

# Instruments for the Analysis of Spoken Language - AnaLiV

H.-N. Teodorescu<sup>1,2</sup>, I. Păvăloi<sup>1</sup>, M. Zbancioc<sup>1,2</sup>, M. Feraru<sup>1</sup>, L. Pistol<sup>1</sup>

<sup>1</sup> Institute of Computer Science of the Romanian Academy, Iași Branch

<sup>2</sup> "Gheorghe Asachi" Technical University of Iași

[hteodor@etc.tuiasi.ro](mailto:hteodor@etc.tuiasi.ro)



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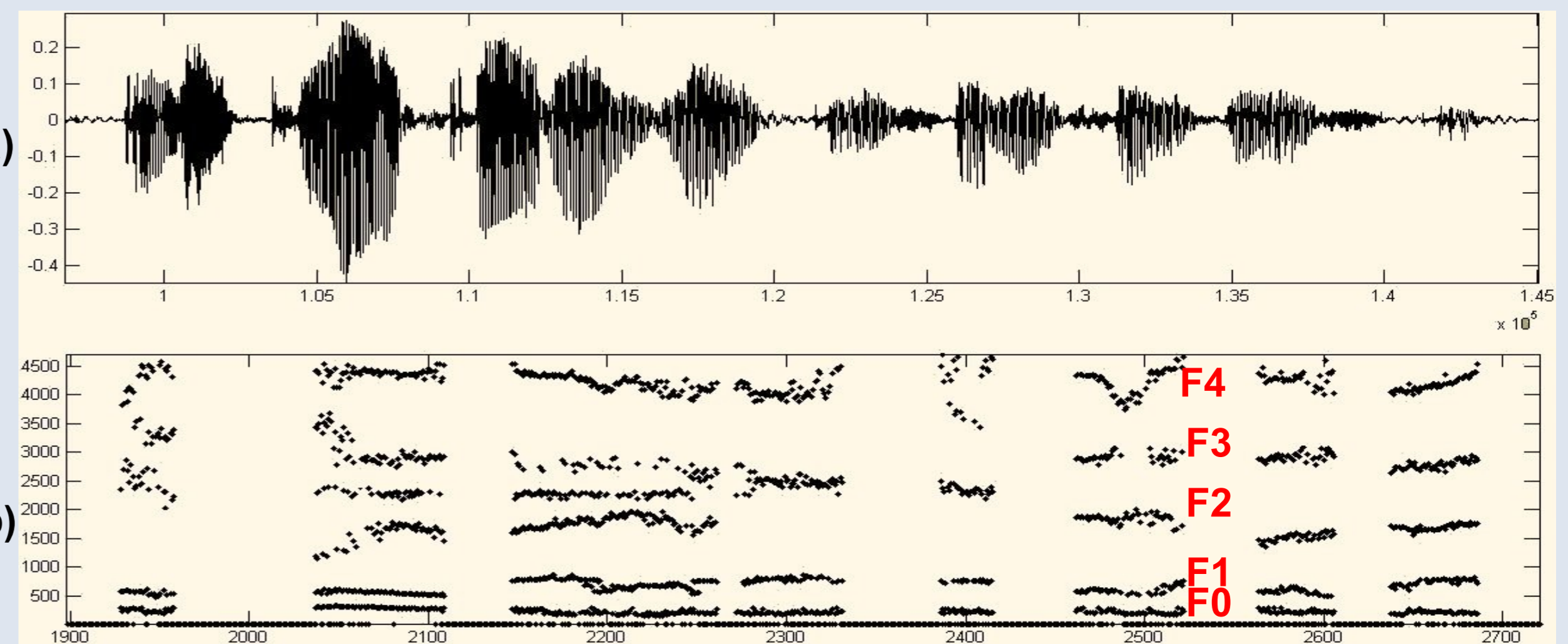
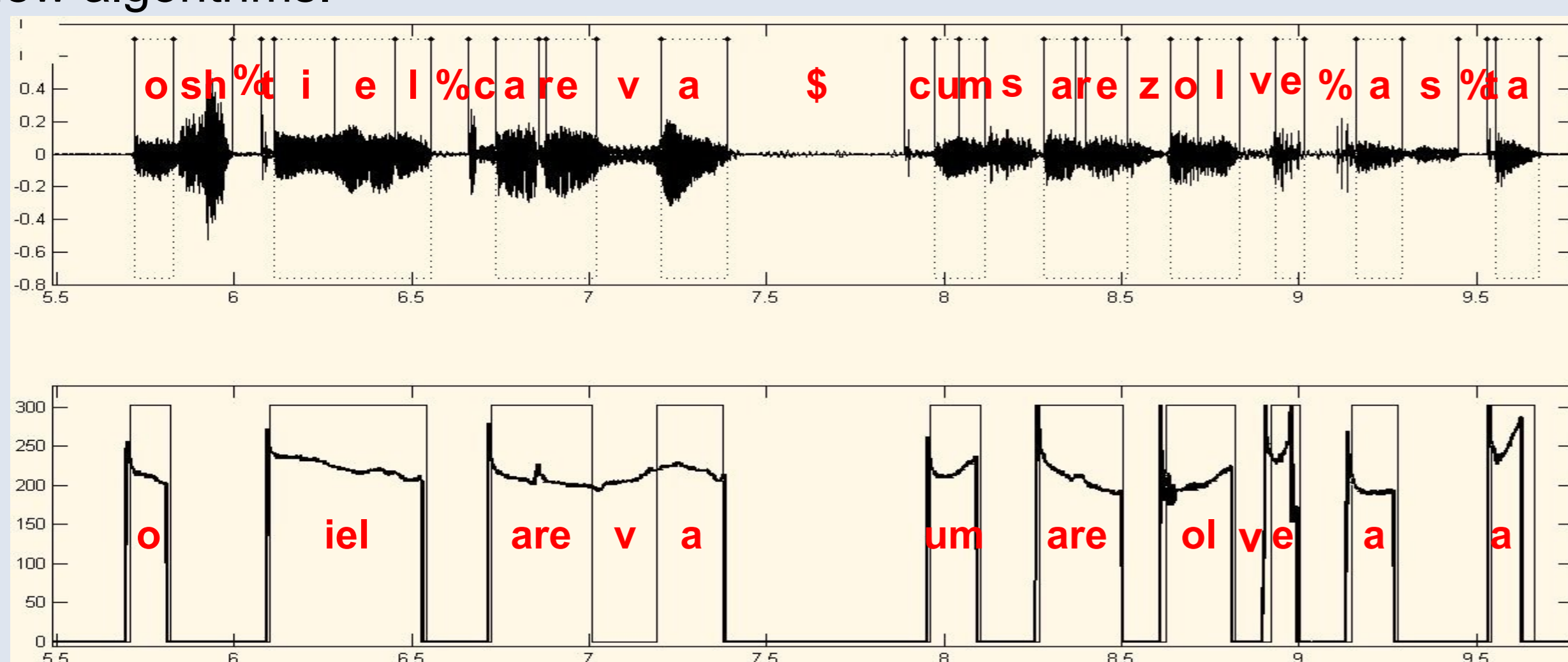
the Romanian Academy

