Toy Story Method for Multi-Policy Social Navigation

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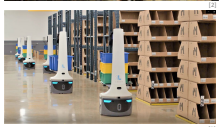
Motivation



[1] XPO Logistics
[2] R. Kümmerle, M. Ruhnke, B. Steder, C. Stachniss and W. Burgard, "A navigation system for robots operating in crowded urban environments," 2013 IEEE International Conference on Robotics and Automation, 2013, pp. 3225-3232, doi: 10.1109/ICRA.2013.6631026.
[3] https://www.ebnet.com/article/robots-are-handling-your-packages/

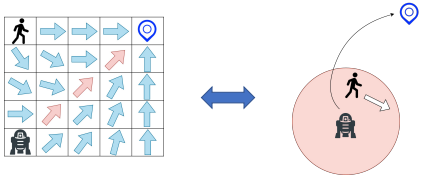
The "Toy-Story"[1] method

[1] John Lasseter. Toy Story, 1995.

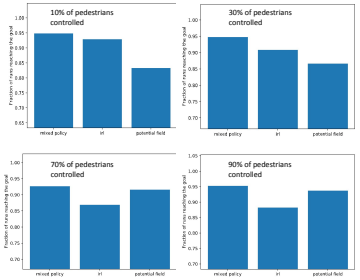
Method

- Two controllers:
  - A socially compliant IRL policy [1]
  - A obstacle avoidance controller [2]
- Context recognition criteria: Proximity to humans.
- Experimental setup:
  - We use the UCY dataset to train and test our approach.
  - 4 scenarios depending on the number of uncontrollable agents(pedestrians).

[1] Bobak H Baghi and Gregory Dudek. Sample Efficient Social Navigation Using Inverse Reinforcement Learning. page 8.
[2] Oussama Khatib, Real-Time Obstacle Avoidance for Manipulators and Mobile Robots. The International Journal of Robotics Research, 5(1):90–98, March 1986.

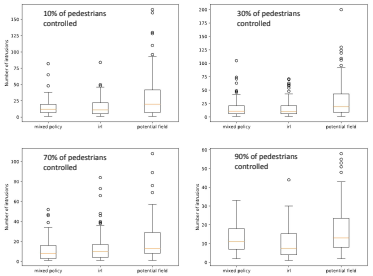


Results: Rate of success

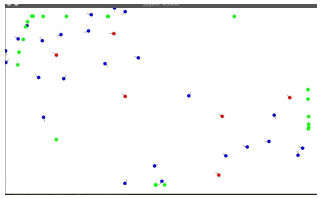


The mixed policy agent consistently outperforms its counterparts.

Intimate intrusions



The performance of the mixed policy is comparable to that of the IRL agent



Uncontrolled agents (pedestrians) with direction of heading
Controlled agents with direction of heading
Goals for the controlled agents

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