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Dynamic generation of dilemma-based situations in virtual environments

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Abstract. Training in complex environment is not only a difficult task for the learner but it is also a challenging work for simulation systems. These systems need to generate dynamically relevant situations according to the learner's profile. Our work focuses on the generation of situations with critical dimensions for non-technical skills training. Dilemma is one of these dimensions. In this paper we will present our early approach of dynamic generation of dilemma-based situations.

Keywords: Dilemma, Virtual environments, Non-technical skills, Training.

1 Introduction

MacCoy Critical is a project which aims to study and improve training systems that use simulation and virtual environments. A particular attention is paid to using these systems to train for non-technical skills in critical situations. In these situations, there is not always an ideal way to handle them. Training using virtual environments, in this case, may enable the learners to anticipate these situations, to better understand them and finally to weigh each alternative solution to handling them. In risk assessment, the criticality is a numerical value calculated from several parameters which are often: severity and probability. Besides these parameters, we have identified other critical dimensions by means of field analysis and interviews with instructors. These dimensions are: ambiguity, dilemma, socio-cognitive load, newness and learner's ability. In this paper we will focus on the dilemma generation.

2 Generation of dilemma-based situations

2.1 Related work

Some work showed interest in creating dilemma situations for training. We can mention [1] and [2]. The main remark about these systems is that they are designed in advance and not generated dynamically. However, we can point out the works of [3] who proposed a user model for a system which automatically generates stories based on dilemmas. The dilemma generation process takes into consideration the relations

between characters in order to identify which type of dilemma to put in place. Our approach is slightly different since our purpose is to generate dynamically situations where there is a conflict of values in general and/or contradictory knowledge (not necessarily involving more than one character) leading to difficult-choice-making situations.

2.2 Dilemma generation

In our approach we propose to classify the dilemma into 3 main categories: (1) Situations where the learner has to perform two contradictory tasks, (2) situations where the learner has to make a choice (opposition of moral values) and finally (3) situations leading to the same negative consequences. In order to generate these situations we propose algorithms used by our orchestration engine on the activity or/and causality models. An output example of the algorithm for category (1) generation would be:

(task1; Verb: "Brake", preconditions: "Red light is on")

(task2; Verb: "Do not brake", preconditions: "Vehicle aquaplaning")

The dilemma in this situation is that the driver should stop because he must respect the law, but if he does, he risks losing control of his vehicle and may be disastrous consequences.

As far as category (2) is concerned, instead of looking for contradictory tasks, we search for tasks which produce a conflict between two human values. In the activity model, we can tag the tasks. These tags can be used to specify which human value is concerned if the task is accomplished. The algorithm output in this case would be a pair of tasks tagged with conflictual moral values.

The third type of dilemma is a situation where the choice consequence is always negative and the same. To generate this type, we propose to use the causality model. In this model, a "barrier" may be a human behavior which prevents an event from happening. Using our algorithm, the system will be able to find two events which lead to the same negative event. An output example (more brutal than the previous one) would be:

("The killer threatens John" → "John is dead"; Barrier: "The mother chooses him")

("The killer threatens Tim" → "Tim is dead"; Barrier: "The mother chooses him")

(("John is dead" OR "Tim is dead") → "The mother loose her son")

3 References

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