## Abstract

The AnaLiV system (ORDA registered, 11959/06.05.2010) is a set of advanced software tools for voice signal analysis, including:

- I. tools for determining the F1-F4 formants, and for extracting the values of F0;
- II. the serial WinCollection program for statistical analysis of spoken language;
- III. a program of GRID parallel computing for the statistics of the formants of the spoken language.

I. The new segmentation algorithm based on the analysis of the signal periodicity is less influenced by the amplitude fluctuations of the analyzed signal and, in consequence, can be adapted also for recordings with a higher noise level. The detection errors are improved with the new algorithms.



The signal segmentation and extraction of fundamental frequency, F0, and formants, F1 – F4

(a) The initial input signal (sentence "He would know, someone, how to solve this."), (b) The signal segment with the new segmentation algorithm

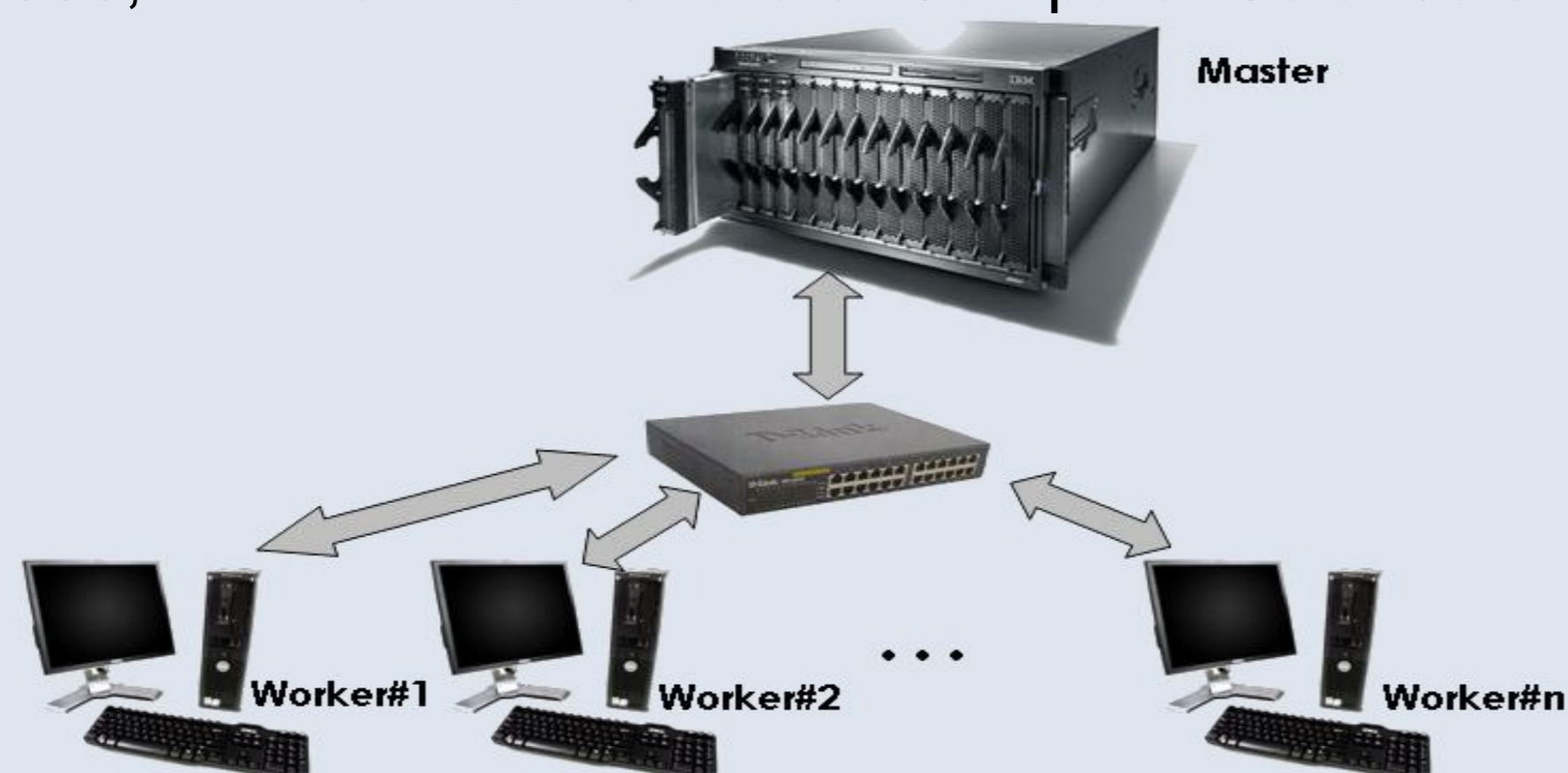
II. WinCollection allows statistical analysis of the vowels and semivowels on subclasses of files, according to the user requirements. The application allows the user to refine the analysis of the voice signal, especially for emotive voices.

