Supporting Group Reflection in a Virtual Role-Playing Environment

Julia Othlinghaus(✉) and H. Ulrich Hoppe

Faculty of Engineering, Department of Computer Science and Applied Cognitive Science, University of Duisburg-Essen, Lotharstr. 63/65,
47048 Duisburg, Germany
{othlinghaus,hoppe}@collide.info

Abstract. This paper presents an approach to supporting group reflection in a virtual role-playing environment with intelligent support designed for the training customer complaint management in electronic shops. The single-player design involves a player and an AIML chat bot in a 2D web-based virtual environment. Building on this, a group reflection tool was designed, which is supposed be used in a training center environment. It features a dashboard design which includes different visualizations of player performance based on automated individual analyses of players' communicative behavior, as well as enriched replays of their conversations, and the ability to make annotations. The separation of the application into the actual role-playing game and the group reflection tool is assumed to support the learning process of responding to customer complaints by changing perspective, receiving feedback, and recognizing different ways of problem solving.

Keywords: Group reflection · Role-play · Intelligent support · Serious games · Multi-agent architecture · Chat bots

1 Introduction

Role-play allows participants to "play a role" in a situation: to act as themselves or otherwise in an environment without fearing irreversible consequence [1]. This makes it essential for a wide-range of education and training scenarios [2]. Authentic simulated environments provide learners with meaningful and near-real experiences: they "learn by doing" [3]. Customer complaint handling skills are often trained by role-playing with simulated customers. Correctly handling customer complaints has become an increasingly important social skill [4, 5]. However, traditional role-play in this context can be time-consuming, hard to administer, and lacking repeatability, while virtual role-plays can provide portable, safe and continuable environments.

This paper presents an attempt to train customer complaint handling skills by building on role-playing in a virtual simulation environment and providing a tool for after-action review. This takes the form of guided group reflection based on automated analysis of player performances.

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2 Background and Related Work

Serious Role-Playing Games. Serious games increase in being acknowledged as efficient and powerful tools for promoting learning and encouraging behavioral change [6], and thus have a great potential for professional training [7]. This article is in line with the work of Malzahn et al. [8], Emmerich et al. [9] and Ziebarth et al. [10]. It focuses on serious role-playing games in 2D and 3D environments for training specific social skills and follows a scenario-based approach. In scenario-based learning environments, conditions, characters, circumstances and parameters are drawn to simulate a real-life context for learning [11]. Table 1 provides a summary of the existing approaches, the training scenarios and their key aspects. The distinctive feature of the approach presented here is the explicit support for group reflection.

Table 1. Overview of existing approaches.

Year	Application domain	Constellation	Support/emphasis
2010	Job interviews	Single-user + chat bot	Scaffolding, Evaluation
2012	Conflict management	Multi-user + chat bot	Collaboration
2014	Patient-centered medical interviews	Single-user + chat bot	Gamification
2016	Customer complaint management	Single-user + chat bot	Explicit group reflection support

Customer Complaint Management. The successful handling of customer problems enhances customer satisfaction, trust and commitment [4], which are essential elements in establishing strong long-term customer-firm relationships [5, 12] and building sustainable market share [13]. While increasing investments in handling complaints can be recognized, firms are lacking effective strategies and programs [4]. Principal evaluative criteria of customer complaints are: (1) the resolution procedures, (2) the interpersonal communications and behavior, and (3) the outcome [4]. General guidelines for handling complaints are, amongst others, provided by the British *Institute of Customer Service* [14]. They include concrete recommendations on how to behave towards a complaining customer, such as thanking the customer for complaining, putting oneself in the place of the customer, always assuming that the customer has a valid point, getting all the facts, correcting the mistake, and responding at any time. Those guidelines have served as a compendium for the performance evaluation and rating.

Group Reflection. Reflection is an important activity in which people recapture, rethink and evaluate their experience in order to lead to new understandings and appreciations, which is very important for learning [15]. Learning processes cannot exclusively be reflected by oneself, but preferably in groups, which enables collective exchange and thus collaborative learning [16]. The term 'group reflection' describes a sort of meta-communication within a group about the learning process [17]. Furthermore, Kim et al. found out that effective instructor intervention is a crucial component leading to the better performance of a group in terms of learning [18].

