LOITER-TB: Thought Bubbles
that Give Feedback on Virtual Agents'
Experiences

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Abstract. We demonstrate LOITER-TB, a prototype of a serious game meant to improve the social awareness of police students. Central to its design is the provision of feedback through thought bubbles of virtual characters with which players interact. Our initial experiments provide weak support for our hypothesis that this form of feedback leads to gains in police students' understanding of social interaction.

Keywords: Serious games · Interpersonal interaction · Virtual agents · Meta-techniques · Flashback · Law enforcement

1 Improving Interpersonal Awareness

Social skills form an important part of everyday interactions, and recent work has investigated a broad variety of serious games to improve people's social skills [5]. In professions such as those of social workers and police officers, having good social awareness is critical to performing their tasks properly. In this demonstration, we show LOITER-TB (LOItering Teenagers, an Emergent Role-play – Thought Bubbles edition), a prototype of a serious game aimed at police students. In the game, players play the role of a patrolling police officer. They interact with a virtual loitering juvenile and his group of friends who need to be convinced by the player to go elsewhere. Depending on the approach the player takes in this interaction, the virtual juvenile will respond differently, for example by cooperating easily or by resisting the player's request. Previous work on serious games for social skills investigated several mechanics to improve learning, but not all of the developed systems provide adequate means for reflection [5]. A central feature of our game is the use of *meta-techniques*, aimed at making players learn more effectively. Meta-techniques are used in live action role play to provide information that is not available to the characters in the game world. In LOITER-TB, we show players the thoughts of virtual characters and let them reflect on this information. This way, we provide feedback about

the social interaction in the game by showing the experience from the juvenile's point of view [3]. Furthermore, our game incorporates research on cognitive models and nonverbal behaviour for virtual agents [1,6] to shape the scenarios and interactions.

2 LOITER-TB

One of our assumptions in creating LOITER-TB was that a completely realistic simulation of a social interaction does not necessarily lead to effective learning [2]. We decided to provide players with a game that focuses on the higher-level thought processes of virtual characters that govern their actions, instead of placing emphasis on nuances in verbal and non-verbal behaviour. The actions of virtual characters in LOITER-TB are largely based on their attitude towards the player, which may change over time due to the player's actions. To determine the attitude of the characters, we use Leary's theory of interpersonal *stances* [1]. According to this model (also called *Leary's Rose*), people assume stances in interpersonal interactions that can be classified as combinations of varying degrees of dominance and affect. For example, when a person acts submissively and shows positive affect toward someone else, this is classified as an accommodating stance. According to [1], certain behaviour 'invites' reactions of people: they tend to show an opposite degree of dominance while showing a similar degree of affection.

The game of LOITER-TB features a scenario in which players have to convince loitering juveniles to cooperate with them. During one play session, players interact three times in different situations with the same group of juveniles at different times in the game world. Players choose their actions in a multiple-choice fashion based on four stances in Leary's Rose. Figure 1 shows the interface of LOITER-TB at the moment which a player can decide how to respond to a juvenile. The juvenile currently has an 'aloof' attitude, expressing disinterest in both a verbal and

Fig. 1. The interface of LOITER-TB when the player can decide on what to do (translated from Dutch).

non-verbal way. The player can choose among four utterances, each representing a different stance, accompanied by corresponding non-verbal postures.

3   Feedback Through Thought Bubbles

In real-life interactions, we cannot always infer the motives behind other people's actions. To let players become aware of how their actions influence others, we use meta-techniques to augment the interactions in LOITER-TB. We show the virtual juvenile's point of view by means of thought bubbles, similar to those found in comics (see [3] for more examples of possible uses of meta-techniques). Currently, we have implemented two varieties of thought bubbles, one showing brief, immediate feedback on the player's actions, and the other providing a flashback to an earlier interaction. The first variety is shown at several points during the scenario while the player is interacting with the virtual juveniles. When the player has performed an action, a thought bubble shows how the juvenile sees the player's current stance in a depiction of Leary's Rose, see Fig. 2a. When the player indicates that he or she has seen this thought bubble, it disappears and the juvenile's actual verbal and non-verbal reaction is shown. This way, players have the opportunity to see how their actions come across to the virtual character, allowing them to reflect on the effects of their behaviour during the game.

