

A DESCRIPTION OF THE VESPRA SPEECH PROCESSING SYSTEM

Rolf Haberbeck

FU Berlin
FB Germanistik
D-1000 Berlin 33

TU Berlin
FB Informatik
D-1000 Berlin 10

ABSTRACT

The VESPRA system is designed for the processing of chains of (not connected utterances of) wordforms. These strings of wordforms correspond to sentences except that they are not realised in connected speech. VESPRA means: Verarbeitung und Erkennung gesprochener Sprache (processing and recognition of speech). VESPRA will be used to control different types of machines by voice input (for instance: non critical control functions in cars and in trucks, voice box in digital telephone systems, text processing systems, different types of office workstations).

1.

The VESPRA system consists of five components:

- 1) the noise reduction unit;
- 2) the phonetic feature extraction and pattern recognition unit;
- 3) an ATN grammar , a dialog model and a model of the controlled machine;

4) a machine control and dialog generation unit;

5) a user friendly software development environment.

2.

In difference to common speech processing systems VESPRA has an integrated noise reduction unit. This noise reduction unit is context sensitive. Depending on the type of noise several types of filters will reduce the noise corresponding to the actual situation in which the system is used. Analog and digital filtering methods will be used. Noise has been up to now a big problem which made a wide use of speech processing systems impossible. The noise reduction is triggered by the actual state of the machine and the general acoustical environment. VESPRA will be able to recognize 500 wordforms speaker dependent and 100 wordforms speaker non sensitive.

An ATN grammar processes all meaningful sentences on the basis of these wordforms (including reduced forms of

sentences). The result of this lexical, syntactical, semantical and pragmatical processing is stored in the dialog memory or compared with the content of the dialog memory. The interpreted command input is processed by the model of the actual state of the controlled machine. If a command by the user is in conflict with the general state of the controlled machine VESPRA informs the user by voice output or by visual output. The voice output will be realised by LPC coded speech and is included in the VESPRA system. The visual output depends on the possibilities offered by the controlled machine. If a command by the user is not in conflict with the general state of the controlled machine the VESPRA system gives an instruction to the controlled machine. The interface between VESPRA and the controlled machine is designed in a way that allows to connect various types of sensors and actors to VESPRA.

There is a feedback control between the lexical, syntactical, semantical and pragmatical processing unit and the phonetic extraction and pattern recognition unit in order to optimize the phonetic processing and the processing of the chains of wordforms. The dialog model and the model of the controlled machine control the noise reduction unit. The chains of wordforms may consist of ten wordforms in the maximum. After the command input by the user is finished the VESPRA system or the controlled machine reacts within 0.3 seconds.

A user friendly software developmental system that runs on a mainframe or a workstation gives a non instructed user (engineer) the possibility to modify certain units of the VESPRA system within a certain limit of complexity.

This developmental system may modify the parameters of the following units:

- lexical, syntactical, semantical and pragmatical processing;
- dialog model and dialog memory;
- model of the actual state of the machine;
- machine control and dialog generation.

No special knowledge in linguistics or information science is required to use this developmental system.

3.

The VESPRA system will not only be realised as a software simulation on a mainframe computer. The main goal is to build a hardware module which can be used for several purposes. This system will be developed in cooperation with several research institutions and major industrial companies. This project is financed by the industry and the federal research and technology department (BMFT: Bundesminister für Forschung und Technologie).

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THE VESPRA SYSTEM

