7	80	2				1				6					1				100	20	80.00
N							2	20	73							1					1	3				100	27	73.00
sh										96		4														100	4	96.00
ts											95	5														100	5	95.00
ch											2	98														100	2	98.00
zh		2	4					1			1		89				3									100	11	89.00
h						12					2	2		84												100	16	84.00
s											3				96	1										100	4	96.00
z		1									2					96						1				100	4	96.00
r	4	5	4										1				86									100	14	86.00
w	3		6														1	56				7		16		89	33	62.92
j										1			9						71		11	6	2			100	29	71.00
a																				99				1		100	1	99.00
i			1						1				2								96					100	4	96.00
u			1					2	4							1						89	1	2		100	11	89.00
e													1								3		96			100	4	96.00
o														1								1		98		100	2	98.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	357	84.59
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			84.31

MHT500_50_7_w20s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	92	1	1				3										2		1							100	8	92.00
d	9	86															5									100	14	86.00
g	1	7	53				8	10	7								4				1	8		1		100	47	53.00
p				24	4																					28	4	85.71
t				48	50	1						1														100	50	50.00
k				9	1	85					1	4														100	15	85.00
m	1		4				71	8	6								1					9				100	29	71.00
n		1	3				3	74	2				1				8		1			6	1			100	26	74.00
N							4	21	68							1					1	5				100	32	68.00
sh										96		4														100	4	96.00
ts											91	9														100	9	91.00
ch											2	98														100	2	98.00
zh		2	4								1		90				3									100	10	90.00
h						12				2	1	3		82												100	18	82.00
s											3				96	1										100	4	96.00
z		1									2		1			95						1				100	5	95.00
r	9	13	4					1					1				72									100	28	72.00
w	2		1														2	79				2		3		89	10	88.76
j										1			5						76		14	1	3			100	24	76.00
a																				100						100	0	100.00
i			1										2								97					100	3	97.00
u			2					1	3				1			1						87	3	2		100	13	87.00
e													1								1	1	97			100	3	97.00
o																						1		99		100	1	99.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	359	84.51
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			84.56

MHT500_50_7_w30s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	90	1	2				4										2		1							100	10	90.00
d	9	86															5									100	14	86.00
g	1	5	56			1	8	7	5								5					11		1		100	44	56.00
p				24	4																					28	4	85.71
t				51	47	1						1														100	53	47.00
k				22	2	71					1	4														100	29	71.00
m	1		6				63	11	5							1	1					11		1		100	37	63.00
n		3	5				3	62	3				1				9		1			12	1			100	38	62.00
N								21	69							1					1	7	1			100	31	69.00
sh										95		4			1											100	5	95.00
ts											89	11														100	11	89.00
ch											3	97														100	3	97.00
zh	1	1	5									1	88			1	3									100	12	88.00
h						13				3	3	6		75												100	25	75.00
s											2				98											100	2	98.00
z		3									1		1			93						2				100	7	93.00
r	11	15	4					1					3				66									100	34	66.00
w	2		1														2	80						4		89	9	89.89
j			1							1			3						73		17	2	3			100	27	73.00
a																				100						100	0	100.00
i			1										2								97					100	3	97.00
u	1		2					1	3				1									87	3	2		100	13	87.00
e													1								1	1	97			100	3	97.00
o																						1		99		100	1	99.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	415	82.09
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			82.23

MHT500_50_10_w10s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	94	1	2				2												1							100	6	94.00
d	9	78															13									100	22	78.00
g	2	5	54				10	14	7								3				1	4				100	46	54.00
p				21	4	3																				28	7	75.00
t				40	58	2																				100	42	58.00
k				4		92					1	3														100	8	92.00
m			9				63	12	5								4					7				100	37	63.00
n		1	4				7	79	2								6					1				100	21	79.00
N							2	20	73							1					1	3				100	27	73.00
sh										96		4														100	4	96.00
ts											94	6														100	6	94.00
ch											2	98														100	2	98.00
zh		2	4					1			1		89				3									100	11	89.00
h						12					2	2		84												100	16	84.00
s											3				96	1										100	4	96.00
z		1									2					96						1				100	4	96.00
r	4	5	4										1				86									100	14	86.00
w	3		6														1	54				7		18		89	35	60.67
j										1			7						74		10	6	2			100	26	74.00
a																				100						100	0	100.00
i			1						1				2								96					100	4	96.00
u			1					2	4							1						89	1	2		100	11	89.00
e													1								3		96			100	4	96.00
o														1								1		98		100	2	98.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	359	84.51
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			84.11

MHT500_50_10_w20s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	92	1	1				3										2		1							100	8	92.00
d	9	86															5									100	14	86.00
g	1	7	53				7	11	7								4				1	8		1		100	47	53.00
p				24	4																					28	4	85.71
t				47	50	2						1														100	50	50.00
k				9	1	85					1	4														100	15	85.00
m	1		4				71	8	6								1					9				100	29	71.00
n		1	3				3	74	2				1				8		1			6	1			100	26	74.00
N							3	21	68							1					1	6				100	32	68.00
sh										95		5														100	5	95.00
ts											91	9														100	9	91.00
ch											2	98														100	2	98.00
zh		2	4								1		90				3									100	10	90.00
h						12				3	1	3		81												100	19	81.00
s											3				96	1										100	4	96.00
z		1									2		1			95						1				100	5	95.00
r	9	13	4					1					1				72									100	28	72.00
w	2		1														2	78				2		4		89	11	87.64
j										1			5						76		14	1	3			100	24	76.00
a																				100						100	0	100.00
i			1										2								97					100	3	97.00
u			2					1	3				1			1						87	3	2		100	13	87.00
e													1								1	1	97			100	3	97.00
o																						1		99		100	1	99.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	362	84.38
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			84.43

MHT500_50_10_w30s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	91	1	1				4										2		1							100	9	91.00
d	9	86															5									100	14	86.00
g	1	5	56			1	8	7	5								5					11		1		100	44	56.00
p				24	4																					28	4	85.71
t				51	47	1						1														100	53	47.00
k				22	2	71					1	4														100	29	71.00
m	1		6				63	11	5							1	1					11		1		100	37	63.00
n		3	5				3	62	3				1				9		1			12	1			100	38	62.00
N								21	69							1					1	7	1			100	31	69.00
sh										95		4			1											100	5	95.00
ts											89	11														100	11	89.00
ch											3	97														100	3	97.00
zh	1	1	5									1	88			1	3									100	12	88.00
h						12				3	3	5		77												100	23	77.00
s											2				98											100	2	98.00
z		3									1		1			93						2				100	7	93.00
r	11	15	4					1					3				66									100	34	66.00
w	2		1														2	80						4		89	9	89.89
j			1							1			3						74		16	2	3			100	26	74.00
a																				100						100	0	100.00
i			1										2								97					100	3	97.00
u	1		2					1	3				1									87	3	2		100	13	87.00
e													1								1	1	97			100	3	97.00
o																						1		99		100	1	99.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	411	82.26
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			82.40

MXM_raw

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	82	2	6				1										3					6				100	18	82.00
d	16	69	1			1					1						12									100	31	69.00
g		6	67				2		7				1				8					8		1		100	33	67.00
p	2		1	23	1	1																				28	5	82.14
t	1			43	28	14					9	5														100	72	28.00
k				5		74					13	7				1										100	26	74.00
m	3		45				12		4				1				28					7				100	88	12.00
n	3	1	30				2	17	6				3			1	15					21	1			100	83	17.00
N		1	7	1			3	4	65					5		1						13				100	35	65.00
sh										75	7	9	7		2											100	25	75.00
ts											65	14			16	5										100	35	65.00
ch										14	13	70	2		1											100	30	70.00
zh						1			1				96			1						1				100	4	96.00
h				2		24				3	9	5		37	20											100	63	37.00
s											11	2	1		83	3										100	17	83.00
z		3													1	95						1				100	5	95.00
r	22	4	30					1									43									100	57	43.00
w	11		29				4										9	36								89	53	40.45
j			6										14				1		55		11	11	2			100	45	55.00
a			2			1						1		3						85		2	4	2		100	15	85.00
i			4										8	2							85	1				100	15	85.00
u			3						5		1		1	1			1					85	2	1		100	15	85.00
e			13										7	10								1	65			96	31	67.71
o			4				7		1		1											12	3	71		99	28	71.72
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2312	829	64.14
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			64.58

MXM500_25_7_w10_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	73	9	4		1			3			1		1				1					5		2		100	27	73.00
d	19	57	4		1	4					1		3			4	7									100	43	57.00
g	1	4	55				6	11	14				1			4	3							1		100	45	55.00
p				3	22	1						1													1	28	25	10.71
t				14	56	12					12	5					1									100	44	56.00
k				8	10	66					15			1												100	34	66.00
m	1		9				65	8	7								9					1				100	35	65.00
n	2	1	9				7	63	10								7					1				100	37	63.00
N			2				4	22	70													2				100	30	70.00
sh										70		29			1											100	30	70.00
ts						4					77				19											100	23	77.00
ch						13				13	18	50		5	1											100	50	50.00
zh			1			1						6	90	1					1							100	10	90.00
h			1	1		12				3	10	9		55	9											100	45	55.00
s											9			1	90											100	10	90.00
z											3				1	96										100	4	96.00
r	26	4	8				2	3									57									100	43	57.00
w	1	1					3						1				1	54				3		25		89	35	60.67
j			1										10			2	2		68		14	2	1			100	32	68.00
a			1											1						94				4		100	6	94.00
i			1										4	1					4		90					100	10	90.00
u								1	1		1								1			90	3	3		100	10	90.00
e			3											1					1		2		93			100	7	93.00
o			1						1													6	3	89		100	11	89.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	646	72.12
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			70.22

MXM500_25_7_w20_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	75	11	3				2	3					1				1					4				100	25	75.00
d	21	56	10		2	3							1			3	4									100	44	56.00
g	1	2	57				8	8	12							4	7							1		100	43	57.00
p				3	20	2						1													2	28	25	10.71
t				15	52	14					13	5					1									100	48	52.00
k					10	75					15															100	25	75.00
m	3		6				68	5	9								8					1				100	32	68.00
n			12				9	59	9								10					1				100	41	59.00
N			2					19	75											1		3				100	25	75.00
sh										70		28			2											100	30	70.00
ts						3					77				20											100	23	77.00
ch						9				12	27	48		3	1											100	52	48.00
zh			1			1						5	91	1					1							100	9	91.00
h			1			13				7	9	2		64	4											100	36	64.00
s											11	1			88											100	12	88.00
z											2		1		1	96										100	4	96.00
r	26	5	5				2	3									59									100	41	59.00
w	3						8										1	53				3		21		89	36	59.55
j			1										9			2	2		72		11	2	1			100	28	72.00
a			1								1			1						94				3		100	6	94.00
i			3										4	1					3		89					100	11	89.00
u									1		1					1						90	4	3		100	10	90.00
e			3											2					1		2		92			100	8	92.00
o			1						1													5	2	91		100	9	91.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	623	73.11
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			71.18

MXM500_25_7_w30_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	75	11	3				2	3					1				1					4				100	25	75.00
d	21	58	11		1	2							1			3	3									100	42	58.00
g	2	2	55				8	7	13							4	8							1		100	45	55.00
p				4	18	2						1													3	28	24	14.29
t				14	52	14					16	3					1									100	48	52.00
k					11	72					17															100	28	72.00
m	5		9				63	5	9								8					1				100	37	63.00
n			11				12	51	10								14					1	1			100	49	51.00
N			2					15	79											1		2	1			100	21	79.00
sh										70		28		1	1											100	30	70.00
ts						3					82				15											100	18	82.00
ch						6				14	31	46		2	1											100	54	46.00
zh			1			1						3	95													100	5	95.00
h						14				7	10	2		61	6											100	39	61.00
s											15	1			84											100	16	84.00
z											2		1		2	95										100	5	95.00
r	25	6	5				2	3									59									100	41	59.00
w	4						8										1	54				2		20		89	35	60.67
j			1										9			2	2		73		11	1	1			100	27	73.00
a			1								1			1						94				3		100	6	94.00
i			3										4	1					3		89					100	11	89.00
u									1		1					1						90	4	3		100	10	90.00
e			2											2					1		3		92			100	8	92.00
o			1						1													5	2	91		100	9	91.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	633	72.68
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			70.87

MXM500_25_10_w10_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	75	9	4		1			3					1				3					2		2		100	25	75.00
d	23	52	3		1	4					1		3			4	9									100	48	52.00
g	1	4	55				7	11	13				1			4	3							1		100	45	55.00
p				3	22	1						1													1	28	25	10.71
t				14	55	13					12	5					1									100	45	55.00
k				8	10	66					15			1												100	34	66.00
m	1		10				63	6	8								11					1				100	37	63.00
n		1	9				12	60	10								7					1				100	40	60.00
N			3				3	22	70													2				100	30	70.00
sh										70		29			1											100	30	70.00
ts						4					77				19											100	23	77.00
ch						12				13	18	51		5	1											100	49	51.00
zh			1			1						6	90	1					1							100	10	90.00
h			1	1		12				3	10	9		55	9											100	45	55.00
s											9			1	90											100	10	90.00
z											3				2	95										100	5	95.00
r	26	4	8				2	3									57									100	43	57.00
w	1	1					6						1				1	51				3		25		89	38	57.30
j			1										10			1	3		68		14	2	1			100	32	68.00
a			1								1			1						94				3		100	6	94.00
i			1										4	1					4		90					100	10	90.00
u								1	1		1								1			90	3	3		100	10	90.00
e			3											1					1		2		93			100	7	93.00
o			1						1													6	3	89		100	11	89.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	658	71.60
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			69.71

