Towards Serious Gaming for Communication Training - A Pilot Study with Police Academy Students

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Abstract. Serious games are increasingly being used for training of communicative skills. The main idea is to create a virtual environment in which a trainee can interact with graphically embodied virtual characters. By designing scenarios in such way that the character's behaviour provides direct feedback on the correctness of the trainee's choices, an interactive learning experience is created. This paper explores the potential of this approach in the domain of law enforcement. A prototype has been developed of a serious game that enables police academy students to train their communicative skills. A pilot study with 41 students has been conducted. The results show that this is a promising instrument for education in this domain, but also point out several suggestions for improvement.

Keywords: serious gaming, virtual characters, communication training.

1 Introduction

"On Friday, August 16th, around 14.30, a report was received of a man and a woman being heavily under the influence of alcohol in a park in Zutphen. A number of police officers went to the park, and found the man and woman there. The man approached the officers with clenched fists while speaking aggressive language. He refused to show his ID. The woman that accompanied him did not want to show her ID either. As a result, both of them were arrested and transferred to the police station. The man showed much resistance to his arrest. Both on the way to the station and at the station, both arrested persons still showed verbally and physically aggressive behaviour towards the police. Both were remanded in custody for insulting and threatening behaviour towards police officers."

Although it is just one example[1], this incident illustrates that aggressive behaviour against police officers is an ongoing concern in The Netherlands. The aggression can range from verbal threats and intimidations to physical violence. In 2006, the Dutch Ministry of the Interior (BZK) initiated a preventive program 'Veilige Publieke Taak'

[1] Source: http://www.politie.nl/nieuws/2013/augustus/17/02-zuthen-agressie-tegen-politieagenten.html.

[1]. Part of this initiative was monitoring the incidence of violence in the public sector. According to this study, around 60% of the employees in the public sector has been confronted with undesired behaviour in the last 12 months. Despite interventions initiated by the Minister of Justice, only a tiny improvement for some services was found in the period 2006-2011 [1]. For the police domain, no significant improvement has been achieved at all, so the situation is still very actual.

There is an ongoing discussion about what can be done to better prepare police officers for such incidents. One of the solutions that are currently considered is to put substantial effort in *training of communicative skills*. The underlying idea is that the way in which employees communicate with citizens might have an effect on whether or not the citizens misbehave. Indeed, communication training and resilience training have become important elements in the education program at the Dutch Police Academy [2]. Such training is typically performed in a group setting, for instance based on role-play, where student learn to communicate with (aggressive) citizens in such a way that the situation does not escalate. Although this form of training has shown to be successful, it is quite expensive with respect to both money and time. Furthermore, the training is not always easy to control or repeat systematically.

As a complementary approach, in our research we propose the use of simulation-based training to learn communicative skills. This is in line with a number of recent initiatives that show promising results regarding the possibility to train social skills based on simulated environments involving virtual humans [3-7]. These projects have addressed a variety of tasks in different domains, including police interviews [3], leadership training for naval officers [4], medical consultations [5], negotiation in different cultures [6], and manager-employee conversations [7].

The main idea of the current system is that Police Academy students can practice their communication skills by engaging in conversations with virtual citizens. By designing the scenarios in such a way that the virtual characters behave well if they are being approached correctly, but misbehave if they are being treated inappropriately, trainees will receive immediate feedback on their performance. With such a system, students have the ability to practice their communication skills in a cost-effective, personalized and systematic manner.

In this paper, a prototype of such a serious game for simulation-based training is presented, which has been developed in collaboration with the Dutch Police Academy. In addition, a pilot study is described that has been performed to evaluate different aspects of the system. The emphasis of the proposed system is on decision making aspects in a graphically realistic environment. By using a combination of motion capture technology and state-of-the-art software from the gaming industry, a realistic environment with human-like virtual characters is created. To achieve this, the choice has been made to use a relatively simple interaction paradigm, based on multiple choice menus and dialogue trees. Hence, the focus of this paper is on developing a learning tool for decision making in familiar environments, and not so much on affective multi-modal interaction (which obviously is an important aspect of simulation-based training too, and which we will integrate with our current system in the future).

2 Theoretical Basis

To design an effective training tool, a first question to be asked is what should be the learning goals of the system. For the current context, these learning goals are similar to the ones used in the existing education program of Police Academy students.

