COMPILATION SYNTHESIS OF SPEECH BASED ON CLIPPED SIGNALS

G.D.FROLOV

16th Parkovaya Str. 27-205
Moscow, USSR, 105484

I.M.YEFREMOVA

Zhukovskaya Ave. 13-75
Zheleznodorozhny 2
Moscow Region, USSR, 143980

The compilation synthesis of speech based on clipped signals is founded on a detailed analysis of the mutual position of zeros of a speech signal.The information used for the synthesis of speech is extracted from the speech signals of a definite speaker.Different minimal items are used for the compilation synthesis - words, syllabels,segments,phonemes.The best diversity of synthesized speech is achieved with tiny items,such as syllabels,segments, phonemes.To obtain high quality synthesized speech it is necessary to do the following preparatory work: define the stressed vowel of the word; define the prosodic features; define the syntactic stress.The preparatory work with the original text is carried out according to the syntactical, grammatical and phonetical rules of the Russian language.

As the pronunciation of a separate letter in the Russian language depends not only on the surroundings but also on its relational position to the stressed vowel, it is necessary to single out,in the original text,groups of words having similar stresses.Such a group of words corresponds in oral speech to a phonetic word.We call it a stressed group.To single out these stressed groups and to define the stressed vowel in them we must prepare the following starting data:

1.Multitude C of permanent components of a word form,where c(i) is an element of multitude C.A permanent component is understood as a most frequent beginning of the grammatical forms of the given word.Each element c(i) is put into correspondence with the number of the stressed vowel of the word (or with the number zero if the number of the stressed vowel changes at changes of the word form) and with a reference to the reciprocal element of the multitude V,described below.

2.Multitude V that consists of variable components of the form of a word.A variabl component of a word form is understood as a complex of all parts of a word form after depriving it of its permanent components. If in a word form there is no variable component,the sign "+" is inserted at its place in multitude V.If the stress in the word form changes,the element of the variable component is put into correspondence with a number that shows the stresse vowel number of the word form.

3.Multitude H of auxiliary words (prepositions,conjunctions,particles) that precede the significant word in the stressed group.

4.Multitude E of auxiliary words that stand after the significant word in the stressed group.This multitude includes only particles.

5.Multitude W of combinations of auxiliary words with significant words,where the sress is put on the auxiliary word.Each element of the multitude W is put into correspondence with the number of the stressed vowel.

For the description of the algorithm of automatic determination of stressed vowels we introduce the following designations: NS - empty word;G(N) - isolated stressed group.The original text is understood as an aggregation of words p(1)...p(i)... p(m).Words are separated by blanks or by marks of punctuation and blanks.Further we bring the algorithm metioned above:

1.Assume: L=1, N=1

2.Check: if L is bigger than m,go to 14

3.Check: if p(L) is an element of H,enter p(L) into G(N) and go to 4,otherwise go to 5

4.Check: if p(L),p(L+1) is an element of W, the number of the stressed vowel is taken from multitude W and go to 13

5.Check: if p(L) is an element of E,enter p(L) into G(N), p1:=p(L-1),go to 6.Otherwise check: if p(L+1) is an element of E, enter p(L), p(L+1) into G(N), L:=L+1, p1:=p(L), if p(L+1) is not an element of E, enter p(L) into G(N), p1:=p(L).

6.Check: if p1 is an element of C,go to 12 take number of stressed vowel from C. Otherwise perform: c1:=p(L)

7.Take the last letter of the word c1 from the right side and add it to the left side of the word v1.

8.Check: if c1 is an element of C,go to 7

9.Check: if v1 is an element of Q,where Q is the sequence of elements of the variable component corresponding with the permanent component c1,go to 7

10.Find the number of the stressed vowel in the word p1 as follows: if in the multitude C the number of the sressed vowel,which is not zero,corresponds with the element c1, then the number of the stressed vowel in the word p1 is found.If the number equals zero, take the number of the stressed vowel from the corresponding element of multitude V.

11.Compute the number of the stressed vowel in group G(N).Add to the number of the stressed vowel of the word p1 the quantity of letters in all auxiliary words that precede the word p1 in the stressed group G(N)

12.Compute: N:=N+1

13.Compute: L:=L+1 .Go to 2

14.End

After the automatic distributionof stresses in the original text has been accomplished,the automatic transcription of th this text is performed. The primary data for the algorithm of automatic transcription are:

1.Number of stressed vowel in the word.

2.Alphabet A of Russian letters and corresponding digital codes.The letters are coded in such a way that operations of substitution of symbols can be performed as arithmetical operations.

3.Alphabet T of transcriptional letters and corresponding digital codes.

4.Multitude S,containing words that form deviations from the rules of transcription,numerals in the form of numbers,special signs and symbols.Each word of this multitude is put into correspondence with its transcribed word.

5.Function F(a)=t,that transforms words written in letters of the alphabet A into transcribed words in letters of the alphabet T. Further we bring the algorithm of rapid transcription:

1.From the original text a word is separated.If there remain no more words,go over to position 6.

2.If the separated word belongs to multitude S,it is replaced by the correspondigg transcribed word and we go over to 1.

3.Each letter of the separated word is substituted by the digital code that corresponds with the letters of alphabet A. The stressed vowel of this word is replaced by the corresponding digital code and after it we add the digital code 100. Now we designate the digital code of the replaced letter or the digital code of the replaced letter and the code determining the character of the stressed vowel with a(i),where i represents the sequence number of the letter in the given word.

4.In the coded word a(1)... a(i)...a(n) we replace a(i) or the aggregation a(i) in accordance with the value of function F,that is specified in the table for the code,or the aggregation of codes of the transcription alphabet,designating them by t(J),where j represents the sequence number of the letter in the transcribed word.

5.In the succession t(1)...t(j)..t(m) we replace t(j) by the corresponding letter of the alphabet T,regarding the character of the sressed vowel.

6.End.

The described algorithm allows to perform the transcription of any Russian text at random according to the rules of Russian phonetics.

The most important word in a syntagm or phrase,the stressed one, tends to occupy a place in the end,that is why the definition of the syntagmatic stress is mainly accomplished with an algorithm of derivation of syntagms in the original text. The algorithms developed for the derivation of syntagms and the definition of prosodic features are founded on the morphological,syntactical and semantic analysis of the text.The system of compilation synthesis of speech includes moduli of derivation of segments,estimationof main tone frequency and also a modulus for adaptive connection of segments and means of developing,storing and reflection of obtained information about the speech signal.