MXM500_25_10_w20_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	75	11	3				2	3					1				3					2				100	25	75.00
d	23	54	10		2	3							1			3	4									100	46	54.00
g	1	2	57				8	8	12							4	7							1		100	43	57.00
p				3	20	2						1													2	28	25	10.71
t				15	51	14					14	5					1									100	49	51.00
k					10	74					16															100	26	74.00
m	3		6				68	6	9								7					1				100	32	68.00
n			12				13	58	9								8									100	42	58.00
N			2					19	75											1		3				100	25	75.00
sh										70		28			2											100	30	70.00
ts						3					77				20											100	23	77.00
ch						9				12	27	48		3	1											100	52	48.00
zh			1			1						5	91	1					1							100	9	91.00
h			1			13				7	9	2		64	4											100	36	64.00
s											11	1			88											100	12	88.00
z											3		1		1	95										100	5	95.00
r	26	5	5				2	3									59									100	41	59.00
w	2						10										1	53				3		20		89	36	59.55
j			1										9			1	3		72		11	2	1			100	28	72.00
a			1								1			1						94				3		100	6	94.00
i			3										4	1					3		89					100	11	89.00
u									1		1					1						90	4	3		100	10	90.00
e			3											2					1		2		92			100	8	92.00
o			1						1									1				5	2	90		100	10	90.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	630	72.81
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			70.89

MXM500_25_10_w30_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	75	11	4				2	3					1				2					2				100	25	75.00
d	25	54	11		1	2							1			3	3									100	46	54.00
g	2	2	55				8	7	13							4	8							1		100	45	55.00
p				4	18	2						1													3	28	24	14.29
t				13	52	14					17	3					1									100	48	52.00
k					11	72					17															100	28	72.00
m	5		8				65	4	9								8					1				100	35	65.00
n			11				14	51	10								12					1	1			100	49	51.00
N			2					15	79											1		2	1			100	21	79.00
sh										70		28		1	1											100	30	70.00
ts						2					83				15											100	17	83.00
ch						6				14	31	46		2	1											100	54	46.00
zh			1			1						3	95													100	5	95.00
h						14				7	10	2		61	6											100	39	61.00
s											15	1			84											100	16	84.00
z											2		1		2	95										100	5	95.00
r	26	5	5				2	3									59									100	41	59.00
w	3						10										1	54				2		19		89	35	60.67
j			1										9			1	3		73		11	1	1			100	27	73.00
a			1								1			1						94				3		100	6	94.00
i			3										4	1					3		89					100	11	89.00
u									1		1					1						90	4	3		100	10	90.00
e			2											2					1		3		92			100	8	92.00
o			1						1									1				5	2	90		100	10	90.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	635	72.59
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			70.79

MXM500_50_7_w10_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	72	10	3		1		1	2					1			1	2					5		2		100	28	72.00
d	12	61	8		1	7							2			7	1		1							100	39	61.00
g	1	1	55				7	10	12				2			4	6							2		100	45	55.00
p			1	4	12	3					3														5	28	24	14.29
t		1		4	46	8					29	1		1		2									8	100	54	46.00
k				12	8	49					27		1	1											2	100	51	49.00
m	1		9				71	5	9								4					1				100	29	71.00
n	3		12			1	9	53	10				1				8					3				100	47	53.00
N			1					32	63													4				100	37	63.00
sh										88		5	2	4	1											100	12	88.00
ts						5					86				9											100	14	86.00
ch						21				14	47	12		4	2											100	88	12.00
zh			1			3				8	3	8	73	3					1							100	27	73.00
h			1	4	1	26				2	7			56	3											100	44	56.00
s										2	25				73											100	27	73.00
z											2				1	97										100	3	97.00
r	21	13	12				1	1					2				50									100	50	50.00
w	6						8	1									2	48				4		20		89	41	53.93
j			1						1				16			1	1		65		13	2				100	35	65.00
a			1								1									90		2		6		100	10	90.00
i			5					1					12	1							78	2	1			100	22	78.00
u		2						1	5		1						1		1			83	2	4		100	17	83.00
e			5											3			1				5	1	85			100	15	85.00
o			1						1											2		6		90		100	10	90.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	769	66.81
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			65.18

MXM500_50_7_w20_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	73	10	4			1	2	1					1			1	1					4		2		100	27	73.00
d	16	57	12		1	4							1			8	1									100	43	57.00
g	1	1	58				7	10	10				2			4	6							1		100	42	58.00
p				4	13	5					1														5	28	24	14.29
t		1		4	46	10					31	1		1		2									4	100	54	46.00
k				6	8	59					26		1													100	41	59.00
m	1		9				69	6	7								7					1				100	31	69.00
n	3		11			1	10	51	9				1				10					4				100	49	51.00
N							2	32	62													4				100	38	62.00
sh										85		3	8	3	1											100	15	85.00
ts						3					90				7											100	10	90.00
ch						15				15	53	11	1	3	2											100	89	11.00
zh			1			1				6	4	10	77	1												100	23	77.00
h			1	3	1	30				4	8			50	3											100	50	50.00
s										1	29				70											100	30	70.00
z											3				1	96										100	4	96.00
r	19	15	10				1	1					2				52									100	48	52.00
w	6						9	1					1				1	49				2		20		89	40	55.06
j			1						1				13			1	1		66		14	3				100	34	66.00
a			1								1									90		2		6		100	10	90.00
i			5										8	1					1		81	3	1			100	19	81.00
u		3	1				1		7		1					1						81	2	3		100	19	81.00
e			5											3			1				3	1	87			100	13	87.00
o			1						1											1		7	1	89		100	11	89.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	764	67.03
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			65.39

MXM500_50_7_w30_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	75	9	4				2	1					1			1	1					4		2		100	25	75.00
d	16	60	11		1	3										8	1									100	40	60.00
g	1	1	58				7	11	8				2			4	7							1		100	42	58.00
p				4	13	5					1														5	28	24	14.29
t		1		4	48	6					33	2				2									4	100	52	48.00
k				6	9	56					27	1	1													100	44	56.00
m	2		10				63	6	8								10					1				100	37	63.00
n	3		14			1	11	46	7				1				12					4	1			100	54	46.00
N							1	31	64													4				100	36	64.00
sh										85		1	11	2	1											100	15	85.00
ts						2					92				6											100	8	92.00
ch						12				16	58	11	1	1	1											100	89	11.00
zh			1							5	4	11	77	1	1											100	23	77.00
h				3	1	24				6	11			52	3											100	48	52.00
s										1	31				68											100	32	68.00
z											3				3	94										100	6	94.00
r	21	14	8				2						2				53									100	47	53.00
w	6						9	1					1				1	49				2		20		89	40	55.06
j			1						1				13			1	1		67		14	2				100	33	67.00
a			1								3									90		2		4		100	10	90.00
i			5										8	1							82	3	1			100	18	82.00
u		3	1				1		7		1					1						81	3	2		100	19	81.00
e			5											4			1				3	1	86			100	14	86.00
o			1						1													7	1	90		100	10	90.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	766	66.94
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			65.31

MXM500_50_10_w10_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	74	9	3		1		1	2					1			1	4					3		1		100	26	74.00
d	12	61	8		1	7							2			8	1									100	39	61.00
g	1	1	55				7	10	12				2			4	6							2		100	45	55.00
p			1	4	12	3					3														5	28	24	14.29
t		1		4	47	7					29	1		2		1									8	100	53	47.00
k				12	8	48					29		1	1											1	100	52	48.00
m	1		8				71	5	10								4					1				100	29	71.00
n	3		12			1	9	54	9				1				8					3				100	46	54.00
N			1					33	62													4				100	38	62.00
sh										88		5	2	4	1											100	12	88.00
ts						5					86				9											100	14	86.00
ch						21				14	47	12		4	2											100	88	12.00
zh			1			3				8	3	8	73	3					1							100	27	73.00
h			1	4	1	28				1	6			56	3											100	44	56.00
s										2	24				74											100	26	74.00
z											2		1		3	94										100	6	94.00
r	21	11	13				2	1					2				50									100	50	50.00
w	5						9	1									2	49				4		19		89	40	55.06
j			1						1				16				2		65		13	2				100	35	65.00
a			1								2									90		2		5		100	10	90.00
i			5					1					13	2							76	2	1			100	24	76.00
u		2						1	5		1						1		1			83	2	4		100	17	83.00
e			5											3			1				5	1	85			100	15	85.00
o			1						1									1		2		6		89		100	11	89.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	771	66.72
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			65.10

MXM500_50_10_w20_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	74	10	4			1	2	1					1			1	2					3		1		100	26	74.00
d	16	57	12		1	4							1			8	1									100	43	57.00
g	1	1	58				7	10	10				2			4	6							1		100	42	58.00
p				4	13	5					1														5	28	24	14.29
t		1		4	46	10					31	1		1		2									4	100	54	46.00
k				6	8	59					26		1													100	41	59.00
m	1		8				68	6	8								8					1				100	32	68.00
n	3		11			1	10	52	8				1				10					4				100	48	52.00
N							2	33	61													4				100	39	61.00
sh										85		3	8	3	1											100	15	85.00
ts						3					90				7											100	10	90.00
ch						15				15	55	11		3	1											100	89	11.00
zh			1			1				6	4	10	77	1												100	23	77.00
h			1	3	1	31				4	8			49	3											100	51	49.00
s										1	25				74											100	26	74.00
z											4				2	94										100	6	94.00
r	19	15	11				2	1					2				50									100	50	50.00
w	5						10	1					1				1	50				2		19		89	39	56.18
j			1						1				13				2		66		14	3				100	34	66.00
a			1								2									89		2		6		100	11	89.00
i			6										8	1					1		81	2	1			100	19	81.00
u		3	1				1		7		1					1						81	2	3		100	19	81.00
e			5											3			1				3	1	87			100	13	87.00
o			1						1									1		1		7	1	88		100	12	88.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	766	66.94
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			65.31

MXM500_50_10_w30_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	76	9	4				2	1					1			1	1					4		1		100	24	76.00
d	16	60	11		1	3										8	1									100	40	60.00
g	1	1	57				7	12	8				2			4	7							1		100	43	57.00
p				4	13	5					1														5	28	24	14.29
t		1		4	49	6					33	2				2									3	100	51	49.00
k				6	9	56					27	1	1													100	44	56.00
m	2		10				62	6	8								11					1				100	38	62.00
n	3		14			1	11	48	6				1				11					4	1			100	52	48.00
N							1	31	64													4				100	36	64.00
sh										85		1	11	2	1											100	15	85.00
ts						2					92				6											100	8	92.00
ch						12				16	58	11	1	1	1											100	89	11.00
zh			1							5	4	11	77	1	1											100	23	77.00
h				3	1	26				6	11			50	3											100	50	50.00
s										1	30				69											100	31	69.00
z											4				4	92										100	8	92.00
r	21	14	8				3						2				52									100	48	52.00
w	5						10	1					1				1	50				2		19		89	39	56.18
j			1						1				13				2		67		14	2				100	33	67.00
a			1								4									89		2		4		100	11	89.00
i			5										8	1							83	2	1			100	17	83.00
u		3	1				1		7		1					1						81	3	2		100	19	81.00
e			5											4			1				3	1	86			100	14	86.00
o			1						1									1				7	1	89		100	11	89.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	768	66.85
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			65.23

MXM500_25_7_w10s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	85	5	2				1										2					4		1		100	15	85.00
d	5	85	1		1	3					2					2	1									100	15	85.00
g		6	63				7	5	13				1			1	2					1		1		100	37	63.00
p				21	5	1																1				28	7	75.00
t				14	61	11					9	4					1									100	39	61.00
k				10	1	82					7															100	18	82.00
m			13				64	7	7								8					1				100	36	64.00
n	2	2	14				9	55	8								6					4				100	45	55.00
N			2				3	9	82													4				100	18	82.00
sh										78		22														100	22	78.00
ts						3					91	2			4											100	9	91.00
ch						2				16	7	75														100	25	75.00
zh						1						4	94									1				100	6	94.00
h			1	2		7				1	9	16		59	5											100	41	59.00
s											21				79											100	21	79.00
z											3					97										100	3	97.00
r	21	9	11					4									55									100	45	55.00
w	5						4										3	54		1		1		21		89	35	60.67
j			1										10				1		74		12	1	1			100	26	74.00
a														1						97		1		1		100	3	97.00
i													3								97					100	3	97.00
u											1								1	1	1	93	2	1		100	7	93.00
e			2																1		1		96			100	4	96.00
o									1													1		98		100	2	98.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	482	79.20
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			78.99

MXM500_25_7_w20s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	l
b	86	5	2				1										2					4				100	14	86.00
d	5	86	1		1	2					1					1	3									100	14	86.00
g		7	58				6	4	10								8					6		1		100	42	58.00
p				20	5	2											1									28	8	71.43
t				9	65	12					10	4														100	35	65.00
k				5		81					14															100	19	81.00
m	1		17				57	5	6								12					2				100	43	57.00
n	1	2	18				4	58	5								8					4				100	42	58.00
N			1					9	80													10				100	20	80.00
sh										85		14			1											100	15	85.00
ts						3					92	1			4											100	8	92.00
ch										16	9	75														100	25	75.00
zh						1						3	94			1						1				100	6	94.00
h				1		13					9	4		71	2											100	29	71.00
s											19	2			79											100	21	79.00
z		1									2					97										100	3	97.00
r	19	10	6				1	2									62									100	38	62.00
w	2		1				4										2	75						5		89	14	84.27
j			2										3				1		86		7		1			100	14	86.00
a														1						98				1		100	2	98.00
i													2						1		97					100	3	97.00
u											1					1				1	1	92	3	1		100	8	92.00
e			2											1					1				96			100	4	96.00
o							1		1														1	97		100	3	97.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	430	81.44
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			81.15

