User modelling with neural networks in a multimodal Unix environment

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The aim of this work is to use an estimation of the user's level of competence in successfully manipulating the operating system to improve dialogue in a multimodal interface, MUNIX, for the Unix operating system. Multimodality allows a natural style of interaction with an integration of different modalities such as speech or direct manipulation, in order to approach the richness of human-human communication. Nevertheless, this kind of dialogue is static. That is, the level of expertise is implicitly assumed to be the same for all users.

We propose to incorporate a dynamic user model in this interface to enhance its adaptive capability according to the user's level. We choose a neural network approach based on Kohonen's self-organising maps. Opposed to the rigidity of the classical stereotypes, this approach offers more tolerance due to the dynamic classification inherent to neural networks, and a fast convergence to an estimation.

The design of the user modelling module in the dialogue architecture presented here can be conceptualised as a three-phase process. Firstly, user-specific significant features such as typing speed, Unix command lexicon employed and rate of error generation, contribute to building a knowledge representation of the Man-Unix interaction. Secondly, the appropriate neural net structure is defined, and training commenced on a supervised corpus. The supervisor arbitrarily defines the corpus - which is representative of the set of Unix user levels of expertise - into five subsets ranging from 'beginner' to 'expert' levels. Finally, the trained self-organised network is incorporated into the interface so as to facilitate dynamic user interaction with the operating system.

This novel multimodal interface component has been shown to rapidly determine the level of expertise of users. Incorporating this module in MUNIX allows enhancement of system response in terms of the most appropriate choice of dialogue modality given a user's level of expertise. The contents of 'Help' services can also in this way be better targeted and matched to a user's level of competence with the system.