
CuCoMaG

Supporting Group Reflection in Serious Role-Playing Games

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Abstract: In this paper we present the application CuCoMaG (*Customer Complaint Management Group reflection*), a web-based role-playing serious game for training customer complaint management connected with a group reflection support tool. The application consists of two different parts. The first part is a serious role-play in which the user puts himself into the role of an employee in a web shop. The user will be confronted with an AI-controlled chat bot representing a complaining customer. Through a chat conversation, the employee tries to solve the customer's problem. In the second phase, an expert or trainer initiates and moderates a group discussion process with the help of a support tool, which prepares and visualizes the results of an automated analysis of the players' performances. The separation of the actual role-playing game and the reflection session is supposed to cause a change of perspective and thus enhance the learning process.

Keywords: Customer Complaint Management, Virtual Role-Play, CuCoMaG, Serious Game, Group Reflection

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1 Introduction

Customer psychology has always been an important part in marketing. The emotions of customers play an important role in the success of service. Negative emotions generally result in triggering complaining behavior among the customers [LS97]. Handling customer complaints in the right way, especially in companies, markets and multinational corporations, has become an increasingly important social skill and is also a subject of professional training [TBC98]. So advanced customer complaint resolution skills are required.

This paper presents a web-based serious game to train customer complaint management skills. The simulated scenarios provide a possibility for the learners to try different solving strategies in a virtual environment. Thus the players' actions have no certain consequences in the real world, but are supposed to prepare them to react adequately for similar situations. This way, the player has the chance to experience conflict situations with customers and learn about how to deal with their complaints.

To increase the learning effect of this virtual role-play, it is followed by a group reflection phase. Reflection and especially group reflection is a successful activity to improve learning processes [JMM93]. The here presented reflection tool is based on a dashboard design, which offers different functions in a well-arranged way. The tool visualizes analyzed data generated from the different players' behaviors. In the game, the players achieve different scores that will be considered in the group reflection phase. An expert or trainer is supposed to initiate a group discussion and reflection process. To consolidate the learn effect, the players get an individual report at the end.

2 Background and Related Work

In the following, an overview of the basic concepts of CuCoMaG (Customer Complaint Management Group reflection) and the subject area where it takes place is provided.

2.1 Serious Games

A serious game is a game that aims to convey certain messages, teach the users specific lessons or provide an experience with an artistic medium [DS06]. It is an efficient tool for training and education [Ma10]. Because of this, a serious game is different from the classical entertaining game because the user focuses on the skills and the experience that can be obtained from it.

Our game is designed to train the players how to behave in the process of dealing with customer complaints. To improve the effect of a serious game an important concept is considered: immersion. Immersion is the perception that someone is in an environment, although actually he is not [Gr03]. Using immersion provides more chances for players

to feel like really acting in a certain situation so that the role distance between the players' real identity and the game is decreased [Zi14].

2.2 Customer Complaint Management

Customer complaints serve as a good way to communicate directly with customers [BM08]. Complaints should be understood as a customer's sign "that there is room for improvement" [BM08]. When companies do not deal with customer complaints, they risk a lack of trust and loyalty, lower sales and that customers do not recommend the company to their environment or, even worse, mention bad and unsatisfying experiences [Co12]. Nowadays customers are much more enlightened about what they can expect from companies and their products. They have a very wide field of alternatives if a certain company does not satisfy what the consumer wants or serves it not sufficiently [BM08]. So it is clear that companies try to satisfy customers in the first place, but in case of failure to clear made faults to make sure the customer buys again or at least do not stick to a negative experience. To teach employees dealing with customer complaints one possibility is to train their soft skills. *Soft skills* are the competence that a person communicates with others in a manner to fulfill his or her intentions, goals or satisfaction without harming other people's feelings or rights [HSD81]. "Business executives consider soft skills a very important attribute in job applicants. Employers want (...) employees to have strong soft skills, as well as hard skills." [Ro12]. Examples for soft skills are: communication skills, creativity, etiquette and good manners, empathy or conflict management. Since especially communication skills, conflict management and empathy are needed when it comes to customer complaints, those skills are addressed in particular in CuCoMaG. In our design of the dialogue, we adopt several principles such as Ritz-Carlton's Gold Standard¹³ to decide which kind of the answers given by the player are better. Those contain e. g. a warm and sincere greeting, anticipation and compliance with guest needs, fond farewell and to give a warm goodbye [FGJ04]. Furthermore it is important to take the customers' problem(s) seriously, give them the feeling that the company wants to help the consumers, improve their feeling about the company and solve the problem(s) [PJ12].

