Balancing the needs of players and spectators in agent-based commentary systems

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ABSTRACT

We describe an agent-based commentary system for computer games which produces real-time and post-game commentary for spectators. Our system adopts an embodied approach in which reporter agents are directly embodied within the game and are subject to the same constraints as players in terms of perception and movement. We analyse the results of an initial evaluation of the system in terms of the conflicting needs of players and spectators, and show that there is an 'optimal' number of reporter agents that is small enough to be tolerated and even welcomed by the players while at the same time producing commentary which is judged to be sufficiently complete, accurate and interesting by the spectators.

Categories and Subject Descriptors

I.2.11 [**Artificial Intelligence**]: Distributed Artificial Intelligence—*Intelligent Agents, Multiagent Systems*; H.5.1 [**Information Interfaces and Presentation**]: Multimedia Information Systems—*Artificial, augmented, and virtual realities, Evaluation/methodology*

General Terms

Human Factors, Performance

Keywords

Synthetic and Embodied Agents, Games, MMOGs, Reporting

1. INTRODUCTION

The increasing availability of broadband Internet connections has led to a rise in popularity of networked games. These range from large, complex, persistent online environments supporting a large number of simultaneous participants, e.g., Massively-Multiplayer Online Games (MMOGs), to more conventional, first person shooter games supporting a relatively small number of players. More recently, games have started to emerge as a spectator sport, with professional players competing for prestige and prizes [2, 5], and semi-professional commentators, players who takes part in a game in order to report on events in the game [1].

Commentating on games and online environments involves balancing two sets of potentially conflicting interests: spectators who want to know what is going on and players (or more generally, participants) who may wish to reveal some events while concealing others—either because an element of surprise is important in the game, or simply because there is a natural expectation of a degree of privacy, even in a shared virtual environment. At the same time, players may benefit from commentary in some situations, e.g., in-game commentary may enhance the enjoyment of the game, and appearing in reports may be a way of building a reputation and progressing in the community of players.

In previous work we have presented a framework for agent-based commentary systems based on embodied reporting agents which can produce real-time and post-game commentary which is individually tailored to the interests of the spectators and provided preliminary results on objective measures of system performance in terms of the number of events reported [3, 4]. In this paper we focus on the players' perspective. We analyse the results of an initial evaluation of our system in terms of the conflicting interests of players and spectators, and show that there is an 'optimal' number of agents which balances the needs of both groups, i.e., that is small enough to be tolerated and even welcomed by the players while at the same time producing commentary which is judged to be complete, accurate and interesting by the spectators.

2. CONTROLLING COMMENTARY

Spectators and players interact with a commentary system in different ways. Spectators want "good" commentary. This could be defined in many ways, e.g., how interesting or engagingly the commentary is, or how well presented. However, at a minimum good commentary requires that certain events be reported. Precisely which events, depends on the type of spectator and their situation. We wish to support different kinds of spectators, from those who don't play but may perhaps become spectators, to those who are actively playing. Some spectators will require real-time commentary covering key events, perhaps delivered via SMS, while others need detailed, post game commentary delivered by an animated presenter, while yet others require commentary in the game itself. A key question is how can spectators control the system to get the commentary they want in the format they want it.

Players on the other hand may wish certain events reported (e.g., when they are playing well) and certain events not reported (e.g., when they are playing badly or when an element of surprise is necessary to the game). What should or shouldn't be reported depends on the nature of the game. For example, in games in which the play-

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ers are always on display (e.g., gladiatorial combat) a lower level of privacy may be expected or even desired than in games where the demands of tactical or social play require privacy. In more unstructured virtual environments, such as SecondLife [6] the expectations of privacy may be higher still.

A key question is how can the players control the commentary, or at a minimum, the events which are recorded by the commentary system. The players' main focus is on playing the game; a commentary system which is too intrusive, e.g., one which explicitly requires a player to define before or after an event whether it is to be reported, will interfere with the gameplay. However simply recording every event in the environment is equally undesirable in environments where either a degree of privacy is required or where recording everything introduces scalability issues (e.g., MMOGs). Ideally, a commentary system needs to achieve a balance between providing a useful and engaging commentary, while at the same time minimising the degree of intrusion into the gameplay.

In our approach commentary is generated by agents that are directly embodied within the game. Being embodied means that the agents are subject to the same constraints as human players in terms of what they can sense. It also means that agents are visible to players and can be affected by their actions. Players can therefore choose whether to try to hide from the agents, or conversely approach them, perhaps 'acting up' for the camera (e.g., celebrating a victory). Our hypothesis was that embodiment and the familiar metaphor of reporters in the field would provide players with the affordances they need to control the commentary system.

3. THE STUDIO SYSTEM

Our solution, the *Studio System*, is a MAS framework in which responsibility for generating commentary is distributed between three kinds of agents: reporters, editors and presenters, which cooperate to produce commentary [3, 4].

