Study of Nine People in a Hallway

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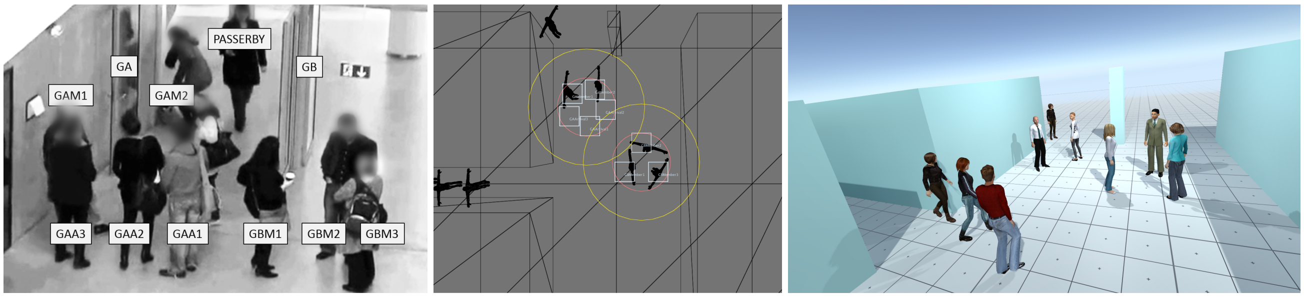

Figure 1: *A study of 9 people in a hallway unveils great complexity for simulation*

1 Approach

Many virtual environments rely on a social population that needs to behave in a plausible manner. This has given rise to a rich field of pedestrian and crowd simulation where collision avoidance is key. However, social environments need to portray plausible contact such as when people know each other. This study presents a typical real-life scenario, which in spite of its mundane nature uncovers a wide range of simulation challenges. We have chosen to use our own social AI system, *Impulsion*, a reactive rule-based system that models social territoriality, proxemics and social navigation [Pedica and Vilhjálmsson 2012], to demonstrate a possible approach to addressing a couple of these challenges. Our approach to simulating human social intelligence is rooted in social sciences. We believe that a solid knowledge of psychology and sociology contributes to the process of imitating face-to-face group interaction and social intelligence in general by providing useful abstractions. The reactive machinery that we realized contains relatively few rules, but a complex scene emerges that captures the essence of the original scenario [1].

To explore the complexity of a naturally occurring social scenario, we chose the hallway of a university, near the end of a class or exam. The scenario is of particular interest because it displays a number of basic human social skills used coherently and in perfect choreography. *Social skills* refer here to those human behaviors apt to sustain effective co-presence and face-to-face communication. With reference to the real life scenario we want to address specific behaviors such as glancing, mutual attention, group formation, rearrangement, territoriality, proxemics and proper navigation of the social landscape.

2 Example Challenges

When several people come together, managing co-presence becomes a challenge because space is a limited resource and initial goals for its use may not always align. This essentially leads to silent negotiations and compromises requiring certain social skills. We focus here on two challenges for our simulation and how we addressed them in Impulsion:

Challenge 1: There is an initial gathering (GA) of GAM1 and GAM2 near the door on the left (see Figure 1). Then GAA1, GAA2 and GAA3 all exit a nearby class room and both GAA1 and GAA2 identify GAM1 as a friend and approach him to start a conversation. GAA2 reaches GA first, blocking GAA1's access to the gathering. But after a relatively short time a stable arrangement of GA emerges that supports all participants. The definition of an F-Formation includes the so-called O-Space [Kendon 1990], which is the center that all participants need equal access to and the group defends from outside interruption. Impulsion already implemented rules to generate F-Formations [Pedica and Vilhjálmsson 2010], but the addition of a recurrent rule that activates rearranging behavior if anyone's access to O-Space gets blocked, ensured that GAA2 eventually steps aside to let GAA1 gain full access.

Challenge 2: The hallway is almost blocked by two gatherings, GA and GB. PASSERBY needs to pass down the hallway and chooses to squeeze between the gatherings, rather than traversing the open space between the members of gathering GB. We implemented RVO [Oliva and Vilhjálmsson 2014], and simply by factoring the abstract entity of a social gathering into velocity costs, makes them undesirable territory, if you decide not to join them.

Discovering these challenges in our real-life scenario and addressing them using suitable abstractions based on social theory, where some understanding of the phenomena already exists, helps the new social skills that the simulation acquired, to carry over to new scenarios that can be created simply by changing initial parameters.

References

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[1]Video at http://secom.ru.is/projects/impulsion/