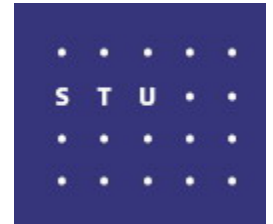# ENCODER METHOD FOR EVALUATION OF CUED SPEECH INTELLIGIBILITY

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Abstract

This paper deals with the problem of the cued speech recognition methods in videoconferences. Cued speech is a specific gesture language (different from the sign language) used for communication between deaf people. The aim of this paper is to show new objective method of testing sentence intelligibility (as is used in telephonometry for speech sentence articulation). The logatomes are not used to testing syllable intelligibility because they have no meaning and cannot be part of common words.

Introduction

Cued speech is a specific linguistic code for hearing-impaired people. It is based both on lip reading and manual gestures. Cued speech is perceived visually and produced gesticulation [3]. There are two types of alphabets in the Slovak cued language. The single-handed alphabet is when an individual uses one hand to form letters. In the double-handed alphabet, both of the individual hands are used. In Fig. 1. (a), the letter A shown below is the Slovak cued language using the single-handed method. In Fig. 1. (b) the double-handed method for the same letter is shown. The 3D space utilized in using cued speech is called the cueing space. This space can be described as is shown in Fig.2. For this reason, the deaf or hard of hearing people should see the whole space during a video conference [1].
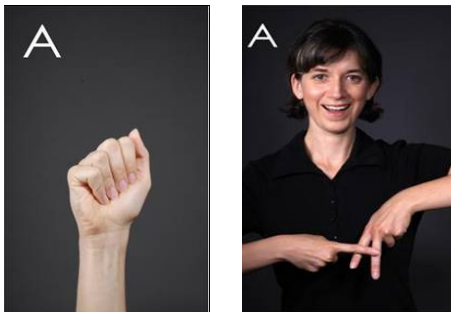

Fig. 1. The difference between cued speech using one hand and two hands

Intelligibility

There are two types of intelligibility: sound articulation and sentence articulation.

Sound articulation

The inspiration of designing the methodologies for intelligibility is based on testing in acoustics.

$$Z = \frac{a}{b} * 100\%$$

The intelligibility is defined as a percentage of the correctly received elements or parts of speech "a" to the total number of transmitted "b" [2]. There are three types of intelligibility testing – syllable, word and sentence intelligibility.

Sentence articulation

The objective method should be the result of method proposal for evaluation of intelligibility of phrases. The degradation of the transmitted video sequence method is tested by this method. It is based on two criteria. The first criterion is the speed of cueing and the second is intelligibility which depends on the capacity of the channel.

The quality measurement of the video sequences has five steps as shown in Fig.2
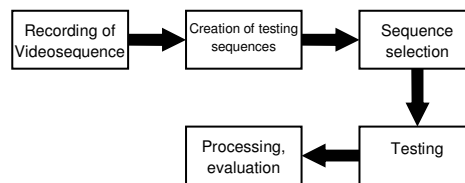

Fig. 2. The process of quality measurement

The video sequence with one sentence in Slovak language is played to the respondents. They evaluate the quality of each sequence promptly after the viewing according to Table 1.

1	completely clear
2	partly clear, understanding of the fundamentals
3	partly clear, fundamentals are misapprehended
4	inapprehensible

Tab. 1. Proposed voting options for testing of sentence intelligibility.

The respondent chooses the answer following his subjective feelings. General feelings of the respondent have an impact on the testing. The video sequence may cause different feelings.

The second part of testing is rewriting the sentence that is cued in Slovak language. It is not necessary to understand every word of sentence but it is important to understand the content. The sentence made by the respondent after watching the video sequence is compared to a reference sentence.

Evaluating the second respondent has the right to play the sequence once, then rewrite the sentence. Since they can help in understanding the nature of a sound, and yet also have to translate sign language into spoken language, it is quite natural. The second vote should not exceed 60 s, but this limit can vary depending on the nature of the test material.

sex	age	QP	bitrate[kbps]	YPSNR[dB]	respondent opinion	evaluate opinion
male	24	30	87,51	39,9	1	1
male	24	35	48,42	36,6	2	2
female	27	40	29,33	33,5	2	2
female	18	45	19,83	30,7	1	2
female	26	50	18,51	28,1	3	4

Tab.2. Results from previous experiment

This method is designed according to previous evaluation methodology clarity transfer Slovak sign language through video-conferencing and a subjective method of ACR [4], which is adapted for assessing the quality of video conferencing for the deaf.

Fig. 4. Picture taken from experiment: first is original next decoded frames by H264 codec with parameter QP40, 50.

Conclusion

This paper shows new objective method of testing sentence intelligibility (as is used in telephonometry for speech sentence articulation). The logatomes are not used to testing syllable intelligibility because they have no meaning and cannot be part of common words. Paper also contains description of one practical example with results.

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