To train soft skills through a serious game has a lot of benefits, because such simulated games can facilitate context-based on-the-job learning in a safe environment with the elements such as systems, processes, cases and scenarios [UWT10]. The players can get an opportunity to apply their knowledge to deal with the occurring complaint in the serious game. Additionally the players get the chance to check how well they behave in the participation, dynamic interaction and goal direction [UWT10]. If employees are supposed to solve customer complaints online, there are some specific rules to follow [EM16]. Employees should try to answer as fast as possible and without any excuses, but assume responsibility. Also a very long answer is not always the best way. Sometimes it is better to write short and clear how the company is going to satisfy the customer. In the

¹³ See www.ritzcarlton.com/en/about/gold-standard

end of a conversation it always makes a good impression to thank the customer for helping the company improving their products or services and appreciate the customer's input.

2.3 Virtual Role-playing

A role-playing game takes place in a virtual environment which allows players to experience a changed position and role [Bu10]. Role-play is about assuming and keeping a role [Ba03]. It offers players a chance to act as another character rather than themselves. Through it, the players can get a deep understanding about how their characteristics effect on their own attitudes, beliefs and the ways of thinking [Ba03]. While a person is playing a certain role it is possible to make mistakes and learn from them without any negative consequences [Ya97]. The great benefit if a virtual role-play is that it can be played time and place independent. Additionally the participants do not have to meet at the same physical place, but can meet in a virtual room [Wa09]. Thus in CuCoMaG it is furthermore not necessary that the player meets with another one at all, because he interacts with a chat bot. That also is an advantage of role-play in a virtual environment.

3 Game Design and Implementation

During the game the player takes the role of an employee of a company named *Cara* selling shoes via an online shop (figure 1). The players' task is to deal with customer complaints. To do so the player communicates with the complaining customer in an online *chat environment*, which is realized by a *chat bot*. An advantage of using a bot instead of a face to face role play is that the bot provides a higher degree of standardization for the conversation. A *message* is considered here consisting of a bot message and the player's answer.

In the beginning of the game, the player is asked to type in a player name which is used later in the group reflection phase to identify the player, but has no certain role in the game. A predefined unisex name – Jamie Smith – is given to the player that helps him immersing more easily into the scenario. A little introduction text at the start of the game is supposed to make the player familiar with his role and the company he works in. Also some company manners are mentioned, like introducing himself to the customer in the beginning of the chat conversation. Furthermore, it is explained that there are so called *sentence openers* in the chat. Sometimes those sentence openers are already completed and usable sentences. Otherwise the player has to type in own words to complete the sentence. The *free text* allows the player to express himself more naturally and individually. The player can search for additional information about the customer or the order in the company's database. The game can end in three ways: The player reaches a predefined end state of the conversation, the player leaves the conversation, the player does not answer for a certain amount of time and does not react to the repeated requests of the customer to answer, so the conversation is terminated by the chat bot leaving the chat.

