Speech Recognition in the Waxholm Dialog System

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ABSTRACT
The speech recognition component in the KTH "Waxholm" dialog system is described. It will handle continuous speech with a vocabulary of about 1000 words. The output of the recogniser is fed to a probabilistic, knowledge-based parser, that contains a context-free grammar compiled into an augmented transition network.

INTRODUCTION
The KTH dialog demonstrator application, Waxholm, gives information on boat traffic in the Stockholm archipelago. It was first presented at the Eurospeech '93 conference (Blomberg et al. 1993). The system contains modules that handle speech recognition, speech synthesis and graphic information such as pictures, maps, charts, and time-tables.

Initially speech data have been collected using a Wizard-of-Oz technique, in which the recognition component was replaced by a human. The recorded speech is used for training and testing the recogniser.

SPEECH RECOGNISER
The speech recognition component will handle continuous speech with a vocabulary of about 1000 words. The work on recognition has been carried out along two main lines: artificial neural networks and a speech production oriented approach. Since neural nets are general classification tools, it is quite feasible to combine the two approaches.

Speech production approach
Our system uses a speech synthesis technique to generate spectral prototypes of words in a given vocabulary, see Blomberg (1991). A speaker-independent recognition system has been built according to the speech production approach, using a formant-based speech production module including a voice source model. Whole word models are used to describe intra-word phonemes, while triphones (three-phoneme clusters) are used to model the phonemes at word boundaries. An important part of the system is a method of dynamic voice-source adaptation. The recognition errors have been significantly reduced by this method.

Artificial neural networks
We have tested different types of artificial neural networks for performing acoustic-phonetic mapping for speech signals, see Elenius & Takács (1990), Elenius & Blomberg (1992), Elenius & Trävén (1993). The tested strategies include self-organising nets and nets using the error-back propagation (BP) technique. The use of simple recurrent BP-networks has been shown to substantially improve performance.

* Names in alphabetic order.

REFERENCES