MXM500_25_7_w30s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	l
b	85	5	3				1										2					4				100	15	85.00
d	6	88	1			1					1						3									100	12	88.00
g		7	56				7	3	11							1	9					5		1		100	44	56.00
p				23	2	2											1									28	5	82.14
t				9	63	10					14	4														100	37	63.00
k				4	2	76					18															100	24	76.00
m	1		19				53	4	6								15					2				100	47	53.00
n	1	2	17				5	54	5								10		1			5				100	46	54.00
N			2					11	77													9	1			100	23	77.00
sh										81	3	14		1	1											100	19	81.00
ts						3					94	1			2											100	6	94.00
ch										11	15	74														100	26	74.00
zh						1						3	94			1						1				100	6	94.00
h				1		13					10	4		67	4										1	100	33	67.00
s											24	2			74											100	26	74.00
z		1														99										100	1	99.00
r	20	9	6				1	2									62									100	38	62.00
w	2		1				4										3	77						2		89	12	86.52
j			2										2				1		86		8		1			100	14	86.00
a														1						98				1		100	2	98.00
i													2						1		97					100	3	97.00
u											1					1				1	1	93	2	1		100	7	93.00
e			2											1					1		1		95			100	5	95.00
o							1		1														1	97		100	3	97.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	454	80.41
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			80.49

MXM500_25_10_w10s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	87	3	2		1		1										2					3		1		100	13	87.00
d	7	84	1		1	3					1					2	1									100	16	84.00
g		6	64				7	6	11				1			1	2					1		1		100	36	64.00
p				21	5	1																1				28	7	75.00
t				14	60	12					9	4					1									100	40	60.00
k				10	1	82					7															100	18	82.00
m			14				62	6	7								10					1				100	38	62.00
n	1	2	13				9	57	8								6					4				100	43	57.00
N			1				3	10	83													3				100	17	83.00
sh										78		22														100	22	78.00
ts						3					91	2			4											100	9	91.00
ch						1				16	7	76														100	24	76.00
zh						1						4	94									1				100	6	94.00
h			1	2		7				1	9	16		59	5											100	41	59.00
s											21				79											100	21	79.00
z											4					96										100	4	96.00
r	22	7	8				1	4									58									100	42	58.00
w	5						5										3	54				1		21		89	35	60.67
j			1										10				1		74		12	1	1			100	26	74.00
a														1						97		1		1		100	3	97.00
i													3								97					100	3	97.00
u											1								1	1	1	93	2	1		100	7	93.00
e			2																		1		97			100	3	97.00
o									1													1		98		100	2	98.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	476	79.46
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			79.24

MXM500_25_10_w20s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	86	5	2				1										2					4				100	14	86.00
d	5	86	1		1	2					1					1	3									100	14	86.00
g		7	58				6	4	10								8					6		1		100	42	58.00
p				20	5	2											1									28	8	71.43
t				9	64	13					10	4														100	36	64.00
k				5		80					15															100	20	80.00
m	1		17				57	5	7								11					2				100	43	57.00
n	2	2	18				6	56	5								8					3				100	44	56.00
N			1					9	80													10				100	20	80.00
sh										85		14			1											100	15	85.00
ts						3					93	1			3											100	7	93.00
ch										16	9	75														100	25	75.00
zh						1						3	94			1						1				100	6	94.00
h				1		13					9	4		71	2											100	29	71.00
s											19	2			79											100	21	79.00
z		1									2					97										100	3	97.00
r	19	9	6				1	2									63									100	37	63.00
w	2						4										2	75						6		89	14	84.27
j			2										3				1		86		7		1			100	14	86.00
a														1						98				1		100	2	98.00
i													2						1		97					100	3	97.00
u											1					1				1	1	92	3	1		100	8	92.00
e			2											1					1				96			100	4	96.00
o							1		1														1	97		100	3	97.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	432	81.36
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			81.07

MXM500_25_10_w30s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	87	4	2				1										2					4				100	13	87.00
d	6	88	1			1					1						3									100	12	88.00
g		7	56				7	3	11							1	9					5		1		100	44	56.00
p				22	3	2											1									28	6	78.57
t				9	63	10					14	4														100	37	63.00
k				4	2	76					18															100	24	76.00
m	1		19				54	4	6								14					2				100	46	54.00
n	1	2	17				5	54	5								10		1			5				100	46	54.00
N			2					11	77													9	1			100	23	77.00
sh										81	3	14		1	1											100	19	81.00
ts						2					95	1			2											100	5	95.00
ch										11	15	74														100	26	74.00
zh						1						3	94			1						1				100	6	94.00
h				2		13					10	4		67	4											100	33	67.00
s											23	2			75											100	25	75.00
z		1														99										100	1	99.00
r	20	9	6				1	2									62									100	38	62.00
w	2		1				4										3	77						2		89	12	86.52
j			2										2				1		86		8		1			100	14	86.00
a														1						98				1		100	2	98.00
i													2						1		97					100	3	97.00
u											1					1				1	1	93	2	1		100	7	93.00
e			2											1					1		1		95			100	5	95.00
o							1		1														1	97		100	3	97.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	450	80.58
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			80.55

MXM500_50_7_w10s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	90	4	1				1	1									1					2				100	10	90.00
d	2	86	2		1	4											5									100	14	86.00
g		5	56				5	13	13				1			1	4							2		100	44	56.00
p				22	3	1																1			1	28	6	78.57
t				11	65	9					10	4					1									100	35	65.00
k				8	2	81					9															100	19	81.00
m			10				67	11	7								3					2				100	33	67.00
n	1	2	8				3	70	5				1				9					1				100	30	70.00
N			2					12	80													6				100	20	80.00
sh										84		16														100	16	84.00
ts						5					89				6											100	11	89.00
ch						2				17	6	75														100	25	75.00
zh						2				2		8	86			1						1				100	14	86.00
h			1	3		9				1	4	2		77	3											100	23	77.00
s											10	2			88											100	12	88.00
z											1				1	98										100	2	98.00
r	11	16	8					1					2				62									100	38	62.00
w	12		2				3										3	47				2		20		89	42	52.81
j			1										6				2		75		14	1	1			100	25	75.00
a																				99				1		100	1	99.00
i													5			1			2		92					100	8	92.00
u											1								1		1	93	2	2		100	7	93.00
e			2																		1		97			100	3	97.00
o									1															99		100	1	99.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	439	81.05
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			80.85

MXM500_50_7_w20s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	90	5	2														2					1				100	10	90.00
d	5	85			2	2										1	5									100	15	85.00
g		7	55				5	8	10							1	7					6		1		100	45	55.00
p				19	5	2											1								1	28	9	67.86
t				9	64	10					12	5														100	36	64.00
k				3	1	80					16															100	20	80.00
m	2		14				55	12	6								9					2				100	45	55.00
n	1	3	14				2	65	3								9					3				100	35	65.00
N			1					14	76													9				100	24	76.00
sh										80		20														100	20	80.00
ts						3					92	1			4											100	8	92.00
ch										13	9	78														100	22	78.00
zh	1					2						6	90			1										100	10	90.00
h				1		13					5	2		75	3										1	100	25	75.00
s											13	1			86											100	14	86.00
z		1									2					97										100	3	97.00
r	17	13	5					2									63									100	37	63.00
w	4						4										3	71				1		6		89	18	79.78
j			2										2				1		88		6		1			100	12	88.00
a																				99				1		100	1	99.00
i													4			1			1		94					100	6	94.00
u											1					1				1	1	92	3	1		100	8	92.00
e			2																1				97			100	3	97.00
o							1		1															98		100	2	98.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	428	81.53
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			81.11

MXM500_50_7_w30s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	89	5	2				1										2					1				100	11	89.00
d	7	85			1						1					1	5									100	15	85.00
g		8	54				7	3	11							1	9					6		1		100	46	54.00
p				23	2	2											1									28	5	82.14
t				9	63	10					14	4														100	37	63.00
k				4	2	75					18	1														100	25	75.00
m	1		18				51	5	7								16					2				100	49	51.00
n	1	3	16				2	59	5								10		1			3				100	41	59.00
N			1	1				16	73													9				100	27	73.00
sh										75	2	21		1	1											100	25	75.00
ts						2					94	1			3											100	6	94.00
ch										9	16	75														100	25	75.00
zh	1					1						3	94			1										100	6	94.00
h				1		14					7	3		72	2										1	100	28	72.00
s											21	1			78											100	22	78.00
z		1									1					98										100	2	98.00
r	19	11	5				1	2									62									100	38	62.00
w	4		1				4										4	74						2		89	15	83.15
j			2										1				1		87		8		1			100	13	87.00
a																				99				1		100	1	99.00
i													3			1			1		95					100	5	95.00
u									1		1					2				1	1	90	3	1		100	10	90.00
e			2																1				97			100	3	97.00
o							1		2															97		100	3	97.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	458	80.23
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			80.30

MXM500_50_10_w10s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	90	4	1				1	1									1					2				100	10	90.00
d	2	85	2		1	4										1	5									100	15	85.00
g		5	56				5	13	13				1			1	4							2		100	44	56.00
p				22	3	1																1			1	28	6	78.57
t				11	64	9					11	4					1									100	36	64.00
k				8	1	82					9															100	18	82.00
m			11				68	11	7								1					2				100	32	68.00
n	1	2	8				3	70	5				1				9					1				100	30	70.00
N			1					13	80													6				100	20	80.00
sh										84		16														100	16	84.00
ts						5					88	1			6											100	12	88.00
ch						2				17	6	75														100	25	75.00
zh						2				2		8	86			1						1				100	14	86.00
h			1	3		10					4	2		77	3											100	23	77.00
s											10	2			88											100	12	88.00
z											1				2	97										100	3	97.00
r	11	16	7					1					2				63									100	37	63.00
w	11		1				5										3	46				2		21		89	43	51.69
j			1										6				2		75		14	1	1			100	25	75.00
a																				99				1		100	1	99.00
i													5			1			2		92					100	8	92.00
u											1								1		1	93	2	2		100	7	93.00
e			2																		1		97			100	3	97.00
o									1															99		100	1	99.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	441	80.97
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			80.76

MXM500_50_10_w20s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	90	5	2														2					1				100	10	90.00
d	5	85			2	2										1	5									100	15	85.00
g		7	55				5	8	10							1	7					6		1		100	45	55.00
p				20	4	2											1								1	28	8	71.43
t				9	64	10					12	5														100	36	64.00
k				4	1	79					16															100	21	79.00
m	2		14				55	12	6								9					2				100	45	55.00
n	1	3	13				2	66	3								9					3				100	34	66.00
N			1					14	76													9				100	24	76.00
sh										80		20														100	20	80.00
ts						3					92	1			4											100	8	92.00
ch										13	9	78														100	22	78.00
zh	1					2						6	90			1										100	10	90.00
h				1		13					5	2		75	3										1	100	25	75.00
s											11	1			88											100	12	88.00
z		1									2					97										100	3	97.00
r	17	12	6					2									63									100	37	63.00
w	4						4										3	71				1		6		89	18	79.78
j			2										2				1		88		6		1			100	12	88.00
a																				99				1		100	1	99.00
i													4			1			1		94					100	6	94.00
u											1					1					1	92	3	2		100	8	92.00
e			2																1				97			100	3	97.00
o							1		1															98		100	2	98.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	425	81.66
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			81.34

MXM500_50_10_w30s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	89	5	2				1										2					1				100	11	89.00
d	7	86			1						1					1	4									100	14	86.00
g		8	54				6	4	11							1	9					6		1		100	46	54.00
p				23	2	2											1									28	5	82.14
t				9	63	10					14	4														100	37	63.00
k				4	2	75					18	1														100	25	75.00
m	1		18				51	5	7								16					2				100	49	51.00
n	1	3	16				2	59	5								10		1			3				100	41	59.00
N			1	1				16	73													9				100	27	73.00
sh										75	2	21		1	1											100	25	75.00
ts						2					94	1			3											100	6	94.00
ch										9	16	75														100	25	75.00
zh	1					1						3	94			1										100	6	94.00
h				1		14					7	3		72	2										1	100	28	72.00
s											21	1			78											100	22	78.00
z		1									1					98										100	2	98.00
r	18	11	5				1	2									63									100	37	63.00
w	4		1				4										4	74						2		89	15	83.15
j			2										1				1		87		8		1			100	13	87.00
a																				99				1		100	1	99.00
i													3			1			1		95					100	5	95.00
u									1		1					2				1	1	90	3	1		100	10	90.00
e			2																1				97			100	3	97.00
o							1		2															97		100	3	97.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2317	456	80.32
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			80.39

