PedLearn
Realtime Pedestrian Tracking, Behavior Learning, and Navigation for Autonomous Vehicles

Aniket Bera, Tanmay Randhavane, Rohan Prinja, Dinesh Manocha
The University of North Carolina at Chapel Hill
Outline

• Motivation
• Previous Work
• Social & Psychological Constraints
• Results
• Conclusion
Crowds are everywhere
Pedestrian Interaction with Driverless Cars

Source: Oxbotica at Oxford University
Robot Navigation

MINERVA
[Thrun 1999]

RHINO
[Burgard 1998]

ACE
[Bauer 2009]

[Kummerle 2015]
Socially-Aware Robot Navigation

Socially-Aware Robot Navigation
[Pandey 2010], [Kruse 2013], [Okal 2016], [Ferrer, Garrell 2013], [Kuderer 2012]

Explicit Models of Social Constraints
[Sisbot 2007], [Kirby 2009]

Learning-based Approach
[Kuderer 2012], [Trautman 2013], [Luber 2012], [Perez-Higueras 2014], [Ramon-Vigo 2014]
Issues

- Prior robot navigation schemes do not take into account:
  - Personality or time-varying behaviors of different pedestrians.
  - Psychological and social constraints
Overview of SocioSense

- Video Stream
- Bayesian State Estimation
  - Personality Traits
    - Psychological Cues
  - Proxemic Distances
    - Social Cues
  - Pedestrian Path Prediction
- Socially-Aware Robot Navigation
Personality Traits

Video: International Trade Fair, New Delhi 2016
Social Cues

- Extroverts can have a smaller personal distance than introverts. [Williams 1971]

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<thead>
<tr>
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<th>Personal Distance</th>
<th>Social Distance</th>
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<tbody>
<tr>
<td>Extrovert</td>
<td>179.58 cm</td>
<td>267.97 cm</td>
</tr>
<tr>
<td>Introvert</td>
<td>88.9 cm</td>
<td>233.17 cm</td>
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Overall Pipeline

• Our robot navigation algorithm satisfies the proxemic distance constraints, including personal space and social space.

• The trajectory computed by our navigation algorithm does not intrude on the personal space of the pedestrian and attempts to avoid the social space.
Acknowledgements

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Thank you!

Aniket Bera, Tanmay Randhavane, Rohan Prinja and Dinesh Manocha