3 *CuCoMaG*: The Game

The effects of a role-play, in particular the pedagogical outcome, usually depends on the post-role-play reflection, since without feedback the transfer to real-world situations cannot be secured [2]. After-action review is a method that helps learners to identify and share effective practices and strategies derived from the experience [19]. This requires a change of perspective. In our approach, this is facilitated by the differentiation of phases of immersion (role-play) and reflection (group session), which is considered to be conducive to learning as meta-cognitive activities are advanced [8].

Game Design. In the role-playing part, the player has the role of an employee who is responsible for customer service in a shoe-selling online shop. He finds himself in a conversation with a chat bot acting as a customer, who reports a certain problem. The player communicates with the customer through a simple chat environment (Fig. 1). Each chat message consists of a sentence opener which the player needs to select from a predefined set, and free text, which (a) gives the player the possibility to express himself more naturally and (b) allows a more detailed analysis of the communicative behavior. Based on the sentence openers, the chat bot can interpret the player's intentions and is able to detect and adequately react to e.g. aggressive or rude behavior by the player.

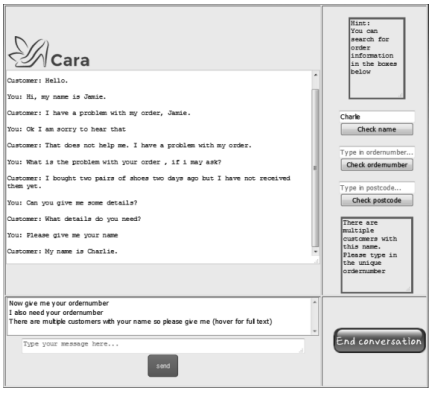

Fig. 1. Chat interface

Each scenario is kept simple and comprehensible to support understanding of the role and task, and to allow the player to focus on the problem-solving process. The main goal is to come to a resolution at the end of the conversation by showing appropriate behavior and choosing beneficial strategies of managing the complaint. A scoring system was implemented to evaluate the individual communicative behavior of each player and to make the performances of different players comparable. Relevant factors that influence the player's score in either a positive or a negative way are politeness, aggressiveness, rudeness, use of forbidden terms and phrases, message time,

message length, moments of silence, answer quality (unhelpful/neutral/helpful), the total amount of answers and the quality of the final solution.

Implementation. The conversational behavior of the chat bot has been implemented using the *Artificial Intelligence Markup Language* (AIML), an XML-based solution for passive chat bots, which follows a simple pattern-matching mechanism [20]. The passive nature and the limited capabilities of AIML have required creative work-arounds in order to enable the bot to become active (by using external triggers) and to show appropriate reactions to the player's input (by preprocessing and using sentence openers) without having an extremely complex script.

In order to ensure platform independence and easy access, the logic and interface of the game client has been realized as a web-based application using common web technologies, such as HTML, CSS and JavaScript. The analysis of the player's performance has been designed as a multi-agent system which includes 11 agents (individual programs implemented in C#) in addition to the client. The multi-agent architecture has resulted in a loosely coupled system that can be easily extended and adapted. It is based on *SQLSpaces*, an implementation of the tuple space concept, which supports various programming languages and is built on a relational database [21]. Each of the agents is responsible for one certain aspect of either input analysis or game control. They mainly check the text input against predefined lists of words, expressions or phrases, or measure certain quantitative aspects, such as the time needed to send the message. The results of the agents' evaluation influence the player's score as well as the answering behavior of the chat bot.

4 Group Reflection Support

The reflection tool has been designed to be used in training centers and requires a trainer or expert to support the group reflection process. This involves a group of participants who have played the game before the start of the session. Since the tool has been realized as a detached application, the reflection phase does not necessarily take place right after the gaming sessions, so the trainer has time to inspect the material and to prepare the group discussion. The tool provides comprehensive preparation and visualization of the analyses' results to the trainer to support the group reflection process.