The role of the reporters is to collect information about "interesting" events in the game world. "Interesting" events are those which are of particular interest to groups of spectators (e.g., which determine the outcome of the game or involve a particular team or player). Reporters are embodied in the virtual environment, but unlike the players cannot influence it directly. They are subject to the same sensory limitations as human players, and to obtain information about events taking place in the game world, the reporter must move to the relevant location within it. Events the reporters judge interesting are forwarded to the editors. Since reporters are not infallible, the editors attempt to verify the data produced by the reporters, e.g., by clarifying conflicting reports or by requiring multiple reporters to detect the same event. In addition, the editors attempt to maximise the collection of relevant and interesting information by assigning reporters in such a way as to provide good coverage of the events in the environment, e.g. by directing idle reporters to under-reported or interesting regions within the environment. Editors pass confirmed reports to the presenter(s). The role of the presenters is to deliver commentary to players and spectators at an appropriate time and in an appropriate format. Different presenters may have differing temporal relationships to reported events, e.g. real-time versus retrospective commentary, or may report differing degrees of detail to different output devices.

By interacting with the presenters, spectators can influence the importance the editors and reporters attach to different events, and so indirectly control what gets presented by the presenters. Editors direct the activities of reporters based on the spectators' expressed preferences and what they know of coverage and the activities of the other reporters. However, reporters are autonomous, and will follow the most interesting event they see (according to spectators' interests and assumptions about which events are interesting), notifying the editor if they abandon their allocated task.

We implemented a prototype *Studio System* based on "Capture the Flag", one of the game types provided by Unreal Tournament (UT). This is a "first person shooter" game, in which two teams of players (Red and Blue), each attempt to collect the flag from the opposing team's flag base and carry it back to their own team's flag base to score a point, while at the same time preventing the opposing team from doing the same to their flag (typically by shooting them). In a first person shooter game like UT it can be difficult for players to avoid the reporters. However the embodiment of the reporters means that they are subject to the same rules as other players; in particular they can be killed. Killing a reporter removes it from the game temporarily, and causes it to forget any information it has not passed to an editor. Killing reporters therefore gives the players a way of preventing the current state of the game being reported. To discourage players from killing reporters indiscriminately, a (small) number of points are deducted from their score for each reporter killed.

A more detailed description of the system can be found in [3, 4].

4. EVALUATION

We ran a series of online trials of our extended CTF game to determine whether the system can generate 'good enough' commentary (especially whether it can provide sufficient coverage of game events), and the impact of the system on playing the game (especially whether reporters interfere with play or otherwise change its feel). The UT server was set to six player slots; connecting players occupied these slots, and any slots unused by such connections were filled by UT's built-in bots. We varied the number of reporters present between 1, 2, 4 and 6, as we expected this to be a major factor affecting both questions. We used the relatively small CTF-Simple game map which we felt should offer the possibility of crowding even with a relatively small number of reporters present.

We invited all players to complete an online questionnaire after playing the game that probed their attitudes to the in-game commentary and the impact of reporters being present. We received 26 completed questionnaires from an estimated 45 players who took part, distributed evenly across the test conditions. We also captured logs from the UT server and from the Studio System.

4.1 Accuracy and Coverage

We assessed coverage by comparing the number of game events (flag captures, pick-ups, takes, drops and returns) that were present in the studio logs compared to the full game logs. For each event, we awarded the Studio one point if its report completely matched the UT server log in all four respects; half a point for a 'partial match' where the player was incorrect or not specified but the report was otherwise correct; and zero points otherwise. Coverage was then computed as the percentage of points awarded out of those that were potentially available. Figure 1 shows the average coverage level for each event type across all games logged on the server.[1]

With the exception of flag captures, coverage for all event types improves as more reporters are introduced into the game environment. However, this improvement becomes smaller as more reporters are added. The greatest increase is seen when going from 1 reporter to 2, with a slightly smaller increase when going from 2 to 4, and the smallest increase when going from 4 to 6. For flag-capture events, even a single reporter yields a high coverage (over 90%) because reporters can reliably deduce that a capture has taken

[1]Note that parts of the system have been reimplemented and the coverage results presented here differ from that in [3].

place (though not which player performed the flag capture) by observing the team scores.

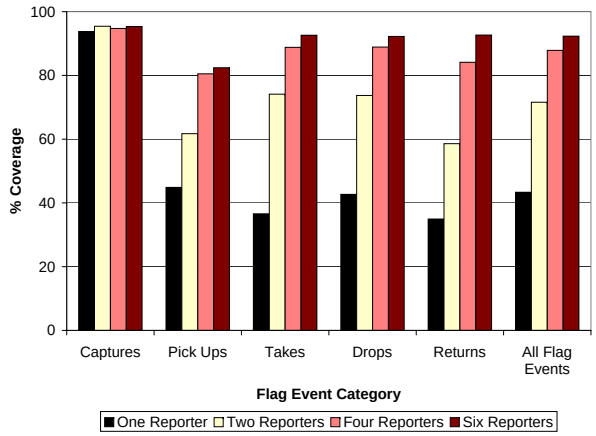

Figure 1: System coverage during live tests.