FSU_raw

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	29	25	4	6	3	5		3	4		2	1	5			4	8					1				100	71	29.00
d	36	34	4		2	1					5	2	9				6		1							100	66	34.00
g	9	12	17				11	7	15			5	8	1		8	4				1	2				100	83	17.00
p				10	2							5		6			5									28	18	35.71
t				39	17	4						23	1	5	8	1	1				1					100	83	17.00
k				21	14	14				5	9	18		7	7					5						100	86	14.00
m	1	8	9				12	32	15							4	18					1				100	88	12.00
n	9	2	15				6	17	10							11	18					12				100	83	17.00
N	6	4	6		1		1	24	37		1		1			10						9				100	63	37.00
sh										22	2	64		11	1											100	78	22.00
ts				8		3					32	54			3											100	68	32.00
ch				1		1					15	77		6												100	23	77.00
zh						8			1	2	2	33	38	12	1	3										100	62	38.00
h						11				16	3	11		53	6											100	47	53.00
s				1	2	1					34	49			13											100	87	13.00
z				3	2	3			5		11	22	26	1	5	20					1	1				100	80	20.00
r	13	7	14	1	1		1	2	7		1	2	37	1		5	4				1	3				100	96	4.00
w	6	3	31				1	5			1						28							3		78	78	0.00
j		6	4	1	3		6	3	3				50			7	3		1		2	10		1		100	99	1.00
a			2	2		2	2	3	7		28	5		7						27		2	8	3		98	71	27.55
i			29				7	28	1		4		12			8					8	2		1		100	92	8.00
u			5	1	1		5	60	6				11	1		1					6	3				100	97	3.00
e			4				9	6	41		3			16			1				5	3	8	4		100	92	8.00
o	2					2	21	13	3		19									9		11		18		98	80	18.37
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2302	1791	22.20
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			22.40

FSU500_25_7_w10_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	44	12	5	1	3	4							10				17		1		1	2				100	56	44.00
d	19	27	3			1					9	1	23			1	16									100	73	27.00
g	1	4	27			7	17	15	13				8	1		2	3		2							100	73	27.00
p			1		12									6			9									28	28	0.00
t		4			53	4					2	14	4	7	1	3	8									100	47	53.00
k				1	25	35				5	12	3	3	14	2											100	65	35.00
m	1		6				44	16	14								16		3							100	56	44.00
n	8		13				13	22	10				5				20		2			7				100	78	22.00
N			3				1	8	79				1				5					3				100	21	79.00
sh										83		12		5												100	17	83.00
ts					2						76	5		1	16											100	24	76.00
ch						15				25	3	57														100	43	57.00
zh			1			14				24	1	20	32	5	3											100	68	32.00
h				6		21				4	4	1	2	60	2											100	40	60.00
s										1	23				76											100	24	76.00
z	2	1	2		1	1					16	3	20		41	8						5				100	92	8.00
r	23	3	6			2		1			3	2	33			2	15		1		1	8				100	85	15.00
w	2	1	2				5	1									23	36						8		78	42	46.15
j							1						39			3	5		34		16	2				100	66	34.00
a											4									95			1			100	5	95.00
i			3				1	8	1				11								74	2				100	26	74.00
u			4				2	16			1		15						1		2	58	1			100	42	58.00
e			2					1	5				5	5			1				1	1	79			100	21	79.00
o	1		1				1	1														4	1	91		100	9	91.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	1101	52.25
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			50.63

FSU500_25_7_w20_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	43	18	4	1	3	4					1		10				15					1				100	57	43.00
d	19	29	4		1	1					7	1	22		1		15									100	71	29.00
g	2	4	28			6	12	13	15				9	1	1	1	5	1	2							100	72	28.00
p					12							1		7		1	7									28	28	0.00
t		5			50	4					4	14	4	11	1	5	2									100	50	50.00
k					26	34				7	11	2		9	8					3						100	66	34.00
m	2	1	7				36	19	16				1				17		1							100	64	36.00
n	7		14				14	16	13				5				22		1			8				100	84	16.00
N			2				2	4	76				1				9					6				100	24	76.00
sh										86		12		2												100	14	86.00
ts					1						76	6		1	16											100	24	76.00
ch						15				23	4	58														100	42	58.00
zh			1			13				13	2	35	31	2	3											100	69	31.00
h						10				13	4			68	5											100	32	68.00
s										1	20				79											100	21	79.00
z		1	2		1	2	1				18	3	16	1	35	19						1				100	81	19.00
r	18	5	11			2		1			2	4	35				9				4	9				100	91	9.00
w	1	1	2				3	3									22	37						9		78	41	47.44
j				1			1	1					32			4	4		39		17	1				100	61	39.00
a			1								4									92			2	1		100	8	92.00
i			2				1	6					13								76	2				100	24	76.00
u			4				4	28	10		1		13	1					1		7	30	1			100	70	30.00
e			2				1	1	6				4	5						1	3	4	71	2		100	29	71.00
o			1				1	1												1		7	2	87		100	13	87.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	1136	50.74
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			49.18

FSU500_25_7_w30_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	40	19	7	1	3	4					1	1	9				13					2				100	60	40.00
d	21	26	7		1	1					8	1	21		1		13									100	74	26.00
g	2	2	32			6	8	12	17				10	1	1	1	5	1	2							100	68	32.00
p					12							1		7		3	5									28	28	0.00
t		6			48	4					6	15	4	8	2	5	2									100	52	48.00
k					23	32				7	11	3		7	12					5						100	68	32.00
m	2	1	7				37	22	13				2				16									100	63	37.00
n	9		15				14	14	11				6				22				1	8				100	86	14.00
N			3				2	3	72				2				12					6				100	28	72.00
sh										88		11		1												100	12	88.00
ts				1							70	8		1	18											98	28	71.43
ch					1	15				22	5	57														100	43	57.00
zh			1			11				7	2	39	32	2	1											95	63	33.68
h						9				13	5			69	4											100	31	69.00
s										1	28				71											100	29	71.00
z			2		2	1	1				23	4	17	1	30	13					1	5				100	87	13.00
r	18	3	12			2					2	2	33			1	6				4	9				92	86	6.52
w	3	1	1				6	2									21	36						8		78	42	46.15
j				1				2	1				24			4	3		38		12	1				86	48	44.19
a			1								4									75			2	1		83	8	90.36
i			4				1	3					10								61	1				80	19	76.25
u			5				3	23	9		1		10	1					1		3	19	2			77	58	24.68
e			1				2	1	4				3	5							4	4	48	2		74	26	64.86
o							1	1										1		1		5		62		71	9	87.32
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2162	1116	48.38
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			47.69

FSU500_25_10_w10_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	43	12	5	1	3	4							11				18		1			2				100	57	43.00
d	17	28	3			1					9	1	23		1	1	16									100	72	28.00
g	1	4	26			7	18	15	13				7	1		2	4		2							100	74	26.00
p			1		12									6			9									28	28	0.00
t		4			54	3					2	13	4	8	1	3	8									100	46	54.00
k				1	25	35				5	12	3	3	14	2											100	65	35.00
m	1		6				44	16	14								16		3							100	56	44.00
n	7		14				11	24	10				5				20		2			7				100	76	24.00
N			3				1	7	80				1				5					3				100	20	80.00
sh										83		12		5												100	17	83.00
ts					2						77	4		1	16											100	23	77.00
ch						15				25	3	57														100	43	57.00
zh			1			14				23	1	22	31	5	3											100	69	31.00
h				4		20				4	4	1	1	64	2											100	36	64.00
s										1	21				78											100	22	78.00
z	2	1	2		1	1					15	3	23		41	7						4				100	93	7.00
r	23	3	7			2		1			3	2	32			2	14		1		2	8				100	86	14.00
w	2	1	2				5	1									25	35						7		78	43	44.87
j							1						36			3	6		36		16	2				100	64	36.00
a											4									95			1			100	5	95.00
i			3				1	9	1				11								72	3				100	28	72.00
u			4				2	16			1		15						1		2	58	1			100	42	58.00
e			2					1	5				5	4							1	1	81			100	19	81.00
o	1		1				1	1														4	1	91		100	9	91.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	1093	52.60
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			50.95

FSU500_25_10_w20_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	43	17	4	1	3	4					1		10				16					1				100	57	43.00
d	19	29	5		1	1					7	1	22		1		14									100	71	29.00
g	2	4	28			6	12	13	15				9	1	1	1	5	1	2							100	72	28.00
p					12							1		7		1	7									28	28	0.00
t		5			51	4					4	13	4	11	1	5	2									100	49	51.00
k					26	34				7	11	2		9	8					3						100	66	34.00
m	2	1	8				35	19	16				1				17		1							100	65	35.00
n	6		14				15	16	13				5				22				1	8				100	84	16.00
N			2				2	4	76				1				9					6				100	24	76.00
sh										84		13		3												100	16	84.00
ts					1						76	6		1	16											100	24	76.00
ch						15				23	4	58														100	42	58.00
zh			1			12				12	1	37	32	2	3											100	68	32.00
h						11				13	4			68	4											100	32	68.00
s										1	20				79											100	21	79.00
z		1	2		1	2	1				17	3	16	1	36	19						1				100	81	19.00
r	18	5	11			2		1			2	4	35				9				4	9				100	91	9.00
w	1	1	2				3	3									22	36						10		78	42	46.15
j				1			1	1					31			4	4		40		17	1				100	60	40.00
a			1								4									92			2	1		100	8	92.00
i			2				1	5					15								74	3				100	26	74.00
u			4				4	28	10		1		13	1					1		7	30	1			100	70	30.00
e			2				1	1	6				4	5						1	2	4	72	2		100	28	72.00
o			1				1	1												1		7	1	88		100	12	88.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	1137	50.69
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			49.13

FSU500_25_10_w30_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	40	18	7	1	3	4					1	1	9				14					2				100	60	40.00
d	21	26	7		1	1					8	1	21		1		13									100	74	26.00
g	2	3	32			6	8	12	17				9	1	1	1	5	1	2							100	68	32.00
p					12							1		7		3	5									28	28	0.00
t		5			50	4					5	14	4	9	2	5	2									100	50	50.00
k					23	33				6	11	3		7	12					5						100	67	33.00
m	2	1	7				36	21	14				3				16									100	64	36.00
n	8		15				15	14	11				6				22				1	8				100	86	14.00
N			3				2	3	72				2				12					6				100	28	72.00
sh										88		11		1												100	12	88.00
ts				1							72	8		1	18											100	28	72.00
ch					1	15				22	5	57														100	43	57.00
zh			1			11				8	1	44	32	2	1											100	68	32.00
h						9				14	5			68	4											100	32	68.00
s										1	27				72											100	28	72.00
z			2		3	1	1				22	4	17	1	31	12					1	5				100	88	12.00
r	20	4	13			2		1			2	4	34			1	6				4	9				100	94	6.00
w	3	1	1				4	3									21	36						9		78	42	46.15
j				1				2					29			6	4		43		14	1				100	57	43.00
a			1								4									92			2	1		100	8	92.00
i			4				1	5					16						1		70	3				100	30	70.00
u			5				4	30	13		1		12	1					1		7	24	2			100	76	24.00
e			1				2	1	6				4	6							4	8	65	3		100	35	65.00
o							1	1			1							1		3		8		85		100	15	85.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	1181	48.79
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			47.30

FSU500_50_7_w10_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	23	39	3	1	3	4							13			4	6		1			3				100	77	23.00
d	10	54	1		1						8		20			4	2									100	46	54.00
g	4	6	28			7	13	8	18				8	1		2	3		2							100	72	28.00
p			1	1	10	1						1		3	3	3				5						28	27	3.57
t				2	42	6					3	11	6	6	14	2	8									100	58	42.00
k				6	11	47				5	9	2	1	9	6	2	1			1						100	53	47.00
m	1		10				41	18	15				1				9		3			1		1		100	59	41.00
n	3	3	17				14	19	12				13				9		1			9				100	81	19.00
N		2	2				2	17	75													2				100	25	75.00
sh										91	1		4	4												100	9	91.00
ts						2				1	87	3			7											100	13	87.00
ch						6				32	14	47	1													100	53	47.00
zh			1			15				25	2	11	41	5												100	59	41.00
h						26				4	5	1	2	53	9											100	47	53.00
s										1	49				50											100	50	50.00
z	2	2	1		1	1	1		1	4	23	1	20		28	11						4				100	89	11.00
r	17	22	13			3			6		3		7		1	2	18		1		1	5	1			100	82	18.00
w	3	1	2				6	3									18	28		11				6		78	50	35.90
j		1			1	1	2	1					16			11	7		47		11		2			100	53	47.00
a											4									87			2	7		100	13	87.00
i			4				1	7	1				2								83	2				100	17	83.00
u			7				1	17	1		2		10	2			1					56	3			100	44	56.00
e			4										4	7			1			1	3	5	74	1		100	26	74.00
o			1				1	1										1		1		1		94		100	6	94.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	1109	51.91
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			50.31

FSU500_50_7_w20_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	23	37	8	1	3	4		1					10			5	6					2				100	77	23.00
d	11	53	4		1	1					5	1	18			3	2					1				100	47	53.00
g	4	5	32			6	12	5	19				9	2		1	3		2							100	68	32.00
p				1	10	1						1		3	4	3				5						28	27	3.57
t				3	43	6					1	11	4	6	15	2	9									100	57	43.00
k				6	12	44				7	9	2		7	10		1					2				100	56	44.00
m	1	1	14				35	20	14				2				12					1				100	65	35.00
n	4	2	21				13	16	14				9				9		1			11				100	84	16.00
N		3	2					8	84													2	1			100	16	84.00
sh										94	2		2	2												100	6	94.00
ts						2				1	86	4			7											100	14	86.00
ch						5				34	13	48														100	52	48.00
zh			1			14				22	5	14	43	1												100	57	43.00
h						17				11	8			44	20											100	56	44.00
s										1	46				53											100	47	53.00
z		1	1		1	2	1			1	26	2	20		25	20										100	80	20.00
r	13	21	16			3	1	1	6		3	1	10		2	1	14		1			7				100	86	14.00
w	2	2	1				7	2									16	30		11				7		78	48	38.46
j		1			1	1	2		2				13			11	7		50		10		2			100	50	50.00
a											6									87			2	5		100	13	87.00
i			4				1	8	1		1		4						1		78	1	1			100	22	78.00
u			5				4	30	4		1	1	11	1			1				1	39	2			100	61	39.00
e			4					1	2				2	5			1				4	6	71	4		100	29	71.00
o							1	1										3		2		1		92		100	8	92.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	1126	51.17
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			49.63

