Simulating Agent Clusters Resembling Human Conversational Groups

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Abstract

This paper attempts to simulate agent clusters resembling people talking in groups. The proposed approach is a formalization of theories concerning human social spatial behaviour. Visuals generated by the simulations vouch for the approach.

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Keywords: social simulation, agent-based behaviour modelling, conversational groups

1 Introduction

Imagine bumping into friends at a party. The ensuing process will often involve: exchanging pleasantries/salutations; standing reasonably close to one another so that seeing or hearing wont be a problem; followed by re-alignment of the body (whole or parts of it) so as to face one another. This paper proposes a virtual replication of this process.

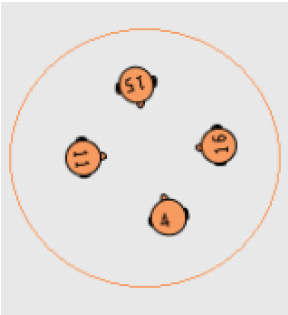

Figure 1: *Blob-shaped agents facing one another within clusters*

Figure 2: *Humanoid characters facing one another appropriately*

2 Our Approach

The simulation shows blob-shaped virtual agents with pointed noses and rounded ears moving within a bounded X-Y plane (see figure 1). The pointed nose indicates the direction of movement or orientation depending upon whether agents are moving or stopped respectively. The blob-shaped representation for agents was chosen in line with the human depiction adopted in [Hall 1969] and [Kendon 1990] to study the spatial-orientational manifestations of human conversational groups.

In the event of two agents moving towards one another, they'd go through the following rituals to adapt a suitable spatial-orientational arrangement. According to [Hall 1969], for social interactions, people often space themselves out at a maximum relative distance of 4 feet – measured from toe-to-toe. Based on this concept, an agent *a* continually monitors its own position with that of its potential cluster partners denoted by set *P*, i.e., other agents within 6 feet in front of self. From then on, for every time step *t* of the simulation, *a* re-calculates its distance from every agent *i* in set *P* using the conventional distance formula, $d_{it} = \sqrt[2]{(x_i - x_a) + (y_i - y_a)}$

When two or more agents come to be spaced from one another just about the virtual equivalent of 4 feet, they stop moving and become interactants of a same cluster *C*. According to [Kendon 1990], people within a conversational group will stand facing one another such that there is no more than 45 degrees discrepancy in their head-to-body orientation. Therefore, after stopping at a relative distance based on rule 1, agents will then modify their orientation so as to face another within a maximum deviation of 45 degrees. Here, Θ is computed as the vector pointing from agent *a*'s current location (x_a, y_a) to the equidistant centroid point (X_{stable}, Y_{stable}). The equidistant centroid point is the average of distances computed between the (x,y) coordinate of each agent *i* in *C* and their cumulative centroid (X_c, Y_c).

Figure 1 demonstrates one possibility of an agent cluster generated by the simulation. Success of the 2D simulations probed an extension into a 3D virtual environment. With minor enhancements, the proposed approach has been adapted into a 3D framework to yield similarly convincing results (see figure 2).

3 Conclusion

Efficiency of the proposed approach in simulating human-like agent clusters has been verified to an extent in [Narasimhan and White 2013]. Nonetheless, the authors are currently working on a more formal evaluation strategy that involves direct comparison of the outcomes of the simulations with videos of naturally occurring human interactions.

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