Social Group Interactions in a Role-Playing Game

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ABSTRACT

We present initial findings from an experiment in which participants played Mafia, an established role-playing game, with our robot. In one condition, the robot played like the rest of the participants; in the other, the robot moderated the game. We discuss general aspects of the interaction, participants' perceptions, and the potential of this scenario for studying group spatial behavior from robotic platforms.

Categories and Subject Descriptors

H.4.m [**Information Systems Applications**]: Miscellaneous

Keywords

Human-robot interaction; group behavior; role games

1. INTRODUCTION

We are interested in various aspects of group interactions in the context of HRI, including sustained patterns of social behavior [2]. To this end, we performed an experiment in which small groups of participants played an established social game, Mafia, with our furniture robot, Chester [4]. In this semi-structured activity, the players were assigned to teams (villagers or mafia) secretly and were involved in group discussions (Fig. 1). The villagers sought to identify the mafia before they were all killed, while the mafia hid his/her identity. We let players stand and freely move in our laboratory space to observe the spatial arrangements that naturally emerged. Our data are not as complex as in real-life social encounters [3], but are rich in terms of spatial arrangements and offer a starting point for their analysis from the robot. An advantage of our scenario is that it involved all participants in an interaction, so they were less likely to become passive spectators or get distracted [4]. The game also let us study two perspectives of the interaction, with the robot as a player or moderator. In this paper, we present initial findings from the study.

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Figure 1: Participants played Mafia. (A) Players took a role card from Chester. (B) Chester played a game. (C) Chester moderated a game and checked the roles of accused players.

2. METHOD

We conducted a Wizard-of-Oz experiment in our laboratory with 10 groups of 4 adults who played Mafia (22 women, 18 men; avg. age=28.4y, SE=2.1). Three sessions had balanced gender, three had 3 men, three had 3 women, and one was all women. The protocol was approved by our Institutional Review Board and piloted to test game dynamics.

Procedure. To start, the wizard that controlled Chester hid in a room next to our laboratory, and the participants completed a demographics survey. They indicated if they were born in the USA (39 participants; 1 was born abroad but moved in early childhood), knew another participant in the session (5 participants), or had played Mafia before (13 participants). Then, the participants watched an instructional video about Mafia, were introduced to Chester and played the game twice. After each game, they rated a few 7-point Likert scale items (Tab. 1); at the end, they answered a final survey about Chester's performance and their experience.

Gameplay. A moderator runs the game and assigns roles to the players: 1 mafia player, 2 or 3 villagers, and 1 doctor. During the night phase, the mafia and the doctor each secretly indicate a player to kill and save, respectively. During the day phase, the moderator says if the victim was saved. If not, this person steps back from the group and stays quiet as if he/she were dead for the game. The remaining players discuss who they think is in the mafia for up to 1.5 min and subsequently convict that player, removing him/her from the game. This sequence continues until the mafia is identified (villagers win) or only two players remain (mafia wins).

Conditions. An experimenter moderated the first game of Mafia (G1) and the rest of the participants played with Chester. The roles were secretly and randomly assigned using cards (Fig. 1A), but the game was rigged such that Chester was always a villager. This allowed the interaction to continue even if the robot was erroneously convicted.

Table 1: Post-condition ratings. Both conditions were used to compute average ratings (R) and standard errors (SE).

Statement	R	SE
a) I enjoyed this game of Mafia	5.36	0.14
b) Chester made the game fun	5.74	0.14
c) The interaction was enjoyable	5.80	0.12
d) I would have preferred to be part of the other team	3.63	0.20
e) I cared about winning the game	3.88	0.22
f) I would have liked to play longer	4.56	0.18
g) I liked the social dynamics of the game	5.13	0.13

The second game (G2) was similar, but Chester served as the moderator, leaving one fewer player (the experimenter that ran (G1) did not participate in (G2)). Chester also played a "cop" who investigated the role of the accused players at the end of the day phases (Fig. 1C) and revealed it publicly. Unlike in (G1), accused villagers kept playing.