To supplement the coverage data, our exit questionnaire asked the players to assess the quality of the commentary. Our prototype system supports a number of presenters. To separate the question of coverage and accuracy from the details of presentation as much as possible, we used the "in game" presenter, which produces brief, topical reports of events in the game in the form of regular player chat. We asked players to rate whether reported events were described accurately. Responses indicate that the accuracy of the system improved with more than one reporter. We also asked them to rate whether the commentary missed out important events. Only one player felt that this was the case with only one reporter present and no players felt this was the case with six reporters present.

In summary, player feedback also suggests that the perceived coverage of the system improves as the number of reporters increases, which is in line with our objective measure of coverage. However, even with only two reporters, only one player agreed with the suggestion that the system missed a large number of events. In other words, players may find a relatively low coverage of events acceptable.

4.2 Intrusiveness

Our questionnaire also asked players to rate a number of statements about the impact of reporters on playing the game, along with free-form comments. Here we focus on the statements concerning whether reporters got in the way of movement and combat; and whether they were intrusive or annoying.

Adding more reporters results in them increasingly obstructing combat and, to a lesser extent, movement. With six reporters, four of the seven players who responded indicated strong agreement that they obstructed combat. However, one observed that they could enhance combat: "Oddly enough, they offered good meatshields. When I was carrying the flag, their presence not only took away enemy points, but helped me escape". Players did not appear to find the system particularly intrusive regardless of the number of reporters. However, some commented that the game did feel different, though not necessarily in a negative way: "It was interesting to have actual, physical spectators, much like any other 'extreme' sport much like what UT tires to portray itself as. I liked the idea of a cameraman or spectator following the action or when I grabbed the flag".

On balance, we would argue that our study shows that deploying a framework of reporter, editor and presenter agents is a viable approach to generating commentary from games. Objectively, two or more reporters were able to cover 50% or more of the events in this particular game, and players appear to have found the resulting in-game commentary to be generally appropriate and reasonably accurate. At the same time, the presence of small numbers of reporters does not appear to have had a negative impact on game play, and may even have enhanced the experience for some due to the feeling of being watched and new opportunities for tactical play.

In terms of the numbers of reporters required, there appear to be rapidly diminishing returns from using more than two in for the test map, both in terms of objective coverage and player perception, while there is increasing cost as we move towards four and six reporters in terms of negative impact on gameplay. In this particular case, we would suggest that two reporters is the most appropriate number. Of course, other maps and other games may have their own 'sweet-spots' in terms of an ideal number of reporters, but we anticipate that the general principle of diminishing returns and increasing costs should hold true.

5. CONCLUSIONS AND FUTURE WORK

We have presented a framework for reporting on computer games, the Studio System, which attempts to balance the requirements of spectators and players. The system is novel in its use of embodied reporters, agents which are directly embodied in the game world and subject to the same constraints as human players. We have described the implementation of the system and summarised the results of a preliminary study of how players experienced the system, showing that there is an 'optimal' number of agents which is small enough to be tolerated and even welcomed by the players while at the same time producing commentary which is judged to be complete, accurate and interesting by spectators.

In future we plan to extend our current basic teamwork model to approaches that can scale to larger worlds, building on previous work on teamwork, e.g., [7]. We also plan to develop embodied presenter agents that can provide engaging news feeds within virtual worlds. A final direction is further validating our framework through more in depth studies with more complex games.

6. REFERENCES

[1] BBC News. Meet the John Motsons of online gaming. February 2005. `news.bbc.co.uk/1/hi/technology/4242871.stm` (verified February 2006).

[2] Cyberathlete Professional League. `www.thecpl.com` (verified February 2006).

[3] D. Fielding, M. Fraser, B. Logan, and S. Benford. Extending game participation with embodied reporting agents. In *Proceedings of the ACM SIGCHI International Conference on Advances in Computer Entertainment Technology (ACE 2004)*, pages 100–108, New York, June 2004. ACM Press.

[4] D. Fielding, M. Fraser, B. Logan, and S. Benford. Reporters, editors and presenters: Using embodied agents to report on online computer games. In *Proceedings of the Third International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS 2004)*, pages 1530–1531, New York, July 2004. IEEE.

[5] National E-Sports League. `www.nationalesports.com` (verified February 2006).

[6] SecondLife. `secondlife.com` (verified February 2006).

[7] M. Tambe. Towards flexible teamwork. *Journal of Artificial Intelligence Research*, 7:83–124, 1997.