Incorporating Human Relationships into Path Planning

Nathan R. Sturtevant

UNIVERSITY of DENVER
DANIEL FELIX RITCHIE SCHOOL OF ENGINEERING & COMPUTER SCIENCE

The Problem

People often think of path planning as just a technology used in games. Necessary, but unrelated to everything else going on.

The Premise

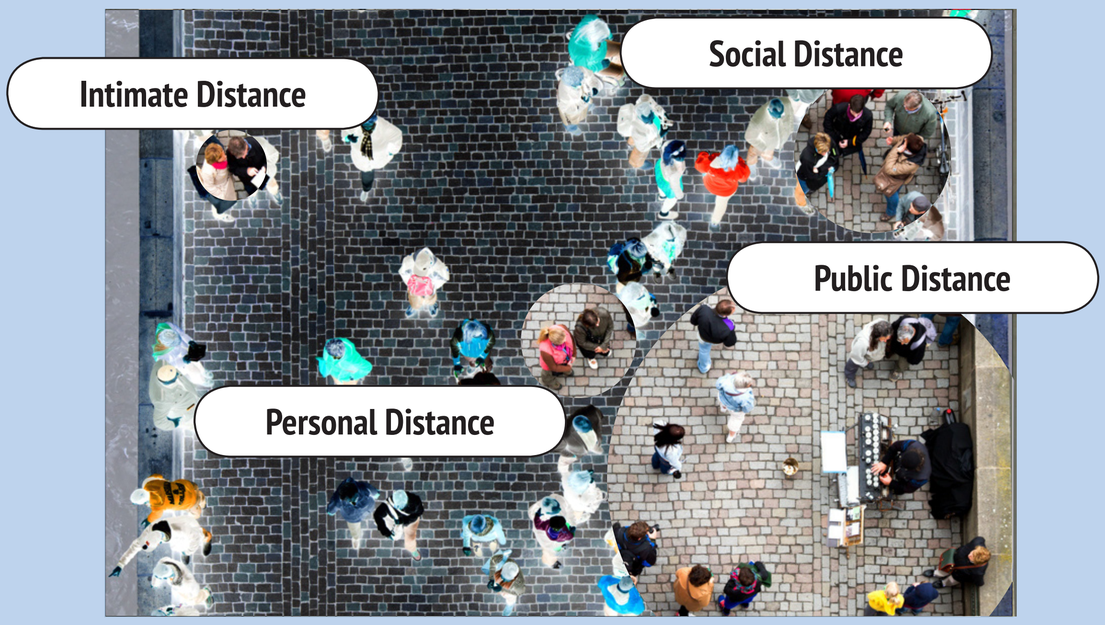
Character movement should not be independent from the relationships between characters.

The Promise

We can put a model of human relationships into a path planning engine to get more interesting behaviors.

The Social Distance Model

Hall (1969) developed a model of the distances at which humans and other creatures interact. This model proposes a spectrum of distances at which characters interact.



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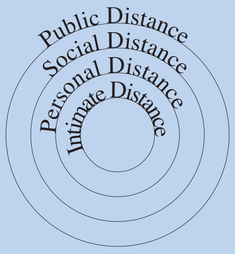

These distances can vary between cultures, but exist consistently when characters interact.

The Perception Model

We propose that when characters move, they are acting on a spectrum of either wanting to be seen, or wanting to avoid being seen. (Typical behavior, however, is neutral on this spectrum.)

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do not want to be seen — Indifference — want to be seen

Examples:

- **A spy does not want to be seen.**
- **Someone pursuing a relationship may take a longer route in order to flirt with someone they might see along the way.**