The design of the reflection tool has been kept simple and plain (Fig. 2). The application allows the trainer to load the game data of different participants; it provides a transcript of their chat conversations annotated with the analyses' results; it offers different chart-based visualizations of each user's score and certain aspects of the communicative behavior; it also facilitates the option to make notes with the help of a notepad. The transcripts give the trainer the possibility to replay the whole chat conversation of each participant or just certain passages from them. The transcripts are enriched with annotation tags showing the analysis agents' findings. In regards to the different chart-based visualizations, the trainer can select one or more players and one or more evaluative factors, such as politeness, aggression, rudeness, moments of silence, answer quality (unhelpful, neutral and helpful) and no-go answers, to display

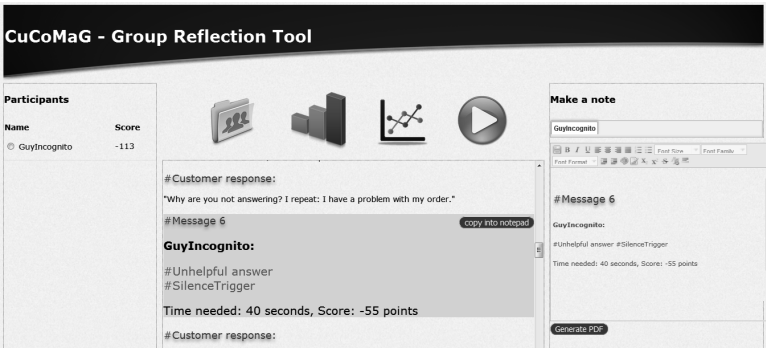

Fig. 2. Group reflection tool

them in the form of a bar chart or line chart. The bar chart shows how many times the selected factors occurred in the selected participants' performances, while the line chart presents the development of the participants' scores over time, with the option to highlight occurrences of the selected factors. The line chart is directly connected to the chat transcripts. This means that the trainer can switch from the chart to a certain point of the conversation by clicking on the graph. The notepad features the option to make notes for each participant. It is also possible to copy parts of the transcripts into the notepad and annotate them. The content of the notepad can be exported at the end of the reflection session to create a report for each participant.

The reflection tool has been designed as a web-based application and implemented using HTML, CSS, JavaScript, as well as JQuery[1] and Highcharts[2] libraries.

5 Conclusion and Future Work

We have presented a virtual role-playing environment for the training of customer complaint handling with group reflection support. The unique feature of this approach is the combination of an immersive role-playing scenario supported by an AI-controlled chat bot, with a separate group reflection phase reinforced by an evaluation tool based on automated performance analysis. Using a chat-based virtual role-play for training customer complaint handling in electronic shops is especially useful, since it provides a realistic training environment which simulates everyday work situations. The group reflection session is supposed to be guided by a trainer, who can use the tool to arrange the interactive after-action review process. With the help of the tool, the trainer can show important sequences from the participants' chat conversations, review specific actions and reasons for the outcome of the game, highlight certain aspects of the communicative behavior, give feedback, and initiate group

[1] http://www.jquery.com/.

[2] http://www.highcharts.com/.

discussions in order to enable reflection by the participants on their actions and to help them improve their performance in the future.

Due to the flexible multi-agent system architecture, the application can easily be adapted to other contexts and scenarios. Future tasks include usability and field studies, as well as the generation of additional scenarios featuring different customer and problem types to increase repeatability and diversity.