In [2], an overview is presented of the theories that are used in this education program for teaching social skills. The document covers a wide variety of skills, including 'core qualities', cooperation, feedback, communication, general conversation skills, task-specific conversation skills, conflict resolution, and emotion/stress regulation. For the proposed project, which has an emphasis on (verbal) communication and aggression de-escalation, especially the last four skills are of relevance. The idea is to capture the knowledge available in the relevant theories within the training system, to enable it to provide appropriate feedback to the actions performed by the trainee (cf. [8,9]). Regarding *general conversation skills*, there are a number of techniques that students should include in their repertoire by repeated practice; these include techniques at a verbal (e.g., paraphrasing, asking questions) and a non-verbal level (e.g., nodding and using eye contact). Regarding *task-specific communication skills*, there are several more sophisticated methods that students should learn to apply in the right context. For instance, in ticket issuing conversations, students can make use of the 'Van der Steen method'. This method divides the conversation in three phases (opening, dealing with reactions, and administrative closure), and prescribes recommended behaviours for different types of reactions of the conversation partner [10]. Similarly, several theories are used that enable people to take away resistance during difficult conversations, such as the Leary Circumplex [11] (which classifies behaviour along the axes of dominance and cooperation, and provides guidance for selecting a type of behaviour that facilitates successful interaction), and the Transactional Analysis [12] (a psychological theory that helps understanding how people express their personality in terms of behaviour). Regarding *conflict resolution*, an important theory is the one by Giebels and Euwema [13], which distinguishes five styles for solving conflicts (namely forcing, avoiding, problem solving, yielding, and compromising), and enables people to make strategic choices between these styles in a particular situation. In addition, the CIPA model is often used, which identifies four phases within difficult conversations (making contact, gathering information, problem solving, and closure), and provides behavioural guidelines for each phase [2]. Finally, regarding *emotion/stress regulation*, students should learn to recognise the aggression level of their conversation partner as well as their own stress level, and be able to find a suitable match between the two by switching between stress levels and corresponding interaction techniques [14]. Although this overview of communication skills was established specifically for the Police Academy, it shows much overlap with the techniques that are prescribed for other domains in which aggression de-escalation plays a role, such as public transport and health care [15].

2.1 Focus of this Pilot Study: the 'Door Scene'

As it would be impossible to address all of the above skills within one pilot study, the focus of the current paper is on one specific learning goal. This learning goal is taken from the module 'Noodhulp' (Emergency Assistance), which is one of the modules in the education program at the Police Academy. As part of this module, students have to learn to correctly handle the so-called 'Door Scene'. This is a situation in which a police officer has just been informed about an incoming emergency call. For the current prototype, we focus on the domain of domestic violence (e.g., a call from a crying woman who claims that her boyfriend is abusing her). The scenario starts at the moment that the police officer (together with his or her partner) arrives at the address from which the call was made, and rings at the door. Typically, the door is then opened by one of the key characters in the scenario (e.g., the woman how made the call, or her boyfriend). The main goal for the trainee is to find out what is going on (e.g., is this indeed a case of domestic violence?) and to decide whether or not there is sufficient evidence to enter the house, while at the same time preventing the situation from escalating by applying the appropriate communication skills.

3 Training Environment

To develop the training environment, the same approach as in [16] has been followed: the environment has been implemented in InterACT[2], a training platform developed by the company IC3D Media.[3] The InterACT platform is especially suitable for designing simulation-based training of interpersonal skills, since it focuses on smaller situations, with high realism and detailed interactions with virtual characters. An example screenshot of a training scenario for students of the Police Academy is shown in Figure 1. In the example displayed in Figure 1, the trainee plays the role of a police officer, responding to a potential domestic violence situation. The goal in this situation is to engage in a conversation with the lady to persuade her to let you help her.

A dialogue system based on conversation trees has been used to enable trainees to engage in a conversation with the embodied conversational agent (ECA). The system is based on the assumption that a dialogue consists of a sequence of spoken sentences that follow a turn-taking protocol. In these scenarios, the trainees starts the conversation by saying something (e.g. "Good morning, we have been informed that your neighbour heard someone cry this morning"). After that, the ECA can respond, followed by a response from the trainee, and so on. These dialogues are represented by conversation trees, where vertices are either decision nodes or atomic ECA behaviours, and the edges are transitions between nodes.

The atomic ECA behaviours consist of gestures, combined with pre-generated fragments of speech, synchronised with facial expressions. Scenario developers can generate their own fragments using a motion sensing input device such as the

[2] http://www.interact-training.nl/.
[3] http://ic3dmedia.com/.

Microsoft Kinect camera and a commercial software package called FaceShift.[4] The recorded fragments are independent from a particular avatar and they can be projected on arbitrary characters.

Each decision node is implemented as a multiple choice menu. By using this menu, the trainee has the possibility to choose between multiple sentences. Hence, the emphasis of the current system is on the verbal aspects of aggression de-escalation. In the system used for the current study, two to four options are available for every decision node.



Fig. 1. Example screenshot of a training scenario.

