Syntactical Analysis of Hungarian Sentences to Produce Prosodic Information for Speech Synthesis

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Telecommunication related speech research has traditions at the Department of Telecommunication and Telematics of the Technical University of Budapest. Good results were archived by the speech recognition groups lead by Klára Vicsi and Péter Tatai. The speech synthesis group coordinated by Géza Németh and Gábor Olaszy has been developing the Multivox multilingual speech synthesizer available for Hungarian, German, Italian, Portuguese and other languages. Our aim now is to produce more natural sounding synthesized speech.

One way to improve speech quality is to add prosodic information to the text. Prosody, ie. the base frequency, amplitude and rhythm changes, is generally not carried by the written text. The reader, recognizing the syntactic structures and the actual meaning of the text, indicates the focus, adds emphasis and pauses to the sentence. Providing prosodic control sequences for the synthesizer, it can parse this additional information and use it when forming the intonation. This results in more natural sounding speech. The control sequences can be added to the text either manually or automatically.

This paper discusses the problem of automatic prosodic information generation for Hungarian by means of syntactical analysis of the sentences. This process can be divided into two separate phases. In the first phase the syntactic analyzer performs an analysis on the sentence. The output of this module is a representation of the structure of the sentence: the predicate, object, subject and other parts of the sentence are identified. This information forms the input of the second phase. The prosody module performs two tasks: assigns stress to each word, and places pauses into the sentence, using phrase boundary information.

The operation of the syntactic analyzer is described in detail. Phrase detection is based on phrase pattern matching, using unification techniques. Phrase patterns are stored in a separate file — the rule matching engine is language independent. The structure of the sentence is determined using structure describing rules.

Stress and pause assignment is performed by the prosody module. The input of this module is the result of the syntactic analysis. Both syntactic and prosodic rules are programmed according to the directions of Ilona Koutny.

New issues in this work:

- A new representation of the syntactic structure is introduced. This representation can provide information for the prosody generator. The result of the syntactic analysis can also be used by any other natural language processing program.

- Syntactic analysis of Hungarian poses special issues. The major difficulties derive from the agglutinative character of the language. This also results in complex morphology of the words and unconstrained word order in the sentence.

- We developed a prosody generator using the output of the syntactic analyzer. This prosody generator can be used as a development tool for the speech synthesizer.

The prototype of the system is worked out for single-clause sentences of constrained topic. The sentences were taken from weather forecasts. The program is implemented in standard C.