Speaker code	Joy	Anger	Sadness	Neutral tone
#1	0.15	0.15	0.11	0.17
#2	0.15	0.17	0.10	0.12
#3	0.20	0.16	0.11	0.21
#4	0.09	0.09	0.10	0.05
#5	-	0.10	0.04	0.10

Coefficient values of variability on the analyzed phonemes („a”, „e”, „i”, „u”, „ă”) for all speakers according to emotional state

## III. Parallel program – block scheme

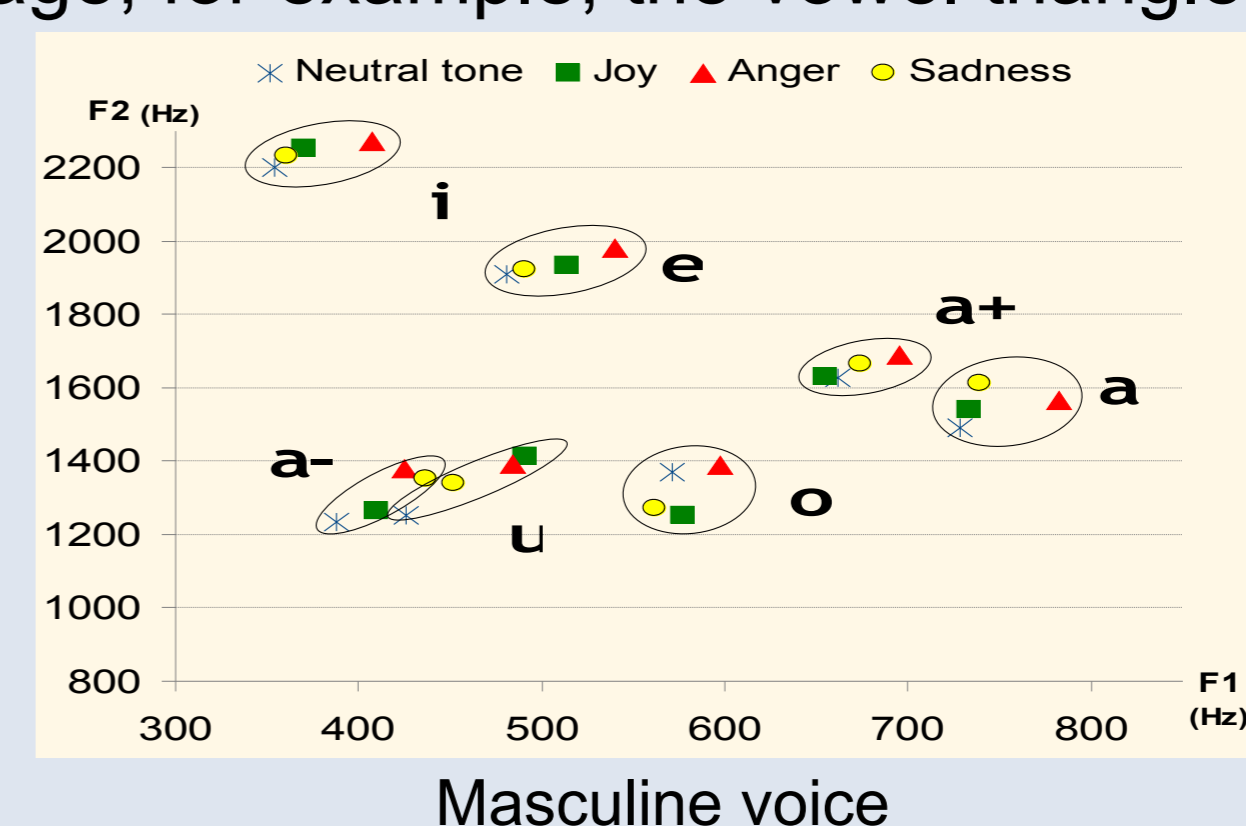
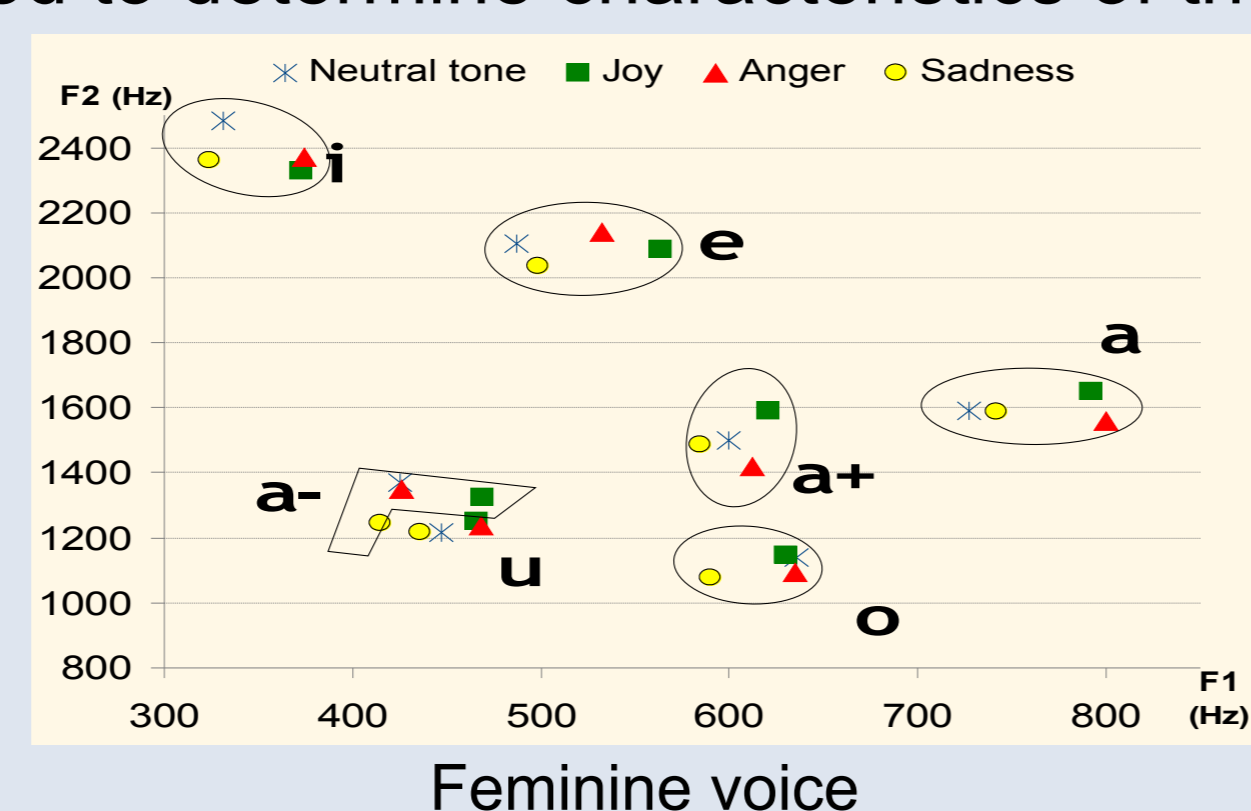
The parallel application (GRID) performs statistics for large corpora of data that require significant resources. Parallelization is achieved up to the phoneme level. The processing were done on a GRID network (developed in "Academic GRID for complex applications" project, No. 74 CEEEX-II03/31.07.2006, in which the Institute of Computer Science of the Romanian Academy, Iași Branch was partner).



- Read the input text files;
- Send data to WORKERS to compute statistical calculus for a phoneme;
- Receive the statistical items for a phoneme from WORKERS;
- Save the results to output text files.

- Receive data for a phoneme;
- Exclude invalid data;
- Compute statistical items for F0 and F1 - F4 formants;
- Send to MASTER the statistical items for a phonem.

The statistical results can be used to determine characteristics of the Romanian language, for example, the vowel triangle:



## Conclusions

The instruments are part of a suite of innovative, high level research tools aimed to advance the research of spoken languages and voice technology. These software instruments have several advantages compared to the existing technology and have already used to produce new results regarding the Romanian language.

[http://www.etc.tuiasi.ro/sibm/romanian\\_spoken\\_language](http://www.etc.tuiasi.ro/sibm/romanian_spoken_language)