For the current evaluation study, four representative scenarios for the 'Door Scene' have been developed, in collaboration with (and approved by) domain experts of the police academy. In two scenarios the ECA is male, and in two scenarios the ECA is female. The scenarios have been designed in such a way that the ending can be either positive (e.g., the ECA lets the police officer enter the house) or negative (e.g., the ECA closes the door and refuses to open again), depending on the appropriateness of the trainee's choices. However, in the current study, no explicit 'score' was assigned to the player's performance.

The contents of the scenarios (i.e., the conversation fragments) have been recorded with the help of professional actors (one male and one female). On average, a scenario lasts about 5 interactions (i.e., both the user and the virtual character speak about 5 sentences before the scenario ends), which means that it takes about 2-3 minutes to play a scenario.

[4] http://www.faceshift.com/.

4 Pilot Study

To obtain feedback from potential end users on the prototype, a pilot study has been performed with students of the Police Academy. In the following sections, the participants, experimental design, and procedure of the study are described, respectively.

4.1 Participants

In total, 41 people were selected to participate in the experiment. All participants were students of the Police Academy, who were following the module 'Emergency Assistance'. The participants came from three different classes, who participated at different days: the first class consisted of 16 students, the second class of 11 students, and the third class of 14 students. No participants dropped out. Out of the 41 participants, 31 were male and 10 were female. The average age of the participants was 27.1 ($\sigma = 6.5$).

4.2 Procedure

The pilot experiment was executed in a computer room at the Police Academy (see Figure 2).



Fig. 2. Impression of the pilot experiment.

At the start, all participants filled out an informed consent form and provided their personal data. This, as well as all other data gathered in this experiment, was collected anonymously. After that, participants received a document with instructions about how to work with the training software. Participants had to play all four scenarios consecutively. They were instructed to first solve each scenario to the best of their ability by carefully observing the situation and by selecting the appropriate responses in the multiple choice menu. After that, they could play each scenario again, in order to explore what would happen in they selected different responses. After having read the instructions, they could start the training software.

Upon launching the software, the start menu shown in Figure 3 was displayed. In the upper part of the menu, participants had to input their personal ID and gender. Below that, they could select the scenario they wanted to run. As mentioned, there were 4 training scenarios, which were chosen in such a way that they were representative for the types of situations encountered on the job.

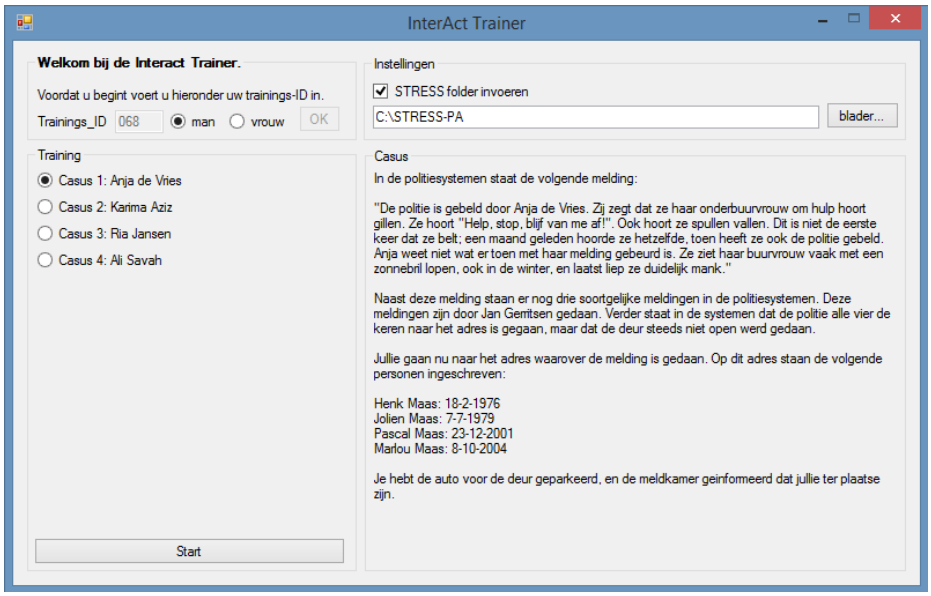


Fig. 3. Start menu of the training software (in Dutch).

4.3 Questionnaire

After the training, the participants were asked to fill out a usability questionnaire. This questionnaire consisted of 20 statements about which the participants had to express their opinion on a 7-point Likert scale. The questionnaire was inspired by Witmer and Singer [17], and included statements about issues such as user experience, presence, and perceived effectiveness. In the end, the statements were grouped into 4 categories, namely *content*, *interaction*, *engagement*, and *effect*, to obtain an average score on

these aspects. The *content* category contained statements about the perceived realism of the scenarios and the characters (e.g., 'the scenarios were representative for real world situations'). The *interaction* category contained statements about how natural it was to interact with the characters (e.g., 'I felt that my answers had an influence in the behaviour of the virtual characters'). The *engagement* category addressed the perceived sense of presence of the participants (e.g., 'during training I felt engaged in the scenarios'). Finally, the *effect* category contained statements asking the participants for their opinion about the effectiveness of the training (e.g., 'I think this type of training is a useful addition to real world training').

