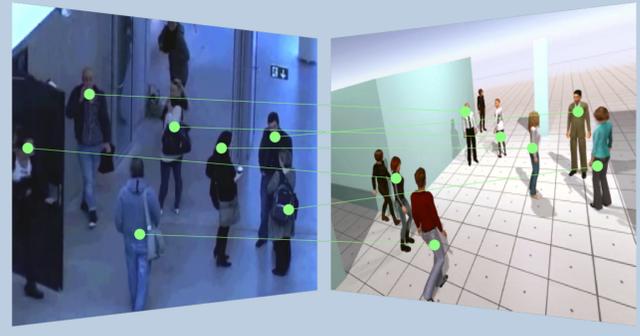# Study of Nine People in a Hallway

Claudio Pedica, Hannes Högni Vilhjálmsson, Karl Valdimar Kristinsson
Socially Expressive Computing Group, CADIA, Reykjavik University

Center for Analysis and Design of Intelligent Agents
CADIA
Gervigreindarsetur Háskólans í Reykjavík

Problem

Many virtual environments rely on a social population. However, they need to portray plausible contact such as when people know each other. This study presents a typical real-world scenario that has been simulated by using our own social AI system, *Impulsion*, to address some of these challenges and contribute to a vocabulary for the design of social simulation.

Social Intelligence

To explore the complexity of a naturally occurring social scenario, we chose the hallway of a university. The scenario displays a number of basic human social skills used coherently and in perfect choreography:

- glancing
- mutual attention
- group formation
- rearrangement
- territoriality
- proxemics
- social navigation

Real-world Scenario

This study presents a typical real-world scenario, which in spite of its mundane nature uncovers a wide range of simulation challenges.
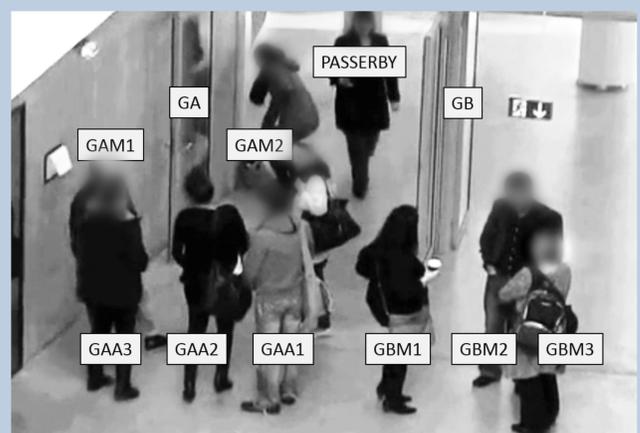

Figure 1: The entities involved in the scenario.

References

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Contacts

Web secom.ru.is, cadia.ru.is
Email hannes@ru.is, claudio07@ru.is
Phone +354 599 6200

Challenges

Event	Description	Challenge	Approach
Mutual Interest (1)	GAA1 shifts attention to GAM1 who does the same thing back.	The attention shifts has to happen while the character is moving and has to be identifiable as an attention mechanism.	A dormant gaze rule for attention shift. The rule is activated only when an entity of special interest is visible and within social range. The entity of special interest becomes the target of the attention shift. Mutuality is guaranteed because GAA1 and GAM1 are mutual targets of each other. The gaze rule has the highest priority and subsumes the other rules for glancing.
Approach (2)	GAA1 walks towards GA. Both GAM1 and GAM2 understand GAA1's intention to join the group.	The navigation has to accept the behavioral constraints of the F-formation once the character is close enough to the group.	A navigation to a location within the group's participants space. The location is a point on an imaginary formation before the group has found a stable arrangement. The navigation ends as soon as the character enters the participants space to leave the control to the F-formation social forces. There is a location available for every member. The character is considered a group member already during this phase.
Civil Inattention (3)	GAA2 and GAA3 come out of the classroom and enter the visual range of GAA1. GAA2 glances briefly at GAA1.	Civil inattention is active all the time but has to submit to other behaviors that signal intention such as attention shifts.	A dormant gaze rule for quick glances. The rule is activated when an entity enters the visual range. The closest entity becomes the target of the glance. This rule keeps a memory of the last target to avoid mechanical repetitive glancing to the same entity. This gaze rule has a weaker priority then attention shifts.
F-Formation (4)	The members of GA are within range and they start arranging into a face-to-face formation.	The self-organization of face-to-face interactions is a complex emergent phenomenon. At its core there is a behavioral relationship between all the members of a group.	A motivational rule generates social forces to constraint the actor to the behavioral rules of a functioning F-formation. The motivational forces are turned off as soon as the actor looses the membership or walks too far from the group's region.
Rearrangement on Obstruction (5)	GAA2 steps aside to allow GAA1 to have an easy and equal access to the o-space.	Obstruction of another member means that a character is too close to the o-space and in front of the line of sight of someone else.	A special case of the rule above activated when the actor is in front of another member. This rule subsumes regular F-formation social forces to let the actor move aside and backward to guarantee free and equal access to the o-space for every member of the group.
Group Avoidance (6)	PASSERBY arrives in the hallway and walks through GA and GB without disturbing the conversations.	The navigation has to be obstacle free but also socially aware.	An extension to the velocity obstacle approach can add a term for F-formations.

Table 1: Challenging events of the real-world hallway scenario.

Results

Significant social events that occurred in the simulation and corresponded to events in the real scenario are shown as screen shots below.

A comparison can be made between the two sets of images, real and simulated, but perhaps more importantly we have summarized these events as a set of interesting challenges in Table 1, juxtaposed with how we handle them.