



## A Robot's Experience of its User: Theory

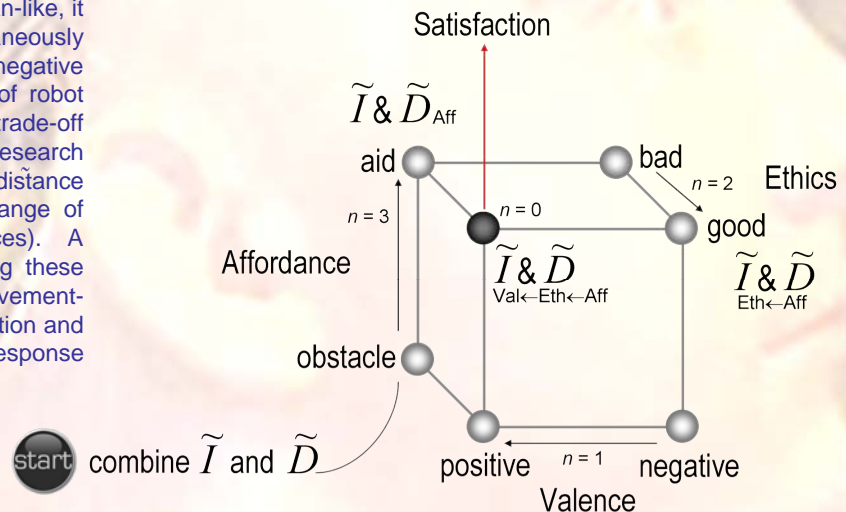
Johan F. Hoorn

VU University, Center for Advanced Media Research Amsterdam  
jf.hoorn@fsw.vu.nl

### Abstract

To make a robot that emotionally is more human-like, it should be capable of balancing simultaneously occurring tendencies of positive and negative emotions. This paper is about the modeling of robot attitudes towards the user, using a fuzzy trade-off algorithm (also see other poster). Empirical research showed that in humans, involvement ( $\tilde{I}$ ) and distance ( $\tilde{D}$ ) are not mutually exclusive and that a range of factors contribute (e.g., ethics, affordances). A hypercube of fuzzy sets deals with combining these factors into an overall value for the involvement-distance trade-off, which contributes to satisfaction and subsequently can form the input for affective response selection.

### Response phase



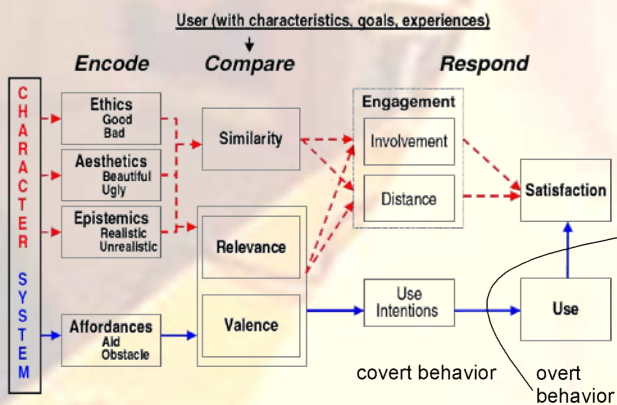
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$$\mu_{and}(\mu_{\tilde{I}}(u), \mu_{\tilde{D}}(u)) = \gamma \cdot \min\{\mu_{\tilde{I}}(u), \mu_{\tilde{D}}(u)\} + ((1 - \gamma)(\mu_{\tilde{I}}(u) + \mu_{\tilde{D}}(u)) / n),$$

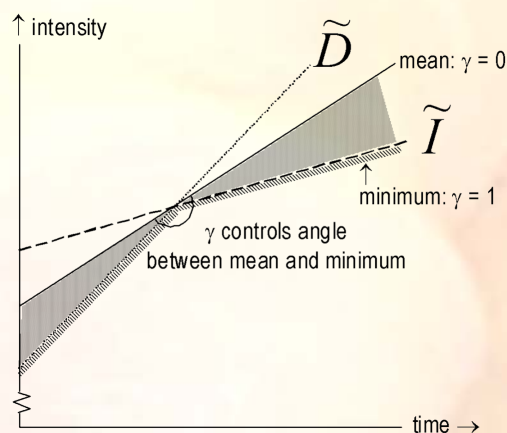
where  $u \in U$ ,  $\gamma \in [0,1]$ , and  $n$  is the number of fuzzy sets for which the mean is calculated (here 2).

(Werners, 1988)

### I-PEFiC Model



Involvement-distance conflict of the robot with its user and the function of  $\gamma$ , which controls the angle in the trade-off outcome-space (gray) between the mean (solid line) and the minimum intensity (hatched) of distance (dotted) and involvement (dashed)



In earlier studies, we showed empirically that involvement-distance trade-offs are part of the user's experiences with fictional and virtual characters (e.g., Konijn and Hoorn 2005; Van Vugt, Hoorn et al. 2006; Van Vugt, Konijn et al. 2006; 2007). Such trade-offs lead to mixed emotions, which are natural to human assessment of others ("Love his looks, hate his behavior")