5 Results

As explained above, the statements included in the questionnaire were grouped into four categories: interaction, content, engagement and effect. The aggregated answers for these categories are (on a scale from -3 up to 3) are shown in Figure 4.

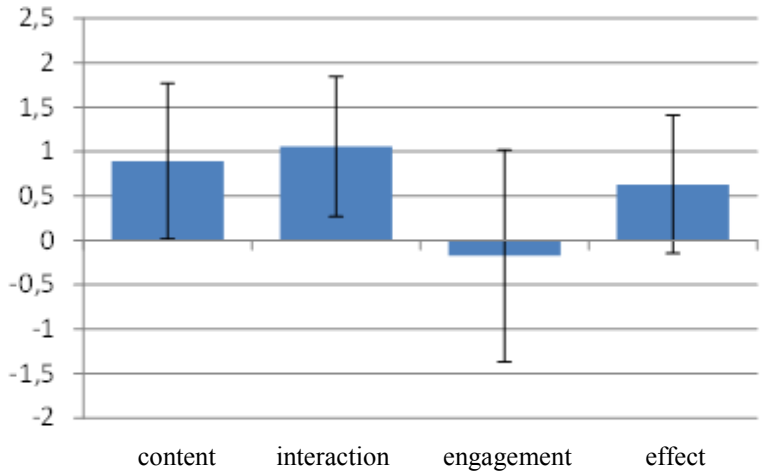


Fig. 4. Results of the pilot experiment.

The first category, *content*, contained questions regarding the scenarios and virtual characters. With an average score of almost 1, the results were mainly positive, however there were critical remarks as can be seen by the rather larger standard deviation. Similar results are found for the second category, *interaction*, and are, with an average score of just above 1, again mainly positive. The worst results are found on the category asking about the *engagement* aspects of the training. This entailed questions about the participants' personal involvement in the scenario, asking for instance about whether they got frightened by the aggression of the virtual characters. With an average score of -0.1 the results do not look promising, however again the standard deviation is very large, indicating a large variation in the answer. The last

category contained questions about the participants' personal belief whether such a training has an *effect*. For example, they had to answer if they thought that this type of training was a useful addition to the current role-play scenarios, and if it would improve their communication skills. Overall, responses to these questions were positive (average 0.6), although there is room for improvement.

In all, these results are encouraging, in the sense that participants from a possible group of end users sees the potential of simulation as an instrument for communication training. Also, it is promising that the content of the scenarios and the way of interacting is considered fairly positive. Nevertheless, there is room for improvement, as witnessed, among other, by the responses given on the topic of 'engagement'. In this respect, it was also interesting to consider the feedback given by individual participants. Some examples of remarks made by the participants were:

- The scenarios were relatively short; I wanted to continue playing after I was allowed to enter the house.
- The emotional impact needs to be increased. I found the behaviour of the virtual characters insufficiently intimidating.
- I did not completely 'buy' the conversation with the virtual character. Compare to training based on role play, I was too much aware that I was only playing a game.
- It might be interesting to include a juridical component in the learning goals of the scenarios.
- It might be interesting to enable interaction with your partner as part of the game.

Based on these suggestions, we are currently working on improving the game.

6 Discussion

The current paper introduced a prototype of a simulation-based training environment that enables Dutch Police Academy students to practice their communication skills during face-to-face conversations. The emphasis of the prototype is on learning how to handle the 'Door Scene' in the context of domestic violence situations.

The prototype was evaluated by means of a pilot study in which 41 students of the Police Academy participated. The results indicate that with respect to user satisfaction, participants were positive about the content of the virtual scenarios and the mechanisms to interact with the characters. Also, they were moderately positive about the potential of the system as an effective learning tool. This was confirmed by some of the teachers, who were also allowed to play the game. Nevertheless, also a number of points for improvement were identified, which mainly have to do with the emotional aspect of the game. In other words, for many participants their sense of presence was limited because they did not 'feel' the emotion in the virtual conversation partner. One interesting way to improve this situation, which we are currently considering, is to combine the scenarios with haptic feedback (e.g., by using a vibrating vest designed for video games). Based on such technology, a situation can be created in which an (aggressive) virtual character can actually 'touch' the user. Another obvious possible extension would be to use a head-mounted display instead a

flat video screen. Our hope is that such extensions will in the future lead to a more engaging, and therefore more effective training tool.

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