**Social Navigation in Unconstrained Environments**

**Introduction**

Autonomous and safe navigation in social environments such as offices, and malls is essential for the use of robots in these places. Social navigation is of particular importance because it doesn’t treat people simply as obstacles, but also as living beings that must be respected; therefore, taking both mental and physical safety individuals in the environment.

Recent studies have shown several solutions to this problem, but the most prevalent ones use variations of the Social Force Model (SFM) introduced by [1,2,6] combined human-robot proxemics.

In the area of proxemics, there is empirical research showing [7] the key distances humans and robots should keep between one another. However, mentioned distance can be affected by how an individual feels about the robot [8]. Most social navigation studies focus either in open or closed spaces [2,4,5,6] using variations of the SFM. This is because the SFM does not require as much planning as other robot navigation techniques, which allows the robot to make adjustments on the fly. The studies by X. Troung et al. [4,6], focus in robot navigation in closed spaces using an extended SFM and their own Proactive Social Motion Model (PSMM). These models successfully understand where individuals are located, and the social and personal space of these individuals. The model used by G. Ferrer [2,5], focuses on navigating with a companion, and being able to tune the parameters of the SFM through reinforcement learning. Additionally, R. Triebel et al. [3] show a simple way for the robot to approach an individual to assist and guide through an airport by using reinforcement learning coupled with mapping techniques. What these studies do not show is how a robot can interact with multiple social actors in these environments, while remaining socially aware; thus, giving the robot a concept, that it too belongs to a social group.

By giving a robot of understanding that it belongs to a social group, the robot will be better equipped at understanding and navigating social situations. My research will focus on making a robot navigate a social environment with the end goal of joining a group to then perform a desired task without the group. I will be looking at how a robot can integrate itself into these social groups without making its individuals feel uncomfortable, by keeping proxemics and the SFM in mind. If successful, this research opens the door for social dynamics where the robot belongs to a group rather than just being aware of the other groups and social context that exist around it.

**References:**

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