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Note on some possible applications of intuititionistic fuzzy sets in machine translation

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Abstract: In the present paper we consider Intuitionistic Fuzzy Sets as a possible tool for improving machine translation output.

1 Introduction.

The so-called Intuitionistic Fuzzy Sets (IFS) defined by K. Atanassov [1] are a generalization of the Fuzzy Sets (FS) proposed by Zadeh ([2]). The most common machine translation programs nowadays use statistical procedures for optimizing the output in the target language. The standard techniques for machine translation use the vast available databases of words and phrases like wordnet (developed by the Princeton University), a set of statistical procedures based on the translation model, and some restraints on the output. Syntax knowledge has not yet been introduced at the desired level. One idea we have is to use Intuitionistic fuzzy sets containing language generated specific metric on order to handle the problem better.

2 d-IFS

Let $d: R^2 \times R^2 \to [0, +\infty)$ be an arbitrary metric on R^2 and $\mu: E \to I$, $\nu: E \to I$ be arbitrary mappings. Then we remind that the set

$$\{(\mu(x), \nu(x)) | x \in E\}$$

is said to be d- Intuitionistic Fuzzy Set or abbreviated d-IFS, if it is fulfilled:

$$(\forall x \in E), (d((\mu(x), \nu(x)), (0, 0)) \leq 1)$$

A wide class of $d - IFS$ may be introduced with the help of any norm on R^2. For example, let $\varphi: R^2 \to [0, +\infty)$ be an arbitrary norm on R^2. Then as usual, φ represents a metric $d = d_\varphi$ on R^2, that is given by the formula:

$$(\forall (\mu_1, \nu_1), (\mu_2, \nu_2) \in R^2, d_\varphi((\mu_1, \nu_1), (\mu_2, \nu_2)) = \varphi(\mu_1 - \mu_2, \nu_1 - \nu_2)).$$

Thus the norm φ generates $d_\varphi - IFS$. When $\alpha \in (0, +\infty)$, the respective d_{φ_α}-IFS are introduced by:

$$\{(\mu(x), \nu(x)) | x \in E, \mu: E \to I, \nu: E \to I \& ((\mu(x))^\alpha + (\nu(x))^\alpha) \leq 1\}$$

Any d_{φ_∞}-IFS is a limit of d_{φ_α}-IFS, when $\alpha \to +\infty$.

The main difficulty here would be to quantify the metric corresponding to a given language. Given a good database of examples, however, this is possible. What possible advantages might this offer? In the current state we have each language corresponding to the same metric, hence syntax rules must be applied externally. If proper metric is introduced we would have an innate representation of them. Thus the problem of applying syntax knowledge may be reduced to comparing intuitionistic fuzzy sets.

3 Conclusion

A possible way for implementing syntax knowledge with the use of approprite IFS has been proposed. Such knowledge will be inherently embedded in the metric corresponding to the target language.

References

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