

# Employing Speech to Contribute to Modelling and Adapting to Students' Emotions

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**Abstract.** Emotions play a significant role in students' learning behaviour. Positive emotions can enhance learning, while negative emotions can inhibit it. This paper describes how we provide intelligent support in a learning platform based on emotions. We discuss two components: an emotion detector to perceive emotions in speech during interaction with the platform; and an emotion reasoner to provide support, which aims at aligning the learner's personal goal with the learning task to evoke positive emotions 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 emotions detector capable of inferring emotions in children's speech. This is then used by the emotion reasoner to provide intelligent support that is responsive to the emotional state of the student.

As described in [1] emotions interact with and influence the learning process. While positive emotions such as awe, satisfaction or curiosity contribute towards constructive learning, negative ones including frustration or disillusionment at realising misconceptions can lead to challenges. The learning process includes a range and combination of positive and negative emotions.

This paper contributes towards the understanding of how intelligent support can be used to turn negative emotions into positive ones.

## 2 Modelling and adapting to emotions

The emotion detector is based on the achievement emotions described in [2] as well as emotions which were detected in Wizard of Oz studies [3]. The input for

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the emotions detector is the result of the speech recognition software by Sail Labs [4]. This software was specifically trained with children’s voices (in German and English). It creates an array of words based on speech input. This word array is used by the emotions detector for classification. The classification is based on the ‘Bags-of-Words’ model (e.g. [5]). We apply a naive Bayes classifier for classifying the emotions. The result of the classification is then used by the system to decide if and how adaptive feedback should be provided via the emotion reasoner.

As described in [2] positive emotions facilitate students’ self-regulation of learning, such as using meta-cognitive and meta-emotional strategies for adapting learning to goals and task demands, while negative emotions lead to reliance on external guidance. A match between personal goals and learning tasks can produce positive emotions, while a mismatch can produce negative emotions [6]. Our emotion reasoner tries to reduce negative emotions by changing the environment via adaptive support. It includes rules about how negative emotions can be transferred into positive emotions by aligning the student’s reasoning process with the learning task. The rules are based on Wizard of Oz studies [3] where the platform was used as a tool to investigate what type of support is effective for a particular emotion.

### 3 Conclusion and future work

We have developed a system that is able to provide effective adaptive feedback based on the emotional state of the student. The aim of the adaptations is to aligning the student’s reasoning process with the learning task in order to enhance the learning experience. The next stage in our research will be the evaluation of the system in respect to students’ emotions. This will include an assessment of the effectiveness of the emotions detector and the emotion reasoner according to students’ learning experience and performance.

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