Employing Speech to Contribute to Modelling and Adapting to Students' Affective States

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Abstract. Affect plays a significant role in students' learning behaviour. Positive affective states can enhance learning, while negative ones can inhibit it. This paper describes how we provide intelligent support in a learning platform based on affect states. We discuss two components: an affective state detector to perceive affective states in speech during interaction with the platform; and an affective state reasoner to provide support, which aims at aligning the learner's personal goal with the learning task to evoke positive affective states for an enhanced learning experience.

1 Introduction

Our aim is to build a learning platform for elementary education that integrates speech recognition for children in order to enable natural communication. We report on the development of an affective state detector capable of inferring affective states in children's speech. This is then used by the affective state reasoner to provide intelligent support that is responsive to the affective state.

As described in [1] affective states interact with and influence the learning process. While positive affective states contribute towards constructive learning, negative ones can lead to challenges. The learning process includes a range and combination of positive and negative affective states. This work contributes towards the understanding of how intelligent support can be used to turn negative affective states into positive ones.

2 Modelling and adapting to affective states

We adopt the layered approach designed by [4] for the development of the intelligent support. The input for the analysis layer is the result of the speech

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recognition software by Sail Labs [2]. This software is trained specifically with children's voices. It creates an array of words based on speech input. This word array is used by the affective state detector for classification. The classification is based on the 'Bags-of-Words' model (e.g. [3]). We apply a naive Bayes classifier to classify the affective states. The system then passes the result of the classification to the reasoning layer, which uses this input to make decisions on how adaptive feedback should be provided, via the affective state reasoner.

As described in [5] positive emotions or affective states facilitate students' self-regulation of learning, figuring in meta-cognitive and meta-emotional strategies for adapting learning to goals and task demands. In contrast, negative emotions can lead to reliance on external guidance. A match between personal goals and learning tasks can produce positive affective states, while a mismatch can produce negative states [6]. Our affective state reasoner includes rules about how negative affective states can be transformed into positive ones by aligning the student's reasoning process with the learning task. The rules are based on Wizard of Oz studies [7] where the platform was used as a tool to investigate what type of support is effective for a particular affective state.

3 Conclusion and future work

We have developed a system that is able to provide adaptive feedback based on affective state. The next stage in our research will be to evaluate the system with respect to students' affective states. This will include an assessment of the effectiveness of the affective state detector and the affective state reasoner with regard to students' learning experience and performance.

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