

## OPPONENT'S REVIEW OF THE DISSERTATION THESIS

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**Title:** Artificial Emotions in Virtual Storytelling  
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Michal Bída in his doctoral thesis entitled “Artificial Emotions in Virtual Storytelling” describes the Emohawk Agent Architecture (EWA) for interactive digital storytelling (IDS). The EWA system should facilitate the creation of simple computer games (interactive dramas), where the agents (NPCs, non-player characters) have believable behavior. The system is used in the thesis to design two simple games – SD One and SD Two. These games are then used in the last part of the thesis that deals with semi-automatic drama analysis.

The thesis is divided into four Chapters. In the first chapter, the author gives an overview of the theoretical background of the thesis. This includes the basics of interactive digital storytelling and affect simulation and also a description of existing IDS systems such as computer games and other simulations. The overview in this chapter is well-written and provides all the information needed to understand the rest of the thesis.

In the second Chapter, the Emohawk Agent Architecture is described in detail. The EWA is a minimalistic architecture for the development of intelligent virtual agents (IVA) in medium sized dramas. The requirements for such a system are specified in this section and a system is developed that fulfills these requirements. The EWA architecture is well thought out and provides a relatively complex system, on the other hand, it is mostly a combination of other existing architectures (most notably a simulation of emotions and a navigation manager). I appreciate the hard work put into the development of the EWA architecture and I believe it is a valuable contribution to the IDS field.

In Chapter 3, the author describes the StoryFactory tool, that can be used to script short movies in 3D environment, and two simple dating games – SD One and SD Two. Both the StoryFactory tool and the two games were developed on top of the EWA architecture. The games are rather simple, however they nicely show the capabilities of the EWA architecture and are able to create a medium-sized drama. This chapter also describes the debugging support implemented in EWA, which nicely shows what happens inside the implemented game and makes the development easier.

The main contribution of the thesis is in Chapter 4, where the author describes a system for automatic drama analysis. It is based on feature extraction from the logs of the games and uses a clustering algorithm in the space of games so that it is easier to investigate. It is evaluated on the SD One and SD Two games and in the MOSS system. The extracted features are interesting and the whole problem of clustering the games is also interesting from a machine-learning point of view. Apart from different types of features, the author also investigates different metrics between the features and shows, how they affect the performance. However, it seems a bit strange, to compare clustering algorithms by their precision with respect to some condition. In such a case, an algorithm that uses the value of the condition as the only feature would have the best precision. I believe in this case a subjective evaluation of the similarity of the games in same clusters would also be interesting (albeit not so objective).

Overall, the thesis is well-written and has a nice, logical structure. There are only a few problems with the text. One of them is, that the author calls the clustering algorithm he used “*k*-means” with some modifications, while the modifications actually turn the algorithm into a variant of the *k*-medoids algorithm. I really appreciate the attachment to the thesis that contains (apart from other content) a few videos from the game. These really helps with the understanding of the text.

I have only a few questions for discussion:

**Q1** None of the games seem to use the full emotion model implemented in the EWA architecture. Is the whole system really needed? Are there any plans/projects that would use more of the simulated emotions?

**Q2** Regarding the clustering: The goal was to cluster the stories so that a developer can only review some of the stories from each cluster and instead of reviewing all the stories. Can the system be really used in this way? How much are the stories in the same clusters similar from a subjective point of view?

I believe the work is a valuable contribution to the field of interactive digital story-telling. The proposed EWA architecture helps to develop medium sized dramas and fulfills the goals set in the thesis. The semi-automatic analysis of virtual drama is also a nice contribution to the field.

The author proved in his thesis he is capable of independent scientific work. Based on this and the reasons above, I recommend the work for defense and I believe Michal Bída should be awarded the Ph.D. degree.