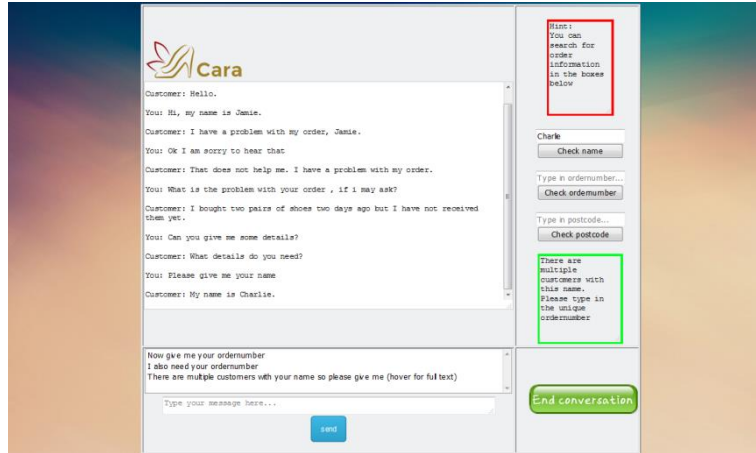


Fig. 1: CuCoMaG game phase

A *score system* has been designed to evaluate the user's performance in form of measures for the group reflection phase. This is done by *agents* (see 3.2). So, if an employee is *aggressive*, *rude* or *uses forbidden (no-go-) words or phrases* the aggressive, rude or no-go agent is activated and it has a negative effect on the score. Contrariwise if someone is very *polite* it is recognized positively. Different *answer qualities* (unhelpful, neutral, helpful) have been defined to differentiate if a chosen answer leads further through the conversation which is good or not, which is negative. The *amount of answers* is also an important factor. The fewer messages have been needed to reach a good end, the better it is. In the end message time and length is used to calculate a writing speed which also influences the score. *Message time* is the time the player needs from receiving a chat bot answer to choose a sentence opener. The *writing speed* is the message time in seconds divided by the message length including the sentence opener. All these attributes are influencing the score, which is then serialized to be used later in the group reflection tool.

The game client was *implemented* as a web application, which allows an easy access to the game. For the structure, layout and design HTML and CSS were used. The functionality, the dynamic manipulation of the user interface and the communication with the backend was realized with JavaScript. The different languages are platform independent to design a flexible and adaptive application. The AI-controlled chat bot was realized with AIML.

3.1 AIML

The interaction with the customer in the chat environment is realized with AIML (Artifi-

cial Intelligence Markup Language), an XML-based chat bot language¹⁴. AIML files contain the answers given by the bot to different specified inputs. The file consists of a list of *categories* where each category contains at least a *pattern* and a *template*. The pattern represents a certain input and the template contains the answer that the bot gives to the player's input. Thus, AIML defines a passive chat bot style that allows the bot to always react to a player's input.

Since there is an infinite number of ways to phrase a statement, sentence openers have been used, which allow the bot to understand the gist of the player's message, while the possibility of free text input enables a more natural conversation. In order to cover all possible states of the conversation and every player input, a dialog model was constructed. Based on this model, the AIML files and the corresponding sentence openers have been constructed.

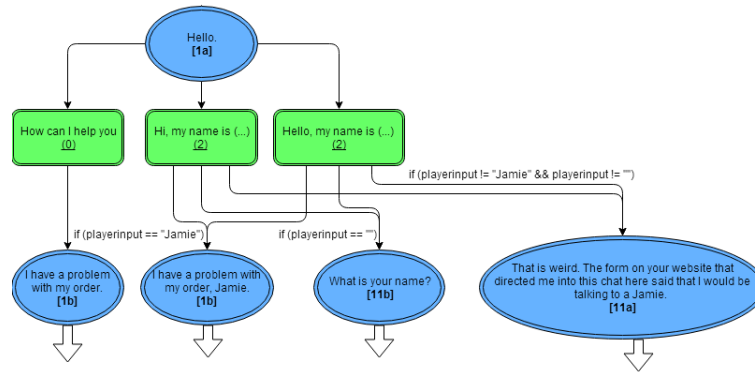


Fig. 2: Dialog model (detailed)

This excerpt of the dialog model (figure 2) shows the beginning of the game. The blue circles represent the AIML bot output. That means, they specify the reactions from the customer in the chat environment. The numbers and letters in the brackets stand for the state, which is used to determine which sentence openers (green boxes) the player can choose from at this point of the game (e.g. [1a]). Sometimes the player has to complete the sentence openers with free text, which is indicated by “(...)”. The numbers in the green boxes stand for the answer quality: 0 (unhelpful), 1 (neutral answer) or 2 (helpful). Both, sentence openers and free text input are analyzed to determine the new game state and the chat bot's answer.