We did not balance the condition order because we wanted to use Chester as a player who could break the ice in the first day phase without biasing participants' proxemic behavior. Since we feared proxemic bias due to the moderator of (G1) as well, she stepped away from the group of players when the game could continue without her (e.g., during discussions).

3. RESULTS

Gameplay. Both games lasted a few minutes on average (G1: M=295 secs, SE=36; G2: M=256 secs, SE=16). Chester was typically convicted early, in error, because he started accusing players to break the ice, thereby generating suspicion. He was convicted 5 times at the end of the first day and twice at the end of the second day. Chester was also killed on the first night by one participant and on the second night by another. Overall, villagers won 3 times in G1 and 6 times in G2. It was easier to identify the mafia in G2 with fewer players and without incorrect convictions.

Post-Condition Survey. As shown in Table 1, the participants enjoyed Mafia in general. The ratings for (b) further suggest that Chester had a positive entertainment effect.

We conducted REML analyses on all post-condition items except (e). We used Game (G1/G2), Participant Team (villager/Mafia), Won (1/0 if the player got to the final phase and his/her team won/lost), and Cared About Winning (1/0 if the response to (e) was above/below 4) as main effects, and Participant ID as a random effect nested within Session. We found significant differences for (f) in terms of Cared About Winning ($F[1, 78] = 5.11$, $p = 0.028$). As expected, a post-hoc t-test showed that participants who cared were more interested in playing for longer (N= 35, M= 4.8, SE= 0.26) relative to the rest (N= 45, M= 4.38, SE= 0.24). There was also a trend for higher (c) ratings when the players cared about winning ($F[1,78]=3.2$, $p=0.08$).

Spatial Behavior. For proxemics, we annotated the positions of the players at 1Hz using laser measurements from the robot. The participants were 1.8m from Chester on average (SE=0.003) during the phases of the games, which is within the typical range for social interactions [1]. We further analyzed the average distances between the participants and the robot during the day phases of the games, when the robot actively interacted in both conditions. A Least Squares regression for Distance Type (to the robot or inter-participant) and Game showed a significant statistical difference for Distance Type ($F[1,38]=12.25$, $p<0.01$). A post-hoc Student's t-test showed that the average inter-participant distance computed for the day phases (N=20, M=1.46m, SE=0.07) was significantly smaller than the average distance between the participants and the robot (N=20, M=1.76m, SE=0.05). Moreover, we noticed that the average distance to the robot increased proportionally from G1 to G2 (N=10, M=1.69m, SE=0.06 vs. N=10, M=1.82m, SE=0.07), but this difference lacked functional meaning. While we suspect that Chester's role could have slightly induced this variation in proxemics, it was small and may be influenced by the lack of counterbalancing.

We observed F-formations [2] during Mafia, as in Figure 1B and 1C. Circular arrangements often emerged when the games started and were sustained for most of the interaction. When the robot stepped out of the group in G1, we often observed re-configurations (e.g., the players closer to Chester changed their orientation to subtly exclude the robot). Vis-à-vis arrangements were often initiated by the robot, e.g., when it accused a player (G1) or announced a death (G2).

Functional vs. Social. Until introduced by the experimenter, Chester was silent with closed eyes. Thus, many people did not notice that it was a robot. Before Chester spoke, 6 participants stood close to its face with their backs to it (blocking its sensors), 2 participants used it as a table for writing, and 2 other participants did both. These behaviors were not observed again after he was introduced, suggesting different use models based on user's perceptions.

Chester's role. We asked the participants which role they preferred for the robot. Twenty-three participants (57.5%) selected moderator, sixteen (40%) selected player and one said that it was equal. Several factors supported their preferences, including interaction time with Chester, entertainment, role skills (e.g., *"good at organizing the group"* as moderator), how mechanical Chester seemed (e.g., *"more machine-like as moderator"*), its value to the game (e.g., *"helped (as player) because not all participants were very vocal"*), social inclusion (G1 *"makes Chester more part of the human crowd"*), perceived intelligence, and trust.

4. FUTURE WORK

We would like to find features to allow the robot to estimate a sense of "groupness". This will increase the robot's awareness of its surroundings and help us design robot behaviors to properly join and leave social encounters.

5. ACKNOWLEDGMENTS

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