FSU500_50_7_w30_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	22	34	9	1	3	4		1					7		1	5	6					7				100	78	22.00
d	13	48	4		2	1					7	1	18			3	2					1				100	52	48.00
g	4	6	32			6	10	5	19				8	2		1	4		2			1				100	68	32.00
p				1	10	1						1		3	4	3				5						28	27	3.57
t				4	42	5					1	13	3	5	14	2	11									100	58	42.00
k				6	11	44				7	9	2		6	11							4				100	56	44.00
m	1	1	12				35	20	14				2				14					1				100	65	35.00
n	5	5	20				11	16	13				8				10		1			11				100	84	16.00
N		4	2					6	83				1									3	1			100	17	83.00
sh										95	2		2	1												100	5	95.00
ts						2				1	82	8			7											100	18	82.00
ch						2				34	13	51														100	49	51.00
zh			1			15				18	5	17	43	1												100	57	43.00
h				1		15				12	8			41	23											100	59	41.00
s										1	44				55											100	45	55.00
z		1	2		2	1	1				24	3	22		25	16						3				100	84	16.00
r	12	18	15			5		1	8		3	1	10		1	1	16		1			7	1			100	84	16.00
w	1	2	1				8	2									16	30		11				7		78	48	38.46
j					1	1	1		2				15			11	7		51		9		2			100	49	51.00
a											7									85			3	5		100	15	85.00
i			7				1	9	2		1		4						1		73	1	1			100	27	73.00
u			6				4	31	3		1	1	9	1			1				1	41	1			100	59	41.00
e			6					1	3					4			1				4	8	68	5		100	32	68.00
o							1	1										3		2		3		90		100	10	90.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	1146	50.30
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			48.79

FSU500_50_10_w10_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	23	39	4	1	3	4							13			4	5		1			3				100	77	23.00
d	8	56	2		1						8		20			4	1									100	44	56.00
g	5	6	28			7	12	7	19				8	1		1	4		2							100	72	28.00
p			1	1	10	1						1		3	3	3				5						28	27	3.57
t				2	43	5					2	11	7	7	14	2	7									100	57	43.00
k				6	11	46				5	11	1	1	9	6	2	1			1						100	54	46.00
m	1		10				40	19	15				1				9		3			1		1		100	60	40.00
n	3	3	17				15	19	12				13				9		1			8				100	81	19.00
N		2	2				2	16	76													2				100	24	76.00
sh										91	1		4	4												100	9	91.00
ts						2				1	87	3			7											100	13	87.00
ch						7				32	14	46	1													100	54	46.00
zh			1			14				27	2	8	42	6												100	58	42.00
h						24				4	6	1	2	54	9											100	46	54.00
s										1	47				52											100	48	52.00
z	2	2	2		1	1	1			4	21	1	20		29	12						4				100	88	12.00
r	17	22	13			3			6		3		7		1	2	18		1		1	5	1			100	82	18.00
w	3	1	2				6	3									20	29		10				4		78	49	37.18
j		1			1	1	2	1					16			10	7		47		12		2			100	53	47.00
a											5									87			1	7		100	13	87.00
i			4				2	7	1				2								82	2				100	18	82.00
u			7				1	16	1		2		10	2			1					57	3			100	43	57.00
e			4						1				4	5			1			1	3	5	74	2		100	26	74.00
o			1				1	1										1		1		1		94		100	6	94.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	1102	52.21
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			50.61

FSU500_50_10_w20_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	23	37	8	1	3	4		1					10			5	6					2				100	77	23.00
d	11	54	4		1	1					6		18			3	1					1				100	46	54.00
g	4	6	31			6	12	5	19				9	2		1	3		2							100	69	31.00
p				1	10	1						1		3	4	3				5						28	27	3.57
t				3	43	5					1	12	4	6	14	2	10									100	57	43.00
k				6	12	43				7	10	2		7	10		1					2				100	57	43.00
m	1	1	14				35	20	14				2				12					1				100	65	35.00
n	4	2	23				13	15	13				9				9		1			11				100	85	15.00
N		3	2					9	84													2				100	16	84.00
sh										94	2		2	2												100	6	94.00
ts						2				1	85	5			7											100	15	85.00
ch						6				34	13	47														100	53	47.00
zh			1			14				24	5	11	44	1												100	56	44.00
h						16				11	8			44	21											100	56	44.00
s										1	45				54											100	46	54.00
z		1	1		1	2	1			2	25	1	20		26	20										100	80	20.00
r	11	22	15			3	1	1	6		3	1	10		1	1	17		1			7				100	83	17.00
w	2	2	1				7	3									18	30		10				5		78	48	38.46
j		1			1	1	2		2				14			10	7		50		10		2			100	50	50.00
a			1								7									86			1	5		100	14	86.00
i			4				1	8			1		3				1				80	1	1			100	20	80.00
u			5				4	28	4		2		11	1			1				1	41	2			100	59	41.00
e			4					1	2				2	3			1				4	6	73	4		100	27	73.00
o							1	1										3		2		1		92		100	8	92.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	1120	51.43
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			49.88

FSU500_50_10_w30_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	22	34	9	1	3	4		1					7		1	5	6					7				100	78	22.00
d	12	50	4		2	1					8		18			3	1					1				100	50	50.00
g	4	6	34			6	9	6	18				8	2.		1	3		2			1				100	66	34.00
p				1	10	1						1		3	4	3				5						28	27	3.57
t				4	42	4					1	14	3	5	14	2	11									100	58	42.00
k				6	11	43				7	10	2		7	11							3				100	57	43.00
m	1	1	12				35	20	14				2				14					1				100	65	35.00
n	5	5	22				11	15	12				8				10		1			11				100	85	15.00
N		4	2					5	84				1									4				100	16	84.00
sh										95	2		2	1												100	5	95.00
ts						2				1	82	8			7											100	18	82.00
ch						2				34	12	52														100	48	52.00
zh			1			15				20	7	13	43	1												100	57	43.00
h						14				12	8			43	23											100	57	43.00
s										1	45				54											100	46	54.00
z		1	2		2	1	1				24	1	23		26	16						3				100	84	16.00
r	11	18	15			4	1	1	8		3	1	10		1	1	18		1			7				100	82	18.00
w	2	2	1				8	2									17	31		10				5		78	47	39.74
j					1	1	2		2				14			10	7		50		11		2			100	50	50.00
a			1								8									84			2	5		100	16	84.00
i			7				1	11			1		4				1		1		72	1	1			100	28	72.00
u			6				4	27	3		1	1	9	1			1				2	43	2			100	57	43.00
e			7					1	2					4			1				4	8	69	4		100	31	69.00
o							1	1										3		2		2		91		100	9	91.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	1137	50.69
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			49.18

FSU500_25_7_w10s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	42	16	3	4	3	2					1		4			1	15		1			8				100	58	42.00
d	21	38	2	1		1					4	1	11		1	7	13									100	62	38.00
g	2	4	30			5	17	10	11				2	1		5	4		1			8				100	70	30.00
p		1		11	1							3		3	1	3	5									28	17	39.29
t	1	2		29	26	6						13	1	3	10	5	4									100	74	26.00
k				14	15	29				3	11	12		13	1	2										100	71	29.00
m		2	11				51	3	10								10		1			12				100	49	51.00
n	3		20				11	9	9							4	15					29				100	91	9.00
N	1		4				1	4	78								4					8				100	22	78.00
sh										85		9		6												100	15	85.00
ts				5							69	5			21											100	31	69.00
ch				1		4				11	1	78		4	1											100	22	78.00
zh						6				7		51	34	2												100	66	34.00
h				1		12					4	20		59	4											100	41	59.00
s											16	8			76											100	24	76.00
z	1	2									14	8	15		33	14	1					12				100	86	14.00
r	5	25	4			1		1			1	1	19	1		4	16				1	21				100	84	16.00
w	3	1	6				6	1									20	34						7		78	44	43.59
j													17			11	5		46		16	5				100	54	46.00
a											1									93		1	1	4		100	7	93.00
i			2				1	3	1				5						1		85	2				100	15	85.00
u			4				2	14			1		13						2		3	60	1			100	40	60.00
e			1						3				4	5							2	2	83			100	17	83.00
o	1		1				1													1		1	1	94		100	6	94.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	1066	53.77
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			53.24

FSU500_25_7_w20s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	48	23	2	1	3	3					1		1			3	12					3				100	52	48.00
d	31	33	3		1	1					3	1	3			11	12		1							100	67	33.00
g	2	6	26			5	12	8	13				5	1		6	3	1	2			10				100	74	26.00
p	1	1		11	1							1	1	7			4	1								28	17	39.29
t	2			35	21	5						18	1	4	11		2		1							100	79	21.00
k				12	22	19				5	10	16		8	5					3						100	81	19.00
m	1	3	16				32	14	10								14					10				100	68	32.00
n	7	3	18				6	5	8							6	17		1			29				100	95	5.00
N	2		3				1	7	61								8					18				100	39	61.00
sh										78		19		3												100	22	78.00
ts				5							67	8			20											100	33	67.00
ch				1		5				1	3	85		4	1											100	15	85.00
zh						6				3		46	35	10												100	65	35.00
h						7				11	4	3		69	6											100	31	69.00
s											7	7			86											100	14	86.00
z		1									12	8	8		32	35					1	3				100	65	35.00
r	12	19	11			1	1	1			1	1	27	1		4	12				2	7				100	88	12.00
w	2	1	11				1	2									19	34						8		78	44	43.59
j		1	2				1						19			3	4		45		19	6				100	55	45.00
a			1								3									91		1	2	2		100	9	91.00
i			2				1	4					7						1		83	2				100	17	83.00
u			4		1		4	33	9				12						4		11	21	1			100	79	21.00
e			1				1		4				3	5						1	5	6	72	2		100	28	72.00
o						1	1													4		7	1	86		100	14	86.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	1151	50.09
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			49.70

FSU500_25_7_w30s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	48	22	5	2	3	2					1					2	10					5				100	52	48.00
d	40	38	3		1	1					3	1	1			3	8		1							100	62	38.00
g	2	8	27			3	7	7	12			1	5	1		7	3	1	3			12		1		100	73	27.00
p		1		11	1							1	1	7			5	1								28	17	39.29
t				37	19	5						19	1	4	11	2	2									100	81	19.00
k				14	19	18				5	10	14		6	9					5						100	82	18.00
m	1	3	21				15	26	10								16					8				100	85	15.00
n	12	7	11				6	5	9							4	16		1			29				100	95	5.00
N	4		6				1	10	34								11					34				100	66	34.00
sh										78	1	18		3												100	22	78.00
ts				5							67	13			15											100	33	67.00
ch				1		5				2	7	81		4												100	19	81.00
zh						5				2		43	35	14		1										100	65	35.00
h						7				15	7	3		64	4											100	36	64.00
s											20	12			68											100	32	68.00
z					1						15	9	12		26	32					2	3				100	68	32.00
r	14	15	15			1		1			1	2	32	1		4	5				4	5				100	95	5.00
w	2	2	15				2	4									23	26						4		78	52	33.33
j		1	3	1					1				30			2	3		36		17	6				100	64	36.00
a			1			1					3									89		1	3	2		100	11	89.00
i			3				1	4					10			1					77	4				100	23	77.00
u			4	1	1		4	36	15				11	1		1			4		10	10	2			100	90	10.00
e			1				2		4				3	8							5	10	62	5		100	38	62.00
o						1	1	1										1		6		8	1	81		100	19	81.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	1280	44.49
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			44.23

FSU500_25_10_w10s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	42	16	3	4	3	2					1		4			1	15		1			8				100	58	42.00
d	21	38	2	1		1					4	1	11		1	7	13									100	62	38.00
g	2	4	30			5	18	9	11				2	1		5	4		1			8				100	70	30.00
p		1		11	1							2		6		2	5									28	17	39.29
t	1	2		29	26	5						13	1	4	10	5	4									100	74	26.00
k				14	15	29				2	11	12		14	1	2										100	71	29.00
m		2	11				49	3	11								10		1			13				100	51	49.00
n			22				13	9	9							4	15					28				100	91	9.00
N	1		4				1	4	78				1				4					7				100	22	78.00
sh										85		9		6												100	15	85.00
ts				5							69	5			21											100	31	69.00
ch				1		4				11	1	78		4	1											100	22	78.00
zh						6				6		51	34	3												100	66	34.00
h				1		13					4	19		59	4											100	41	59.00
s											14	8			78											100	22	78.00
z	1	2									13	8	16		33	14	1					12				100	86	14.00
r	6	24	4			1		1			1	1	19	1		4	16				1	21				100	84	16.00
w	3	1	7				5	1									20	34						7		78	44	43.59
j							1						17			11	4		46		16	5				100	54	46.00
a											1									93		1	1	4		100	7	93.00
i			2				1	4	1				6						1		83	2				100	17	83.00
u			4				2	14			1		13						2		3	60	1			100	40	60.00
e			1						3				4	5							2	2	83			100	17	83.00
o	1		1				1															1	1	95		100	5	95.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	1067	53.73
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			53.20

