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FUZZY ESTIMATION OF ADEQUATENESS OF TRANSLATION MODELS

Abstract

Main properties of language translation models are studied and fuzzy estimation of adequateness of these models is given.

Any language translation process not realized with absolute accuracy and with zero error [1-6]. Modeling of translation can be carried out by different ways and there are exist various kinds of models for this process. In works [2-6] the cybernetic models are studded and realized in the computer. In the work [5] the general concept of mathematical model of translation process is analyzed. Under the mathematical model of translation process we will understand the approximately description of this process by mathematical symbols. This definition is sufficiently general and concerned the algorithmic description of translation processes also.

Translation process can be characterized by some operator P, which makes transition of the any unit f of the text in original to appropriate unit x of the text in translation. This process can be expressed as following

$$P(f) = x \tag{1}$$

Any material for translation, that is the text of the original, gives some set D with elements f. This set translated by operator P on the set Q, which is the text of translation. Then

$$P(D) = Q \tag{2}$$

Equations (1) and (2) are equivalent and are the general expression of mathematical model of translation process. Let operator P carries out the translation of the text D to text Q ideally. Translation operators we will call translators. All real models of translation are approximately. Existence of absolute exact translator is supposed. Each translator in the practice realized with some approximation of operator P. So, n-th approximation of this operator we shall denote through P_n, $n=1,2...$Than $Q_n = P_n(D)$ is some approximation of the ideal translation Q.

A degree of nearness (proximity in some sense) of the texts Q_n and Q, we shall call a degree of adequateness of translation Q_n by translator P_n respect to ideal translation. Adequateness of translation determines his quality. For the quantitative characteristic of adequateness of the translation it is necessary to enter concept of degree of nearness for texts Q and Q_n. For this purpose different approaches can be used. One of them and it is possible the most successful, there can be a concept of degree of nearness of the elements entered with the help of fuzzy analyze of the theory of linguistic variables of L.Zadeh [9].

Let's note, that one of the main questions in theory linguistic variables of L.Zadeh is the concept and properties of so-called functions of belonging of elements to the fuzzy sets. We shall enter this concept for our case. Let V there is a fuzzy set of every possible reasoning on degree of nearness of the texts Q_n and Q. Through t we shall denote an any element of the set V, that t is any one reasoning on a degree of nearness of texts Q_n and Q. Below for clearness we shall putt $t_n = Q_n \backslash Q$. Let $\mu_v(t)$ is the function of belonging of the element t to the set V. Properties of this functions analyzed in the [7].

From definition of the function of a belonging   follows, that if $\mu_v(Q_n \backslash Q)$ tends to one then the given translation Q_n tends to the ideal translation Q. If $\mu_v(Q_n \backslash Q) = 0$, then the given translation Q_n completely misses with ideal translation Q. Other values of the function $\mu_v(t)$ contain between 0 and 1. In the same way, function $\mu_v(Q_1 \backslash Q_2)$ we shall call the degree of nearness of two translations Q_1 and Q_2.

Let for every element x in the text Q there corresponds only one element f in the text D of the original. Hence, there exist an operator A, which will transform the text Q back to the text of the original D, so

$$A(x) = f \quad \text{or} \quad A(Q) = D \qquad (3)$$

The text Q is unknown, so direct comparison of texts Q and Q_n it is impossible. In practice frequently act as making the return translation of the text Q_n into language of the original. Let the operator A^*-is one of the realizations of the operator of return translation to language of original. We denote $Dn^* = A^*(Q_n)$. The text D_n^* is in the language of the original and this text may be comparison with original D. In practice comparison of the texts D_n^* and D   considered for study of translation quality. Similarly previous, the degree of nearness of the texts D_n^* and D can be considered by fuzzy analyze. It is obvious, that

$$P_n(D) - P(D) = Q_n - Q \qquad (4)$$

If Q_n tends to Q, than from (4) follows, that $P_u(D)$ tends to P(D). It means, that translation $P_n(D)$ being improved, consistently aspires to ideal translation P(D). The reasonable improvement of machine translation can be achieved in computer dialogue and intellectualization of machine translations.

Equation (3) is operator equation of first kind. Hence, problem of translation is unstable problem. We shall result some conclusions, which are made on the basis of the general theory of unstable problems [9].

1. As much as small change in the text of the original, his arbitrary translation can give as much as big divergence respect to the true translation. Therefore, translation as a whole is strong unstable process.

2. Translation should be always realized in view of possible errors. In computer translation it is necessary take this fact into account. Unfortunately, these circumstances are not taken into account at drawing up of models of well known machine translations models and these translations frequently give the big divergences respect to the original.

3. The text of the original having errors is not necessary to carry out for translation with high accuracy. From the general theory of unstable problems follows, that such approach, usually, yields the worse results.

In modern linguistics there are not enough effective methods for quantitative estimate of adequateness of translations. In the scientific literature a problem of norm of translation frequently is discussed, that also repeatedly has undergone to criticism from various positions.

In this work to estimate of adequateness of translation the method of fuzzy analyses is applied. For this purpose we enter a number of fuzzy variables and sets. Let Y –adequateness of translation, X_1-content of text, X_2-scope of a genre, X_3-observance of grammatical rules (formal, semantic rules, syntactic situations etc.), X_4 - reputation and professionalism of the translator in the given genre, X_5-responses about the given translator. It is obvious, that these criteria do not cover every possible case and are only basis for the analysis. Below considered four types of translators:

1. First man translation,   2. Second man translation,
3. Computer translation,   4. Post editing computer translation.

These alternative translators we are denote through U_1, U_2 U_3, U_4. For each alternative we used values, which are gives as a fuzzy sets.

CRITERIONS	ALTERNATIVES-Y			
	U_1	U_2	U_3	U_4
X_1	0.6	0.7	0.2	0.4
X_2	0.7	0.5	0.1	0.3
X_3	0.5	0.5	0.2	0.4
X_4	0.8	0.6	0.3	0.5
X_5	0.6	0.6	0.2	0.4

The criteria have the different importance for different alternatives. For everyone criterion appropriate factor-coefficient is entered.

In the conclusion we note, that the considering above approach and receiving results are applied to estimate of adequacy of translations of the A.P.Chekhov's pieces into Azerbaijan language by N. Rafibeyli and H. Ziya (see: [5,8]).

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