In order to enable the passive chat bot to react to longer phases of inactivity of the player, triggers are used, which set off a reaction from the bot. He will then remind the player to answer and repeat his last statement. A similar approach is used for initializing an appropriate reaction to rude or aggressive behavior of the player. If the player acts rudely or aggressively the player input is replaced by a keyword which the AIML bot reacts to.

¹⁴ See <http://www.alicebot.org/aiml.html>

With this technique it is not necessary to define a pattern for every rude or aggressive expression, but instead there is only one pattern that covers all aggressive or rude behavior. AIML features multiple different reactions to the same input. The bot will choose randomly from a list of reactions to rude and aggressive input, which let the bot appear more realistic and less predictable.

For the implementation of the chat bot the C# library AIML bot¹⁵ was used.

3.2 Multi-Agent Architecture

The applications' backend includes the game client itself and eleven agents. Every agent is an individual program running in parallel to the others. They are responsible for analyzing the player input to provide the measures' values that are important for the score system and also for the game flow. The communication between the agents and the client is organized using *SQLSpaces* as a blackboard system to exchange data. The idea of those spaces is that agents are able to write *tuples* (ordered lists of primitive data) into the space and communicate like that [We12]. With the blackboard system, which besides the blackboard itself consists of a knowledge source component and a control component, it is possible to separate problem solving knowledge into independent parts [Zi14]. Every agent including the client can read/write tuples from/to the tuple space. They are waiting for a tuple to appear, which has the structure they can deal with. Afterwards they can use the information provided by the read tuple to enrich data (e. g. information about triggered agents) and write a new tuple to which other agents might react to.

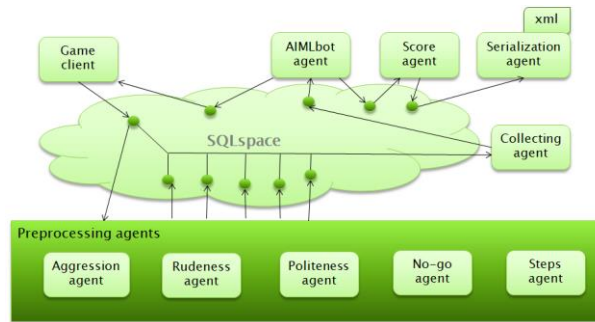


Fig. 3: Agents communication and message transport in SQLSpaces

Because every agent can only process a special form of tuple, a certain direction is set. We consider a game loop as shown in figure 3.

After the user has sent a message and the game client wrote the affiliated tuple into the tuple space, the preprocessing agents read and process it. The preprocessing agents are analyzing the behavior of a user by mining the content of the messages. The group of

¹⁵ See <http://aimlbot.sourceforge.net/>

preprocessing agents includes the *aggression agent* which is searching for aggressive keywords, caps lock and consecutive exclamation marks, the *politeness agent* which is searching for polite keywords, the *rudeness agent* which is searching for rude keywords or symbols, the *no-go agent* which is searching for phrases that should not be used even if they are neither aggressive or rude and the *step agent* which is counting the overall number of messages.