FSU500_25_10_w20s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	48	23	2	1	3	3					1		1			3	12					3				100	52	48.00
d	30	35	4		1	1					3	1	3			10	11		1							100	65	35.00
g	2	6	26			5	12	8	13				5	1		6	3	1	2			10				100	74	26.00
p	1	1		11	1							1	1	7			4	1								28	17	39.29
t	2			34	22	5						18	1	4	11		2		1							100	78	22.00
k				12	22	19				5	10	16		8	5					3						100	81	19.00
m	1	3	16				32	14	10								14					10				100	68	32.00
n	9	3	18				5	5	8							6	15		1			30				100	95	5.00
N	2		3				1	7	61								8					18				100	39	61.00
sh										77		19		4												100	23	77.00
ts				5							66	9			20											100	34	66.00
ch				1		5				1	3	85		4	1											100	15	85.00
zh						5				3		48	36	8												100	64	36.00
h						8				11	4	3		68	6											100	32	68.00
s											7	7			86											100	14	86.00
z		1									12	8	9		31	36					1	2				100	64	36.00
r	11	20	11			1		1			1	1	28	1		4	12				2	7				100	88	12.00
w	2	1	11				1	2									21	31						9		78	47	39.74
j		1	2				1						19			3	3		47		19	5				100	53	47.00
a			1								3									91		1	2	2		100	9	91.00
i			2				1	4					8						1		82	2				100	18	82.00
u			4				4	33	9		1		12						4		10	22	1			100	78	22.00
e			1				1		4				3	5						1	4	6	73	2		100	27	73.00
o						1	1													4		7	1	86		100	14	86.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	1149	50.17
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			49.75

FSU500_25_10_w30s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	49	23	4	2	3	2					1					2	9					5				100	51	49.00
d	40	38	3		1	1					3	1	1			3	8		1							100	62	38.00
g	2	8	27			3	7	7	12			1	5	1		7	3	1	3			12		1		100	73	27.00
p		1		11	1							1	1	7			5	1								28	17	39.29
t				37	19	5						20	1	4	10	2	2									100	81	19.00
k				14	19	18				5	10	14		6	9					5						100	82	18.00
m	1	3	21				15	26	10								16					8				100	85	15.00
n	12	7	11				6	5	9							4	16		1			29				100	95	5.00
N	4		6				1	10	34								11					34				100	66	34.00
sh										78	1	18		3												100	22	78.00
ts				4							66	15			15											100	34	66.00
ch				1		5				2	7	81		4												100	19	81.00
zh						5				2		43	35	14		1										100	65	35.00
h						7				15	7	3		64	4											100	36	64.00
s											19	12			69											100	31	69.00
z					2						14	9	12		26	32					2	3				100	68	32.00
r	15	15	15			1		1			1	2	31	1		4	5				4	5				100	95	5.00
w	2	2	16				1	4									23	26						4		78	52	33.33
j		1	3	1									30			2	3		37		18	5				100	63	37.00
a			1			1					3									89		1	3	2		100	11	89.00
i			3				1	4					11			1			1		75	4				100	25	75.00
u			4	1	1		4	36	15				11	1					4		10	11	2			100	89	11.00
e			1				2		4				3	7							5	10	63	5		100	37	63.00
o						1	1	1										1		6		8	1	81		100	19	81.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	1278	44.58
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			44.32

FSU500_50_7_w10s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	37	34	3		1	3					1		3				11					7				100	63	37.00
d	21	62				1					3		5		1	3	4									100	38	62.00
g	3	11	26			4	14	13	12				1	1		5	2		1			7				100	74	26.00
p	1			8	4							2		4	1	3	5									28	20	28.57
t				20	35	6						10	2	3	13	2	9									100	65	35.00
k				10	14	35				3	9	13		6	3	2				5						100	65	35.00
m			11				42	10	12								12		2			11				100	58	42.00
n			17				14	21	8							5	15					20				100	79	21.00
N			3				2	5	84													6				100	16	84.00
sh										85		12		3												100	15	85.00
ts					1						71	8			20											100	29	71.00
ch				1		2				3		92			2											100	8	92.00
zh						1				5		43	49	2												100	51	49.00
h						14				1	3	9		65	7					1						100	35	65.00
s											19	3			78											100	22	78.00
z		4									14	7	20		31	14	1					9				100	86	14.00
r	5	31	7		1			1			1	1	18	1		1	20					13				100	80	20.00
w	4	1	4				2	1									17	32						17		78	46	41.03
j													15			12	9		50		14					100	50	50.00
a																				99			1			100	1	99.00
i			1					1	1				4						2		89	2				100	11	89.00
u			1					8	1		1		7	1					1			72	7	1		100	28	72.00
e								1	2				1										96			100	4	96.00
o			1				1																	98		100	2	98.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	946	58.98
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			57.90

FSU500_50_7_w20s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	40	31	3	2	3	2					1		3			2	9					4				100	60	40.00
d	31	50	2			1					2	2	1			2	8		1							100	50	50.00
g	2	8	23			4	9	15	12				6	1		5	3	1	3			8				100	77	23.00
p				11	1							2	1	6			7									28	17	39.29
t				28	28	5						17	1	4	12	2	2		1							100	72	28.00
k				10	23	20				5	11	15		8	3					5						100	80	20.00
m	2	2	14				19	31	9								17					6				100	81	19.00
n	10	1	14				7	17	7							6	16					22				100	83	17.00
N	2		3				1	8	54								5					27				100	46	54.00
sh										76		21		3												100	24	76.00
ts				2							73	6			19											100	27	73.00
ch				1		2				1	2	92		2												100	8	92.00
zh						3				3		50	41	3												100	59	41.00
h						6				13	7	1		68	5											100	32	68.00
s											22	2			76											100	24	76.00
z		1									16	5	9		31	37					1					100	63	37.00
r	8	23	12					1			1	2	32	1		3	10				2	5				100	90	10.00
w	1	1	8				2	3									23	31						9		78	47	39.74
j			3	1			1						23			2	4		49		14	3				100	51	49.00
a			1																	96			1	2		100	4	96.00
i			1				1	3					10						1		81	3				100	19	81.00
u			2		1		4	35	11				7	1					1		9	25	4			100	75	25.00
e			1					1	2				1	1								4	89	1		100	11	89.00
o						1	1											1		4		1		92		100	8	92.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	1108	51.95
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			51.46

FSU500_50_7_w30s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	43	31	2	2	3	2					1		2			2	8					4				100	57	43.00
d	32	47	3		1	1					4	1	1			1	8		1							100	53	47.00
g	2	10	23			1	10	11	11			4	6	1		4	3	1	2			10		1		100	77	23.00
p				11	1							1	1	7			6	1								28	17	39.29
t				34	22	5					1	18	1	4	11	2	2									100	78	22.00
k				12	21	16				5	10	16		6	9					5						100	84	16.00
m	2	4	14				12	36	10								16					6				100	88	12.00
n	10	4	13				5	10	7							6	16					28		1		100	90	10.00
N	4		3				1	9	27								11					45				100	73	27.00
sh										78		19		3												100	22	78.00
ts				3							72	9			16											100	28	72.00
ch				1		3				4	8	81		3												100	19	81.00
zh						7				2		46	38	6		1										100	62	38.00
h						6				16	7	1		65	5											100	35	65.00
s											26	5			69											100	31	69.00
z					1						20	7	11		22	37					2					100	63	37.00
r	10	18	13		1			2			1	2	36	1		3	6				2	5				100	94	6.00
w	2	1	12				2	5									31	20						5		78	58	25.64
j		1	3	1			1	1	1				30			2	1		39		16	4				100	61	39.00
a			1			1					1									91			4	2		100	9	91.00
i			2				1	5					11	1		1			1		76	2				100	24	76.00
u			1	1	1		6	35	15				9	1		1			3		11	13	3			100	87	13.00
e			1				1		4				1	2						1	1	7	78	4		100	22	78.00
o						1	1	2										1		8		6		81		100	19	81.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	1251	45.75
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			45.37

FSU500_50_10_w10s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	37	35	3		1	3					1		4				11					5				100	63	37.00
d	21	62				1					3		5		1	3	4									100	38	62.00
g	3	11	26			4	14	13	12				1	1		5	2		1			7				100	74	26.00
p	1			8	4							2		4	1	3	5									28	20	28.57
t				20	35	6						10	2	4	13	2	8									100	65	35.00
k				9	15	35				3	9	13		6	3	2				5						100	65	35.00
m			12				42	9	12								12		2			11				100	58	42.00
n			17				15	21	9							5	15					18				100	79	21.00
N			3				2	5	84													6				100	16	84.00
sh										85		12		3												100	15	85.00
ts				2							69	8			21											100	31	69.00
ch				1		2				3		92			2											100	8	92.00
zh						1				5		43	49	2												100	51	49.00
h						13				1	3	9		66	7					1						100	34	66.00
s											16	3			81											100	19	81.00
z		4									14	7	20		31	14	1					9				100	86	14.00
r	5	30	8		1			1	1		1	1	17	1		1	21					12				100	79	21.00
w	4	1	4				2	1									17	33						16		78	45	42.31
j							1						16			12	9		48		14					100	52	48.00
a																				99			1			100	1	99.00
i			1					1	1				4						2		90	1				100	10	90.00
u			1					8	1		1		7	1					1			73	7			100	27	73.00
e								1	2				1										96			100	4	96.00
o			1				1																	98		100	2	98.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	942	59.15
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			58.08

FSU500_50_10_w20s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	41	31	3	2	3	2					1		2			2	9					4				100	59	41.00
d	31	50	2			1					2	2	1			2	8		1							100	50	50.00
g	2	8	23			4	9	15	12				6	1		6	3	1	2			8				100	77	23.00
p				11	1							2	1	6			7									28	17	39.29
t				28	28	5						17	1	4	12	2	2		1							100	72	28.00
k				10	23	20				5	11	15		8	3					5						100	80	20.00
m	2	2	14				21	30	9								17					5				100	79	21.00
n	9	2	15				7	16	7							6	17					21				100	84	16.00
N	2		3				1	8	54								5					27				100	46	54.00
sh										76		22		2												100	24	76.00
ts				2							72	7			19											100	28	72.00
ch				1		2				1	2	92		2												100	8	92.00
zh						3				3		50	41	3												100	59	41.00
h						6				13	7	1		68	5											100	32	68.00
s											19	3			78											100	22	78.00
z		1									16	5	10		30	37					1					100	63	37.00
r	8	23	11					1			1	2	32	1		3	11				2	5				100	89	11.00
w	1	1	7				2	3									23	31						10		78	47	39.74
j			3	1			1						22			2	4		49		15	3				100	51	49.00
a			1																	96			1	2		100	4	96.00
i			1				1	3					9						1		83	2				100	17	83.00
u			2		1		4	35	11				7	1					1		9	25	4			100	75	25.00
e			1						3				1	1								4	89	1		100	11	89.00
o						1	1											1		4		1		92		100	8	92.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	1102	52.21
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			51.71

FSU500_50_10_w30s_res

phon	b	d	g	p	t	k	m	n	N	sh	ts	ch	zh	h	s	z	r	w	j	a	i	u	e	o	_	data	err	1
b	43	31	2	2	3	2					1		2			2	8					4				100	57	43.00
d	31	48	3		1	1					3	2	1			1	8		1							100	52	48.00
g	3	10	23			1	9	11	10			4	6	1		4	3	1	2			11		1		100	77	23.00
p				11	1							1	1	7			6	1								28	17	39.29
t				34	22	5					1	18	1	4	11	2	2									100	78	22.00
k				12	21	16				5	10	16		6	9					5						100	84	16.00
m	2	4	15				11	36	10								16					6				100	89	11.00
n	10	5	13				5	9	7							6	16					28		1		100	91	9.00
N	4	1	3				1	8	28								11					44				100	72	28.00
sh										78		19		3												100	22	78.00
ts				4							71	9			16											100	29	71.00
ch				1		3				4	7	82		3												100	18	82.00
zh						7				2		46	38	6		1										100	62	38.00
h						6				16	7	1		65	5											100	35	65.00
s											26	5			69											100	31	69.00
z					1						20	7	11		22	37					2					100	63	37.00
r	11	18	13		1			2			1	2	35	1		3	6				2	5				100	94	6.00
w	2	1	13				3	5									31	18						5		78	60	23.08
j		1	3	1			1	1	1				31			2	1		38		17	3				100	62	38.00
a			1			1					1									91			4	2		100	9	91.00
i			2				1	5					11	1		1			1		76	2				100	24	76.00
u			1	1	1		6	34	15				9	1		1			3		12	12	4			100	88	12.00
e			1				1		4				1	2						1	1	7	78	4		100	22	78.00
o						1	1	2										1		8		5	1	81		100	19	81.00
sum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2306	1255	45.58
avr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---			45.18

Segmentation results for the experiment MHT500_25_7

Iteration 0

10ms
Window: 2
Start points: 65.333336
  End points: 65.333336
30ms
Window: 6
Start points: 84.444443
  End points: 84.444443
50ms
Window: 10
Start points: 91.555557
  End points: 91.555557