To provide feedback on the entire interaction, a flashback from the perspective of the juvenile is shown at the start of the second and third interactions, before players choose their first action. This flashback is also shown in a thought bubble and shows information about the juvenile's impression of the player, see Fig. 2b. This impression is based on an average of the player's behaviour in terms of stances, for example, on average, the player may have acted in an 'attacking' manner. Based on this average, the juvenile adapts a 'preferred' stance for the following interaction, namely the stance which is invited by the player's average stance. The juvenile will use both this preferred stance and the stance that is invited by a player's action to determine his next action. The thought bubble with the flashback shows three items: a sentence which indicates what the
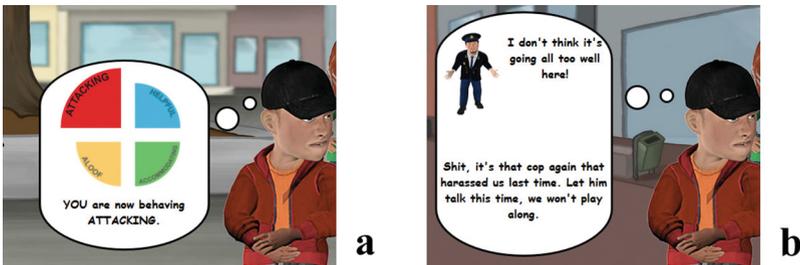

Fig. 2. (a) A thought bubble that indicates how the juvenile interpreted the player's action. (b) A thought bubble that shows a flashback of the juvenile to the previous situation, indicating how the juvenile remembers the player's behaviour.

player's average stance was; a flashback to an action of the player which illustrates to that stance; and a sentence which conveys the juvenile's preferred stance during the coming situation. With help of this feedback, players may become more aware of how their behaviour influenced the juvenile's stance and also of the way the juveniles will probably respond to them from then on. Thus, this feedback is both retrospective and prospective: it informs the player about what has happened and what he or she might expect during the following interaction.

4   First Results and Future Work

We evaluated the feedback in two iterations of LOITER-TB with several classes of police trainees of the Dutch Police Academy [4]. An experiment with the current prototype did not provide evidence for any learning gains in police trainees. Although they commented that the game was realistic enough in terms of setting, participants found it relatively obvious how to complete the game with a peaceful ending. Police instructors were positive about the game, noting that it could be useful in this form, but mainly for less experienced police trainees.

For upcoming iterations of the LOITER-TB prototype, we envision implementing ways to adapt the feedback to players of the game, based on their prowess in social interaction and their preferred form of feedback. Additionally, we would like to investigate the use of scenarios in which the virtual characters adapt their behaviour to players' progress and skill in the game. We plan to conduct experiments with police trainees who are at the beginning of their studies, in order to investigate whether learning gains would be higher with this user group.

References

1. Leary, T.: Interpersonal Diagnosis of Personality: functional Theory and Methodology for Personality Evaluation. Ronald Press, New York (1957)
2. Linssen, J.M., de Groot, T.F., Theune, M., Bruijnes, M.: Beyond simulations: serious games for training interpersonal skills in law enforcement. In: Proceedings of ESSA 2014, pp. 604–607 (2014)
3. Linssen, J.M., Theune, M.: Meta-techniques for a social awareness learning game. In: Proceedings of ECGBL 2014, pp. 697–704 (2014)
4. Linssen, J.M., Theune, M., de Groot, T.F., Heylen, D.K.J.: Improving social awareness through thought bubbles and flashbacks of virtual characters. In: Brinkman, W.-P., et al. (Eds.): IVA 2015, LNAI, vol. 9238, pp. X–Y (2015)
5. Pereira, G., Brisson, A., Prada, R., Paiva, A., Bellotti, F., Kravcik, M., Klamma, R.: Serious games for personal and social learning and ethics: Status and trends. Procedia Comput. Sci. **15**, 53–65 (2012)
6. Ravenet, B., Ochs, M., Pelachaud, C.: From a user-created corpus of virtual agent's non-verbal behavior to a computational model of interpersonal attitudes. In: Aylett, R., Krenn, B., Pelachaud, C., Shimodaira, H. (eds.) IVA 2013. LNCS, vol. 8108, pp. 263–274. Springer, Heidelberg (2013)