The results of the preprocessing agents are taken by the *collecting agent* to merge it to one tuple. It contains all the enriched data, which can now be used by the *AIML bot agent*. It uses this information to decide on a fitting bot answer dependent on the AIML file. It adds the answer to the tuple and writes it into the tuple space. This tuple is then read by the game client that can now display the bot answer. After that the whole process repeats until an end state is reached. But not only the client reads the tuple of the AIML bot agent. Also the *score agent* takes the data to calculate the score. The tuple generated by this score agent is then again taken by the *serialization agent* to save the data, which is later used by the group reflection tool, into an xml-file. However, not every agent is part of this loop. For example the *register agent* which is responsible for taking the user name and providing a new session for the user. If the user does not answer for a certain amount of time, the *silence agent* is triggered. In this case also the AIML bot agent gets active and writes a silence message, which is a triggered bot answer, that appears when the player do not react in a certain amount of minutes.

4 Group Reflection Tool – Design and Implementation

Reflection can be defined as a learning method that allows people to learn from their own behavior [Mo04]. While reflecting the person gets sensitive and aware about its actions. Through the process of reflection, people's way of thinking and acting is observed and critically questioned. It is about changing the perspective to get a new and different look on the own actions, reactions and attitudes [Me91]. Additionally, learning from mistakes is one of the most effective ways of learning [FM06]. To make this effect even wider it is helpful to do reflection in groups. This approach allows different perspectives and solutions for the same problem or situation. Not only considering one's own behavior in a certain situation but additionally the ones from others, offers more perspectives and gives a quite wide range on how to deal with problems.

Since self- and group reflection methods are often used to improve learning processes, and learning becomes more and more involved with technological development, it was a question of time that reflection in a technological environment will be regarded more closely. Therefore, this project supports the learning effect of the serious game with a group reflection support tool.

The tool was developed to use it in a collaborative training center environment. Therefore it is not necessary to do the reflection right after the games was played. An *expert or trainer* is supposed to lead the discussion and the tool gives him the possibility to present

the performances and results of different players. Due to the fact that the actual gaming session is separated from the reflection phase, the trainer is able to take some time before meeting with the participants to go through the different chat conversations, make notes about them and about things he or she wants to talk about and compare certain measures or sequences.

For the group reflection tool a dashboard design was chosen, where every feature is offered as intuitive as possible with emphasis on usability and utility. The tool offers the trainer a reasonable number of opportunities to deal with the player's performances and reflect them adequately.



Fig. 4: Group Reflection Tool – Conversation View

In figure 4 the group reflection tool is shown. On the left side the players who participate in the reflection phase are listed with their achieved scores. All icons in the center were chosen regarding their ability of self-description. The *folder icon* allows the user to load player files. The two *chart symbols* offer different visualizations of the players' performances in form of a bar chart or a line chart. If the user clicks the round button on the right the whole *chat conversation* of one selected player is displayed *enriched with annotations from the analysis agents* and a result overview containing information like how the conversation ended or the conversation time. Below the buttons in the center, different *measures* are selectable over checkboxes. The *notepad* on the right side offers the possibility to make notes for each player. There is a tab for each of the users. If the trainer hovers over a message from the chat conversation it will be *highlighted* with a colored background and a bigger font-size for presentation purposes and a button appears indicating that the message can be copied into the notepad by clicking, including its formatting. The functionality to create a *report* for each player by generating a PDF-file is useful for further consideration and progress.

The *bar chart* (figure 5) shows how many times the selected measures have been used by each player. I. e. if politeness is checked, the y-axis of the bar chart displays how often the player acted or reacted polite. The chart will be drawn for the loaded players and the selected measures. Any measure combinations are possible and the chart will

dynamically adapt to selections and deselections. The player selection can be changed in the chart. If no measures are selected, an empty chart will be displayed.