Iteration 1

10ms
Window: 2
Start points: 68.444443
  End points: 68.444443
30ms
Window: 6
Start points: 85.333336
  End points: 85.333336
50ms
Window: 10
Start points: 91.555557
  End points: 91.555557

Iteration 2

10ms
Window: 2
Start points: 70.666664
  End points: 70.666664
30ms
Window: 6
Start points: 85.777779
  End points: 85.777779
50ms
Window: 10
Start points: 92.000000
  End points: 92.000000

Iteration 3

10ms
Window: 2
Start points: 72.888885
  End points: 72.888885
30ms
Window: 6
Start points: 87.111115
  End points: 87.111115
50ms
Window: 10
Start points: 92.444443
  End points: 92.444443

Iteration 4

10ms
Window: 2
Start points: 72.888885
End points: 72.888885
30ms
Window: 6
Start points: 87.555557
End points: 87.555557
50ms
Window: 10
Start points: 93.333336
End points: 93.333336

Iteration 5

10ms
Window: 2
Start points: 74.222221
End points: 74.222221
30ms
Window: 6
Start points: 87.111115
End points: 87.111115
50ms
Window: 10
Start points: 93.333336
End points: 93.333336

Iteration 6

10ms
Window: 2
Start points: 73.333336
End points: 73.333336
30ms
Window: 6
Start points: 87.111115
End points: 87.111115
50ms
Window: 10
Start points: 93.777779
End points: 93.777779

Iteration 7

10ms
Window: 2
Start points: 74.222221
End points: 74.222221
30ms
Window: 6
Start points: 87.555557
End points: 87.555557
50ms
Window: 10
Start points: 92.888885
End points: 92.888885

Segmentation results for the experiment MHT500_25_10

Iteration 0

10ms
Window: 2
Start points: 65.333336
End points: 65.333336
30ms
Window: 6
Start points: 84.444443
End points: 84.444443
50ms
Window: 10
Start points: 91.555557
End points: 91.555557

Iteration 1

10ms
Window: 2
Start points: 68.000000
End points: 68.000000
30ms
Window: 6
Start points: 85.333336
End points: 85.333336
50ms
Window: 10
Start points: 91.555557
End points: 91.555557

Iteration 2

10ms
Window: 2
Start points: 69.333336
End points: 69.333336
30ms
Window: 6
Start points: 85.777779
End points: 85.777779
50ms
Window: 10
Start points: 92.000000
End points: 92.000000

Iteration 3

10ms
Window: 2
Start points: 70.222221
End points: 70.222221
30ms
Window: 6
Start points: 86.222221
End points: 86.222221
50ms
Window: 10
Start points: 92.000000
End points: 92.000000

Iteration 4

10ms
Window: 2
Start points: 72.888885
  End points: 72.888885
30ms
Window: 6
Start points: 87.111115
  End points: 87.111115
50ms
Window: 10
Start points: 92.444443
  End points: 92.444443

Iteration 5

10ms
Window: 2
Start points: 72.888885
  End points: 72.888885
30ms
Window: 6
Start points: 87.555557
  End points: 87.555557
50ms
Window: 10
Start points: 92.888885
  End points: 92.888885

Iteration 6

10ms
Window: 2
Start points: 72.888885
  End points: 72.888885
30ms
Window: 6
Start points: 87.111115
  End points: 87.111115
50ms
Window: 10
Start points: 93.333336
  End points: 93.333336

Iteration 7

10ms
Window: 2
Start points: 73.777779
  End points: 73.777779
30ms
Window: 6
Start points: 87.111115
  End points: 87.111115
50ms
Window: 10
Start points: 93.777779
  End points: 93.777779

Iteration 8

10ms
Window: 2
Start points: 73.777779
  End points: 73.777779
30ms
Window: 6
Start points: 88.000000
  End points: 88.000000
50ms
Window: 10
Start points: 93.777779
  End points: 93.777779

Iteration 9

10ms
Window: 2
Start points: 73.777779
  End points: 73.777779
30ms
Window: 6
Start points: 88.000000
  End points: 88.000000
50ms
Window: 10
Start points: 93.333336
  End points: 93.333336

Iteration 10

10ms
Window: 2
Start points: 73.777779
  End points: 73.777779
30ms
Window: 6
Start points: 88.000000
  End points: 88.000000
50ms
Window: 10
Start points: 92.888885
  End points: 92.888885

Segmentation results for the experiment MHT500_50_7

Iteration 0

10ms
Window: 2
Start points: 66.225166
  End points: 66.225166
30ms
Window: 6
Start points: 85.871964
  End points: 85.871964
50ms
Window: 10
Start points: 91.832230
  End points: 91.832230

Iteration 1

10ms
Window: 2
Start points: 69.315674
  End points: 69.315674
30ms
Window: 6
Start points: 86.975716
  End points: 86.975716
50ms
Window: 10
Start points: 91.832230
  End points: 91.832230

Iteration 2

10ms
Window: 2
Start points: 71.302429
  End points: 71.302429
30ms
Window: 6
Start points: 88.079468
  End points: 88.079468
50ms
Window: 10
Start points: 92.494484
  End points: 92.494484

Iteration 3

10ms
Window: 2
Start points: 73.289185
  End points: 73.289185
30ms
Window: 6
Start points: 88.520973
  End points: 88.520973
50ms
Window: 10
Start points: 93.598236
  End points: 93.598236

Iteration 4

10ms
Window: 2
Start points: 74.613686
  End points: 74.613686
30ms
Window: 6
Start points: 89.183220
  End points: 89.183220
50ms
Window: 10
Start points: 94.260483
  End points: 94.260483

Iteration 5

10ms
Window: 2
Start points: 75.275940
  End points: 75.275940
30ms
Window: 6
Start points: 89.403976
  End points: 89.403976
50ms
Window: 10
Start points: 94.481239
  End points: 94.481239

Iteration 6

10ms
Window: 2
Start points: 74.834435
  End points: 74.834435
30ms
Window: 6
Start points: 89.624725
  End points: 89.624725
50ms
Window: 10
Start points: 94.922737
  End points: 94.922737

Iteration 7

10ms
Window: 2
Start points: 76.600441
  End points: 76.600441
30ms
Window: 6
Start points: 90.507729
  End points: 90.507729
50ms
Window: 10
Start points: 94.922737
  End points: 94.922737

Segmentation results for the experiment MHT500_50_10

Iteration 0

10ms
Window: 2
Start points: 66.225166
End points: 66.225166
30ms
Window: 6
Start points: 85.871964
End points: 85.871964
50ms
Window: 10
Start points: 91.832230
End points: 91.832230

Iteration 1

10ms
Window: 2
Start points: 68.211922
End points: 68.211922
30ms
Window: 6
Start points: 86.975716
End points: 86.975716
50ms
Window: 10
Start points: 92.052979
End points: 92.052979

Iteration 2

10ms
Window: 2
Start points: 70.419426
End points: 70.419426
30ms
Window: 6
Start points: 87.417221
End points: 87.417221
50ms
Window: 10
Start points: 92.273727
End points: 92.273727

Iteration 3

10ms
Window: 2
Start points: 71.743927
End points; 71.743927
30ms
Window: 6
Start points: 88.300224
End points: 88.300224
50ms
Window: 10
Start points: 92.935982
End points: 92.935982

Iteration 4

10ms
Window: 2
Start points: 73.068436
End points: 73.068436
30ms
Window: 6
Start points: 88.520973
End points: 88.520973
50ms
Window: 10
Start points: 93.598236
End points: 93.598236

Iteration 5

10ms
Window: 2
Start points: 74.392937
End points: 74.392937
30ms
Window: 6
Start points: 89.183220
End points: 89.183220
50ms
Window: 10
Start points: 94.260483
End points: 94.260483

Iteration 6

10ms
Window: 2
Start points: 74.834435
End points: 74.834435
30ms
Window: 6
Start points: 89.624725
End points: 89.624725
50ms
Window: 10
Start points: 94.701988
End points: 94.701988

Iteration 7

10ms
Window: 2
Start points: 75.275940
End points: 75.275940
30ms
Window: 6
Start points: 90.066223
End points: 90.066223
50ms
Window: 10
Start points: 94.922737
End points: 94.922737

Iteration 8

```
10ms
Window: 2
Start points: 75.717438
  End points: 75.717438
30ms
Window: 6
Start points: 90.728477
  End points: 90.728477
50ms
Window: 10
Start points: 95.143486
  End points: 95.143486


Iteration 9

10ms
Window: 2
Start points: 76.158943
  End points: 76.158943
30ms
Window: 6
Start points: 90.949226
  End points: 90.949226
50ms
Window: 10
Start points: 94.922737
  End points: 94.922737


Iteration 10

10ms
Window: 2
Start points: 77.483444
  End points: 77.483444
30ms
Window: 6
Start points: 90.949226
  End points: 90.949226
50ms
Window: 10
Start points: 94.922737
  End points: 94.922737
```

Segmentation results for the experiment MXM500_25_7

Iteration 0

10ms
Window: 2
Start points: 64.159294
End points: 64.159294
30ms
Window: 6
Start points: 88.495575
End points: 88.495575
50ms
Window: 10
Start points: 94.247787
End points: 94.247787

Iteration 1

10ms
Window: 2
Start points: 65.044250
End points: 65.044250
30ms
Window: 6
Start points: 89.823006
End points: 89.823006
50ms
Window: 10
Start points: 95.132744
End points: 95.132744

Iteration 2

10ms
Window: 2
Start points: 69.026550
End points: 69.026550
30ms
Window: 6
Start points: 90.707962
End points: 90.707962
50ms
Window: 10
Start points: 95.575218
End points: 95.575218

Iteration 3

10ms
Window: 2
Start points: 69.911507
End points: 69.911507
30ms
Window: 6
Start points: 91.150444
End points: 91.150444
50ms
Window: 10
Start points: 96.017700
End points: 96.017700

Iteration 4

10ms
Window: 2
Start points: 70.796463
End points: 70.796463
30ms
Window: 6
Start points: 91.592918
End points: 91.592918
50ms
Window: 10
Start points: 96.017700
End points: 96.017700

Iteration 5

10ms
Window: 2
Start points: 71.238937
End points: 71.238937
30ms
Window: 6
Start points: 91.592918
End points: 91.592918
50ms
Window: 10
Start points: 96.460175
End points: 96.460175

Iteration 6

10ms
Window: 2
Start points: 71.238937
End points: 71.238937
30ms
Window: 6
Start points: 91.592918
End points: 91.592918
50ms
Window: 10
Start points: 96.460175
End points: 96.460175

Iteration 7

10ms
Window: 2
Start points: 70.796463
End points: 70.796463
30ms
Window: 6
Start points: 91.592918
End points: 91.592918
50ms
Window: 10
Start points: 96.460175
End points: 96.460175

Segmentation results for the experiment MXM500_25_10

Iteration 0

10ms
Window: 2
Start points: 64.159294
End points: 64.159294
30ms
Window: 6
Start points: 88.495575
End points: 88.495575
50ms
Window: 10
Start points: 94.247787
End points: 94.247787

Iteration 1

10ms
Window: 2
Start points: 64.601768
End points: 64.601768
30ms
Window: 6
Start points: 88.938049
End points: 88.938049
50ms
Window: 10
Start points: 95.132744
End points: 95.132744

Iteration 2

10ms
Window: 2
Start points: 66.814156
End points: 66.814156
30ms
Window: 6
Start points: 90.265488
End points: 90.265488
50ms
Window: 10
Start points: 95.575218
End points: 95.575218

Iteration 3

10ms
Window: 2
Start points: 69.026550
End points: 69.026550
30ms
Window: 6
Start points: 90.265488
End points: 90.265488
50ms
Window: 10
Start points: 95.575218
End points: 95.575218

Iteration 4

10ms
Window: 2
Start points: 69.911507
  End points: 69.911507
30ms
Window: 6
Start points: 91.592918
  End points: 91.592918
50ms
Window: 10
Start points: 96.017700
  End points: 96.017700

Iteration 5

10ms
Window: 2
Start points: 69.469025
  End points: 69.469025
30ms
Window: 6
Start points: 91.592918
  End points: 91.592918
50ms
Window: 10
Start points: 96.017700
  End points: 96.017700

Iteration 6

10ms
Window: 2
Start points: 69.911507
  End points: 69.911507
30ms
Window: 6
Start points: 92.035400
  End points: 92.035400
50ms
Window: 10
Start points: 96.460175
  End points: 96.460175

Iteration 7

10ms
Window: 2
Start points: 71.238937
  End points: 71.238937
30ms
Window: 6
Start points: 92.035400
  End points: 92.035400
50ms
Window: 10
Start points: 96.460175
  End points: 96.460175

Iteration 8

```
10ms
Window: 2
Start points: 71.238937
  End points: 71.238937
30ms
Window: 6
Start points: 92.035400
  End points: 92.035400
50ms
Window: 10
Start points: 96.460175
  End points: 96.460175


Iteration 9

10ms
Window: 2
Start points: 70.796463
  End points: 70.796463
30ms
Window: 6
Start points: 92.035400
  End points: 92.035400
50ms
Window: 10
Start points: 96.460175
  End points: 96.460175


Iteration 10

10ms
Window: 2
Start points: 70.796463
  End points: 70.796463
30ms
Window: 6
Start points: 92.477875
  End points: 92.477875
50ms
Window: 10
Start points: 96.460175
  End points: 96.460175
```

Segmentation results for the experiment MXM500_50_7

Iteration 0

10ms
Window: 2
Start points: 67.324562
End points: 67.324562
30ms
Window: 6
Start points: 89.692986
End points: 89.692986
50ms
Window: 10
Start points: 94.736839
End points: 94.736839

