

Little Mozart: Establishing long term relationships with (virtual) companions

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Abstract. This paper aims to present e the work developed at Cnotinfor within the LIREC project. We will present Little Mozart mind architecture and facial expressions. Our goal is to create a virtual e-learning agent capable of establishing meaningful interactions with children on how to compose and improve their knowledge of melodic composition and basics of musical language. In order to make our agent believable and engaging we resorted to facial and body 3D modeling techniques as a strategy for expressing emotion through multimodal communication.

Keywords: mind, emotion, expression, interaction

1 Introduction

LIREC (Living with Robots and interactivE Companions) it's a four year project conducted in a consortium led by Queen Mary University of London, in which Cnotinfor participates through its Centre for Technological Innovation.

Little Mozart is our pedagogical virtual agent and he aims to establish meaningful interactions with children on how to compose and improve their knowledge of melodic composition and basics of musical language. In order to teach melodic music basics Little Mozart uses Pedro Sousa's methodology, his methodology is based on a series of rules in what comes to the correct sequence of musical notes. The user's choices can result in more agreeable musical melodies, meaning that there are better combinations and harmonies to produce a composition. Another rule is the combination of tempi, the composition is made with 4 tempi, which results in combinations of 2 tempi plus 1 plus 1; 2 tempi notes plus 2; 3 tempi notes plus 1 or 4 tempi notes.

Little Mozart composition scenario is inside a house divided in several rooms each with one musical note and colour associated, so when the user chooses a room the associated note is added to the staff. The process continues until the melody is completed. Little Mozart has two other scenarios, one introductory, and another one where the user has the possibility to choose an instrument reproduce the created composition

2 Mind architecture

The Little Mozart's mind implementing a model of emotions based on FLAME [2] (which is based on OCC theory [5]).

The model reacts to world (game) events or consequences of user actions. Those events are then conducted through a series of stages resulting in verbal, body and facial behaviours.

The stages are divided in two major components:

The Emotional Component starts evaluating the events against agent goals. The agent major goal is to improve user musical melodic composition. Then Appraises the previous evaluation influenced by the learning component (explained later). After this stage the emotion resulting from Appraisal state is Filtered according to mood. The behaviour selection is the last stage. This stage selects behaviours according to emotional state and influenced by information from the learning component.

The Learning Component learns from user previous actions and creates expectations about the next user actions. It also memorises some information about the user in two memory levels: the short term that stores n past emotional states and long term memory that stores statistical information about the user tendencies (musical melodic composition). The consequences of agent's actions on user are also memorised in order to better select behaviours.

3 Facial expressions

Our prototype reflects our concern to increase Mozart's believability, through providing him with facial expressions. Therefore, based on Ekman's six basic emotions and his Facial Action Coding System, FACS [1], we developed 6 different facial expressions for happiness, sadness, fear, anger, disgust and surprise and supported the design process on previous studies on facial expression and emotion expression. We used a 3d manipulation software to model the muscles of Little Mozart's face using morphing technique, which allows modeling portions of the face which allows smooth transitions [3].



Figure 1: Little Mozart's facial expressions

References

1. Donato, G. Bartlett, M. S., Hager, J. C., Ekman, P., & Sejnowski, T. J.: Classifying Facial Actions. IEEE Transactions on pattern analysis and machine intelligence, 974-989 (1999)
2. El-Nasr, M.S., Yen, J., & Ioerger, T.R.: "FLAME: Fuzzy Logic Adaptive Model of Emotions" in Autonomous Agents and Multi-Agent Systems. Vol. 3, pp. 219-257 (2000)
3. Lierios, A, Garfinkle & Levoy, (2002). Feature-Based Volume Metamorphosis. Stanford University.

4. Ortony, A., Clore, G., & Collins, A.: *The Cognitive Structure of Emotions*. Cambridge University Press (1988)