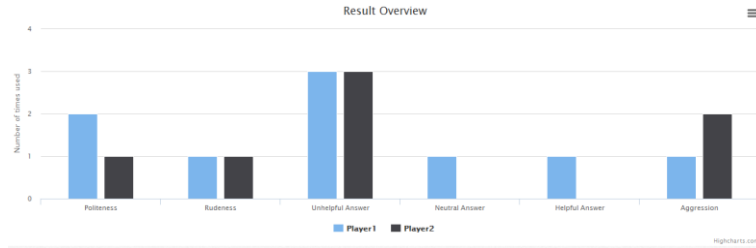


Fig. 5: bar chart with multiple players and measures

The *line chart* (figure 6) works in a similar way. It displays the player's performance during the whole chat conversation regarding the score he achieved in every message (y-axis) and the index of the messages (x-axis). Upon selecting one or more measures like rudeness, dots in different shapes will appear on the line chart, representing the messages where those specific measures were true. By hovering the mouse over a message, a small box (tooltip) will appear, which shows more detailed information, including the score and the measures which were true in that specific message. The contents of the tooltips, including the texts and the corresponding colors, are generated dynamically based on the measures selected by the user.

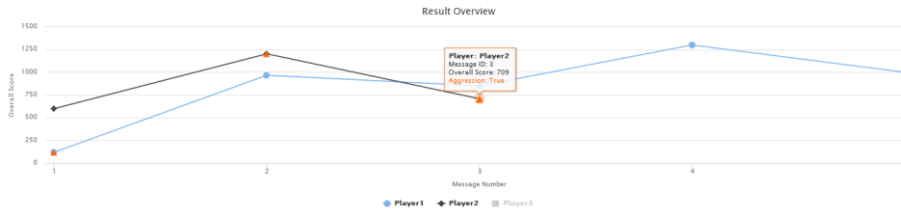


Fig. 6: line chart with multiple players and measure

A great feature is that trainers *can directly switch from the line chart into a certain point of interest in the chat history* by clicking on a point in the chart. The display changes to the conversation view and highlights the clicked message (figure 4).

To facilitate a flexible usage regarding operating systems and underlying hardware the group reflection tool has been *implemented* using common web technologies, so it can be run in a browser. Therefore, HTML 5 was used for the structure and CSS 3 for the design of the tool. The application logic has been realized with JavaScript and JQuery¹⁶, additionally the following open source libraries were used: JsPDF¹⁷ for converting html into a PDF-document, NiceEdit¹⁸ for the notepad and the JQuery framework for High-

¹⁶ See <http://code.jquery.com/jquery-1.12.2.min.js>

¹⁷ See <https://parall.ax/products/jspdf>

¹⁸ See <http://nicedit.com/>

charts¹⁹ to realize the interactive charts.

5 Conclusion and Future Work

CuCoMaG is a web-based application that combines the benefits of a virtual learning environment with the advantages of generating knowledge through reflection in a group. In the *role-playing phase* the user gets introduced to a critical situation in which he or she has to communicate with an unsatisfied customer that is represented by an AI-controlled chat bot. The player has to find a way to solve the customer's problem by using certain system supports, like request the database for order information, and has to stick to the company's manners and requirements. After the conversation ends the player leaves the game environment. Later the *group reflection phase* is entered, in which the player(s) start reflecting their own behavior and the one of the other participants. The trainer or expert, who leads through this process has the possibility to line out certain messages or reactions. He or she is able to go through the whole conversation, have a look at the agent's annotations or compare different players in a line or bar chart. Additionally the group or the trainer can store notes in a notepad and export them into a PDF file for a report, if wanted. With this technical support and the trainer's competences the participants can learn soft skills, the company's provided behavior patterns or other learning targets.

To make the serious game more diversified and improve the replayability, it makes sense to offer more scenarios and also more customer types, e. g. one whose problem is not easily solvable or an aggressive customer, who insults the user. These randomly chosen diversities allow addressing and training more skills. Also predictability will be avoided and players can experience the game more often while feeling challenged sufficiently. In addition the application has to pass wide field and usability tests.

CuCoMaG is a great opportunity to use and test computer supported learning approaches to prepare employees for daily situations and improve their soft skills to make them more flexible, self-confident and innovative.

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¹⁹ See <http://www.highcharts.com> and <http://code.highcharts.com/highcharts.js>

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