References

1. Ladousse, G.P.: Role Play. Oxford University Press, Oxford (1987)
2. Lim, M.Y., Aylett, R., Enz, S., Kriegel, M., Vannini, N., Hall, L., Jones, S.: Towards intelligent computer assisted educational role-play. In: Chang, M., Kuo, R., Kinshuk, Chen, G.-D., Hirose, M. (eds.) Edutainment 2009, LNCS, vol. 5670, pp. 208–219. Springer, Heidelberg (2009)
3. Slator, B.M., Chaput, H.C.: Learning by learning roles: a virtual role-playing environment for tutoring. In: Frasson, C., Gauthier, G., Lesgold, A. (eds.) ITS 1996. LNCS, vol. 1086, pp. 668–676. Springer, Heidelberg (1996). doi:10.1007/3-540-61327-7_167
4. Tax, S.S., Brown, S.W., Chandrashekaran, M.: Customer evaluations of service complaint experiences: implications for relationship marketing. J. Mark. **60**, 60–76 (1998)
5. Sirdeshmukh, D., Singh, J., Sabol, B.: Consumer Trust, Value, and Loyalty in Relational Exchanges. J. Mark. **66**(1), 15–37 (2002)
6. Cheong, Y.-G., Khaled, R., Grappiolo, C., Campos, J., Martinho, C., Ingram, G., Paiva, A., Yannakakis, G.N.: A computational approach towards conflict resolution for serious games. In: Proceedings of the Sixth International Conference on the Foundations of Digital Games. ACM, New York (2011)
7. Marr, A.C.: Serious Games für die Informations- und Wissensvermittlung: Bibliotheken auf neuen Wegen. Dinges & Frick, Wiesbaden (2010)
8. Malzahn, N., Buhmes H., Ziebarth S., Hoppe H.U.: Supporting reflection in an immersive 3D learning environment based on role-play. In: EC-TEL 2010, pp. 542–547. ACM, New York (2010)
9. Emmerich, K., Neuwald, K., Othlinghaus, J., Ziebarth, S., Hoppe, H.U.: Training conflict management in a collaborative virtual environment. In: Herskovic, V., Hoppe, H.U., Jansen, M., Ziegler, J. (eds.) CRIWG 2012. LNCS, vol. 7493, pp. 17–32. Springer, Heidelberg (2012). doi:10.1007/978-3-642-33284-5_2
10. Ziebarth, S., Kizina, A., Hoppe, H.U., Dini, L.: A serious game for training patient-centered medical interviews. In: IEEE 14th International Conference on Advanced Learning Technologies (ICALT), pp. 213–217. IEEE, New York (2014)
11. Herrington, J., Oliver, R., Reeves, T.C.: Patterns of engagement in authentic online learning environments. In: Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2001. AACE, Chesapeake (2002)
12. Orshinger, C., Valentini, S., de Angelis, M.: A meta-analysis of satisfaction with complaint handling in services. J. Acad. Mark. Sci. **38**(2), 169–186 (2010)
13. Urban, G.L., Sultan, F., Qualls, W.J.: Placing trust at the center of your internet strategy. Sloan Manag. Rev. **42**, 39–49 (2000)
14. The Institute of Customer Service. https://www.instituteofcustomerservice.com/research-insight/guidance-notes/article/handling-complaints

15. Boud, D., Keogh, R., Walker, D.: Promoting reflection in learning: a model. In: Boud, D., Keogh, R., Walker, D. (eds.) Reflection: Turning Experience into Learning, pp. 18–40. Kogan Page, London (1985)
16. Schuster, R.J.: Gruppenreflexion als Kommunikationsinstrument. In: Management und Wirtschaft. Schriftenreihe zur wirtschaftswissenschaftlichen Forschung, vol. 13, pp. 7–23. Fachhochschule des bfi Wien, Wien (2010)
17. Hilzensauer, W.: Theoretische Zugänge und Methoden zur Reflexion des Lernens. Ein Diskussionsbeitrag. In: Häcker, T.H., Hilzensauer, W., Reinmann, G. (eds.) Bildungsforschung, vol. 5(2) (2008)
18. Kim, P., Hong, J.-S., Bonk, C., Lim, G.: Effects on group reflection variations in project-based learning integrated in a Web 2.0 learning space. In: Interactive Learning Environments, vol. 19(4), pp. 333–349. Routledge, London (2011)
19. Morrison, J.E., Meliza, L.L.: Foundations of the after action review process. In: ARI Special Report, vol. 42. U.S. Army Research Institute for the Behavioral and Social Sciences, Arlington (1999)
20. Wallace, R.: The Elements of AIML Style. ALICE AI Foundation (2004)
21. Weinbrenner, S.: SQLSpaces – A Platform for Flexible, Language-Heterogeneous Multi-Agents Systems. University of Duisburg-Essen (2012)