Putting it into practice

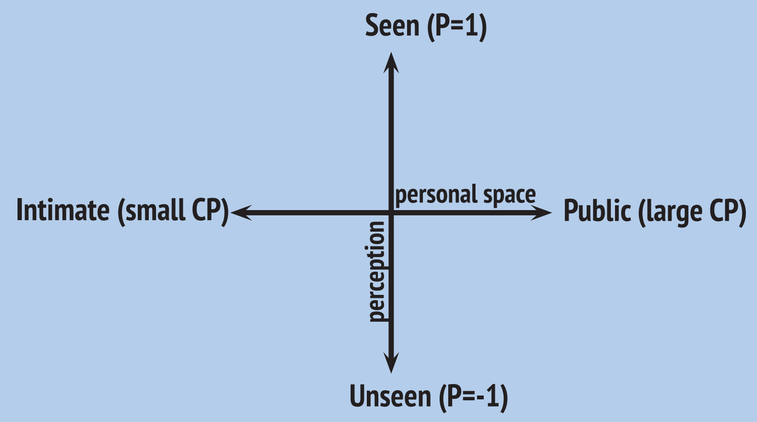
We now have two parameters for influencing behavior, and can induce a range of behaviors by varying these parameters. We change the cost of an edge *c(e)* relative to a target according to:

- **c_p : the cost of being perceived**
- **c_{ps} : the cost of personal space**
- **d : the distance to the target**
- **Δ : the angle to the target**
- **k_i : tunable constants**

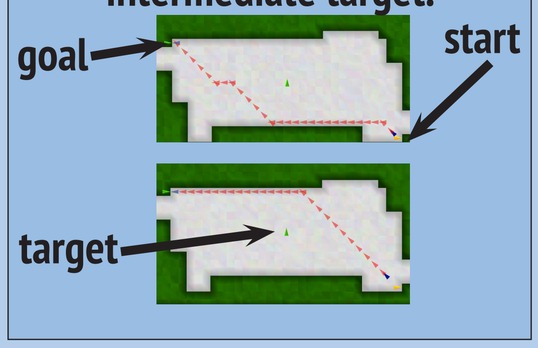
$$c_p = k_1 \cdot max(-P * cos(\Delta \cdot k_2), 0)/d$$

$$c_{ps} = min(abs(CP - d)/k_3, k_4)$$

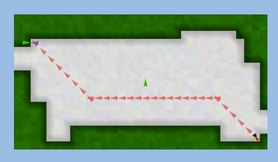
$$c(e = \{s_1, s_2\}) = c_{ps} + c_p + d(s_1, s_2)$$



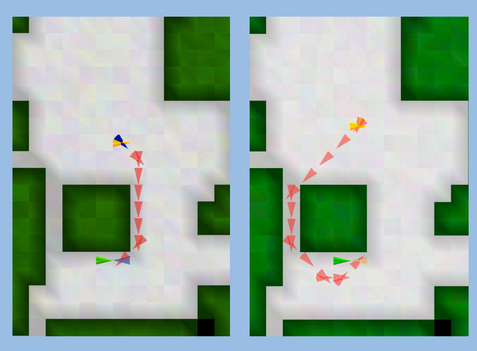
Example 1a: Vary P relative to intermediate target.



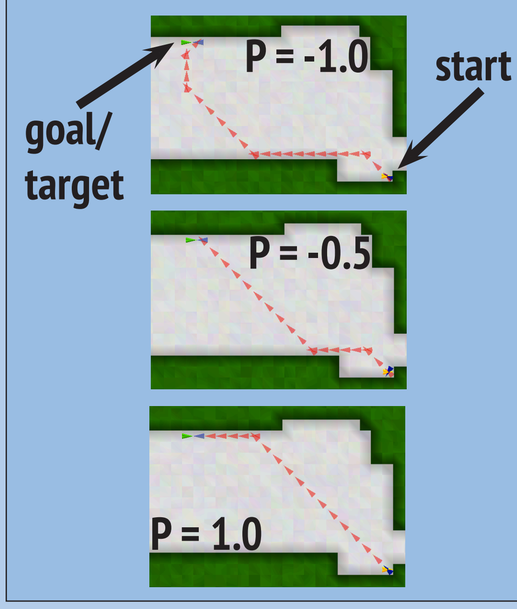
Example 1b: Combine low P with targeted CP=2



Example 2: Threshold between changing paths for avoidance behavior.



Example 3: Vary P relative to the target.



Final Challenges

We have demonstrated how a social model can influence path planning. This provides a tech demo, but it is a challenge to integrate this in a compelling way into a complete game.