Iteration 1

10ms
Window: 2
Start points: 67.763161
End points: 67.763161
30ms
Window: 6
Start points: 91.008774
End points: 91.008774
50ms
Window: 10
Start points: 95.394737
End points: 95.394737

Iteration 2

10ms
Window: 2
Start points: 70.394737
End points: 70.394737
30ms
Window: 6
Start points: 91.447365
End points: 91.447365
50ms
Window: 10
Start points: 96.271927
End points: 96.271927

Iteration 3

10ms
Window: 2
Start points: 70.394737
End points: 70.394737
30ms
Window: 6
Start points: 91.666664
End points: 91.666664
50ms
Window: 10
Start points: 97.149124
End points: 97.149124

Iteration 4

10ms
Window: 2
Start points: 71.491226
End points: 71.491226
30ms
Window: 6
Start points: 91.885963
End points: 91.885963
50ms
Window: 10
Start points: 97.149124
End points: 97.149124

Iteration 5

10ms
Window: 2
Start points: 71.491226
End points: 71.491226
30ms
Window: 6
Start points: 91.885963
End points: 91.885963
50ms
Window: 10
Start points: 97.149124
End points: 97.149124

Iteration 6

10ms
Window: 2
Start points: 71.710526
End points: 71.710526
30ms
Window: 6
Start points: 92.105263
End points: 92.105263
50ms
Window: 10
Start points: 97.149124
End points: 97.149124

Iteration 7

10ms
Window: 2
Start points: 71.710526
End points: 71.710526
30ms
Window: 6
Start points: 92.324562
End points: 92.324562
50ms
Window: 10
Start points: 96.929825
End points: 96.929825

Segmentation results for the experiment MXM500_50_10

Iteration 0

10ms
Window: 2
Start points: 67.324562
End points: 67.324562
30ms
Window: 6
Start points: 89.692986
End points: 89.692986
50ms
Window: 10
Start points: 94.736839
End points: 94.736839

Iteration 1

10ms
Window: 2
Start points: 67.763161
End points: 67.763161
30ms
Window: 6
Start points: 90.350876
End points: 90.350876
50ms
Window: 10
Start points: 95.394737
End points: 95.394737

Iteration 2

10ms
Window: 2
Start points: 69.736839
End points: 69.736839
30ms
Window: 6
Start points: 91.228073
End points: 91.228073
50ms
Window: 10
Start points: 95.614037
End points: 95.614037

Iteration 3

10ms
Window: 2
Start points: 69.956139
End points: 69.956139
30ms
Window: 6
Start points: 91.228073
End points: 91.228073
50ms
Window: 10
Start points: 96.271927
End points: 96.271927

Iteration 4

10ms
Window: 2
Start points: 70.833336
End points: 70.833336
30ms
Window: 6
Start points: 91.885963
End points: 91.885963
50ms
Window: 10
Start points: 97.149124
End points: 97.149124

Iteration 5

10ms
Window: 2
Start points: 71.052635
End points: 71.052635
30ms
Window: 6
Start points: 91.447365
End points: 91.447365
50ms
Window: 10
Start points: 97.149124
End points: 97.149124

Iteration 6

10ms
Window: 2
Start points: 69.956139
End points: 69.956139
30ms
Window: 6
Start points: 89.692986
End points: 89.692986
50ms
Window: 10
Start points: 94.956139
End points: 94.956139

Iteration 7

10ms
Window: 2
Start points: 72.149124
End points: 72.149124
30ms
Window: 6
Start points: 92.324562
End points: 92.324562
50ms
Window: 10
Start points: 97.368423
End points: 97.368423

Iteration 8

```
10ms
Window: 2
Start points: 72.149124
  End points: 72.149124
30ms
Window: 6
Start points: 92.543861
  End points: 92.543861
50ms
Window: 10
Start points: 97.149124
  End points: 97.149124


Iteration 9

10ms
Window: 2
Start points: 72.149124
  End points: 72.149124
30ms
Window: 6
Start points: 92.763161
  End points: 92.763161
50ms
Window: 10
Start points: 96.929825
  End points: 96.929825


Iteration 10

10ms
Window: 2
Start points: 72.368423
  End points: 72.368423
30ms
Window: 6
Start points: 93.201752
  End points: 93.201752
50ms
Window: 10
Start points: 96.929825
  End points: 96.929825
```

Segmentation results for the experiment FSU500_25_7

Iteration 0

10ms
Window: 2
Start points: 55.458515
End points: 55.458515
30ms
Window: 6
Start points: 76.419212
End points: 76.419212
50ms
Window: 10
Start points: 86.462883
End points: 86.462883

Iteration 1

10ms
Window: 2
Start points: 55.458515
End points: 55.458515
30ms
Window: 6
Start points: 77.292580
End points: 77.292580
50ms
Window: 10
Start points: 86.462883
End points: 86.462883

Iteration 2

10ms
Window: 2
Start points: 57.641922
End points: 57.641922
30ms
Window: 6
Start points: 78.602623
End points: 78.602623
50ms
Window: 10
Start points: 85.589523
End points: 85.589523

Iteration 3

10ms
Window: 2
Start points: 57.205238
End points: 57.205238
30ms
Window: 6
Start points: 80.349342
End points: 80.349342
50ms
Window: 10
Start points: 86.899567
End points: 86.899567

```
Iteration 4

10ms
Window: 2
Start points: 58.078602
  End points: 58.078602
30ms
Window: 6
Start points: 82.096069
  End points: 82.096069
50ms
Window: 10
Start points: 87.772926
  End points: 87.772926


Iteration 5

10ms
Window: 2
Start points: 58.515285
  End points: 58.515285
30ms
Window: 6
Start points: 82.532753
  End points: 82.532753
50ms
Window: 10
Start points: 87.772926
  End points: 87.772926


Iteration 6

10ms
Window: 2
Start points: 58.078602
  End points: 58.078602
30ms
Window: 6
Start points: 82.969429
  End points: 82.969429
50ms
Window: 10
Start points: 88.209610
  End points: 88.209610


Iteration 7

10ms
Window: 2
Start points: 56.768559
  End points: 56.768559
30ms
Window: 6
Start points: 83.406113
  End points: 83.406113
50ms
Window: 10
Start points: 88.209610
  End points: 88.209610
```

Segmentation results for the experiment FSU500_25_10

Iteration 0

10ms
Window: 2
Start points: 55.458515
End points: 55.458515
30ms
Window: 6
Start points: 76.419212
End points: 76.419212
50ms
Window: 10
Start points: 86.462883
End points: 86.462883

Iteration 1

10ms
Window: 2
Start points: 56.331879
End points: 56.331879
30ms
Window: 6
Start points: 77.729256
End points: 77.729256
50ms
Window: 10
Start points: 86.899567
End points: 86.899567

Iteration 2

10ms
Window: 2
Start points: 56.331879
End points: 56.331879
30ms
Window: 6
Start points: 77.292580
End points: 77.292580
50ms
Window: 10
Start points: 86.026199
End points: 86.026199

Iteration 3

10ms
Window: 2
Start points: 58.078602
End points: 58.078602
30ms
Window: 6
Start points: 79.039299
End points: 79.039299
50ms
Window: 10
Start points: 86.026199
End points: 86.026199

```
Iteration 4

10ms
Window: 2
Start points: 57.641922
  End points: 57.641922
30ms
Window: 6
Start points: 80.786026
  End points: 80.786026
50ms
Window: 10
Start points: 87.336243
  End points: 87.336243


Iteration 5

10ms
Window: 2
Start points: 57.641922
  End points: 57.641922
30ms
Window: 6
Start points: 82.096069
  End points: 82.096069
50ms
Window: 10
Start points: 87.772926
  End points: 87.772926


Iteration 6

10ms
Window: 2
Start points: 58.078602
  End points: 58.078602
30ms
Window: 6
Start points: 82.532753
  End points: 82.532753
50ms
Window: 10
Start points: 87.772926
  End points: 87.772926


Iteration 7

10ms
Window: 2
Start points: 58.515285
  End points: 58.515285
30ms
Window: 6
Start points: 82.532753
  End points: 82.532753
50ms
Window: 10
Start points: 87.772926
  End points: 87.772926


Iteration 8
```

10ms
Window: 2
Start points: 58.078602
End points: 58.078602
30ms
Window: 6
Start points: 83.406113
End points: 83.406113
50ms
Window: 10
Start points: 88.209610
End points: 88.209610

Iteration 9

10ms
Window: 2
Start points: 57.641922
End points: 57.641922
30ms
Window: 6
Start points: 83.406113
End points: 83.406113
50ms
Window: 10
Start points: 88.646286
End points: 88.646286

Iteration 10

10ms
Window: 2
Start points: 57.641922
End points: 57.641922
30ms
Window: 6
Start points: 83.406113
End points: 83.406113
50ms
Window: 10
Start points: 88.646286
End points: 88.646286

Segmentation results for the experiment FSU500_50_7

Iteration 0

10ms
Window: 2
Start points: 54.048141
End points: 54.048141
30ms
Window: 6
Start points: 75.492340
End points: 75.492340
50ms
Window: 10
Start points: 83.150986
End points: 83.150986

Iteration 1

10ms
Window: 2
Start points: 55.798687
End points: 55.798687
30ms
Window: 6
Start points: 76.805252
End points: 76.805252
50ms
Window: 10
Start points: 84.245079
End points: 84.245079

Iteration 2

10ms
Window: 2
Start points: 58.205688
End points: 58.205688
30ms
Window: 6
Start points: 78.336983
End points: 78.336983
50ms
Window: 10
Start points: 84.682716
End points: 84.682716

Iteration 3

10ms
Window: 2
Start points: 58.862144
End points: 58.862144
30ms
Window: 6
Start points: 79.649887
End points: 79.649887
50ms
Window: 10
Start points: 85.339165
End points: 85.339165

```
Iteration 4

10ms
Window: 2
Start points: 59.737419
  End points: 59.737419
30ms
Window: 6
Start points: 80.525162
  End points: 80.525162
50ms
Window: 10
Start points: 86.870895
  End points: 86.870895


Iteration 5

10ms
Window: 2
Start points: 59.737419
  End points: 59.737419
30ms
Window: 6
Start points: 81.181618
  End points: 81.181618
50ms
Window: 10
Start points: 87.089714
  End points: 87.089714


Iteration 6

10ms
Window: 2
Start points: 59.080963
  End points: 59.080963
30ms
Window: 6
Start points: 81.619255
  End points: 81.619255
50ms
Window: 10
Start points: 87.308533
  End points: 87.308533


Iteration 7

10ms
Window: 2
Start points: 57.986870
  End points: 57.986870
30ms
Window: 6
Start points: 82.056892
  End points: 82.056892
50ms
Window: 10
Start points: 87.308533
  End points: 87.308533
```

Segmentation results for the experiment FSU500_50_10

Iteration 0

10ms
Window: 2
Start points: 54.048141
  End points: 54.048141
30ms
Window: 6
Start points: 75.492340
  End points: 75.492340
50ms
Window: 10
Start points: 83.150986
  End points: 83.150986

Iteration 1

10ms
Window: 2
Start points: 55.579868
  End points: 55.579868
30ms
Window: 6
Start points: 77.242889
  End points: 77.242889
50ms
Window: 10
Start points: 84.682716
  End points: 84.682716

Iteration 2

10ms
Window: 2
Start points: 57.768051
  End points: 57.768051
30ms
Window: 6
Start points: 77.461708
  End points: 77.461708
50ms
Window: 10
Start points: 84.901535
  End points: 84.901535

Iteration 3

10ms
Window: 2
Start points: 59.299782
  End points: 59.299782
30ms
Window: 6
Start points: 78.993439
  End points: 78.993439
50ms
Window: 10
Start points: 85.339165
  End points: 85.339165

Iteration 4

10ms
Window: 2
Start points: 59.299782
End points: 59.299782
30ms
Window: 6
Start points: 80.087524
End points: 80.087524
50ms
Window: 10
Start points: 85.776802
End points: 85.776802

Iteration 5

10ms
Window: 2
Start points: 59.518600
End points: 59.518600
30ms
Window: 6
Start points: 80.962799
End points: 80.962799
50ms
Window: 10
Start points: 86.870895
End points: 86.870895

Iteration 6

10ms
Window: 2
Start points: 59.518600
End points: 59.518600
30ms
Window: 6
Start points: 80.743980
End points: 80.743980
50ms
Window: 10
Start points: 87.089714
End points: 87.089714

Iteration 7

10ms
Window: 2
Start points: 59.737419
End points: 59.737419
30ms
Window: 6
Start points: 81.400436
End points: 81.400436
50ms
Window: 10
Start points: 87.308533
End points: 87.308533

Iteration 8

10ms
Window: 2
Start points: 59.518600
End points: 59.518600
30ms
Window: 6
Start points: 82.275711
End points: 82.275711
50ms
Window: 10
Start points: 87.746170
End points: 87.746170

Iteration 9

10ms
Window: 2
Start points: 59.299782
End points: 59.299782
30ms
Window: 6
Start points: 82.056892
End points: 82.056892
50ms
Window: 10
Start points: 88.183807
End points: 88.183807

Iteration 10

10ms
Window: 2
Start points: 58.643326
End points: 58.643326
30ms
Window: 6
Start points: 82.494530
End points: 82.494530
50ms
Window: 10
Start points: 87.964989
End points: 87.964989