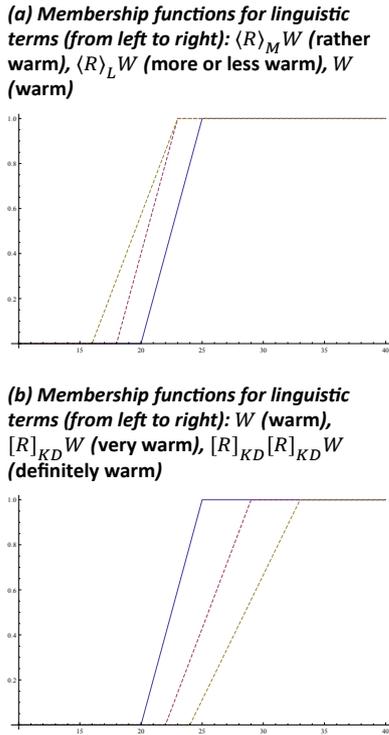


Fig. 1. Membership functions for linguistic terms

its expressive power is intermediate. In our framework the statements (E1) and (E3) can be represented by $\langle R \rangle_{\otimes} [R]_{\rightarrow} P$ and $[R]_{\Rightarrow} \langle R \rangle_{\odot} P$, respectively, where \otimes (resp. \odot) is a left-continuous t-norm and \rightarrow (resp. \Rightarrow) is its residual implication. By Corollary 3.1, we have

$$\langle R \rangle_{\otimes} [R]_{\rightarrow} P \subseteq P \subseteq [R]_{\Rightarrow} \langle R \rangle_{\odot} P,$$

which coincides with our intuition.

There is a kind of dualism between some linguistic hedges. Namely, let the following expressions be given:

(E4a) *rather not P*;

(E5a) *not very P*.

In particular, if we say that a temperature outside is *rather not warm*, it obviously cannot be treated as *extremely warm*, whence *rather not P* \subseteq *not very P*. By Property 3.3(c) this can be modeled by operators (2) for (E4a) and by (1) for (E5a) using a left-continuous t-norm \otimes , its residual implication \rightarrow , and the negation \neg induced by \otimes . However, if in some cases *rather not P* = *not very P* is required, one can apply Łukasiewicz connectives.

Similarly, consider the following expressions:

(E4b) *definitely not P*;

(E5b) *not quite P*.

For example, if one says that outside is not even *quite warm*, the intuition dictates that it is *definitely not warm*, thus *not quite P* \subseteq *definitely not P*. As before, by Property 3.3(c) this case may be supported by choosing a left-continuous t-norm \otimes , its residual implication, and the negation induced by \otimes . Łukasiewicz connectives are to be applied whenever equality is desired.

6. Concluding Remarks

In this paper we have presented two applications of fuzzy modal operators. First, we have shown how these operators may be used for fuzzy set approximations. Basing on the observation that fuzzy set approximations maybe viewed as intuitionistic fuzzy sets, we have presented the application of these operators in the problem of skills matching for selecting research projects. Also, we have pointed out how fuzzy possibility and fuzzy necessity operators can be used for modeling linguistic hedges. This representation is based on the observation that linguistic hedges may be viewed as specific kind of modal expressions. The presented approach reflects the contextual meaning of these modifiers which is, in our opinion, intuitively justified.

AUTHOR

Anna Maria Radzikowska – Warsaw University of Technology, Faculty of Mathematics and Information Science, Koszykowa 75, 00-662 Warsaw, Poland, e-mail: A.Radzikowska@mini.pw.edu.pl.

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