Humans and robots understanding each other
FAST project – new Frontiers in Autonomous Systems Technology

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Human-Technology Interaction
The FAST project

- Goal: AGVs (Autonomous Guided Vehicles) with fixed tasks in environments with people need to deal with uncertainties
- Five industrial partners
- Three academic partners
  - Mechanical Engineering
  - Electrical Engineering
  - Human-Technology Interaction

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Problem statement

• Robots and AGVs interact more closely with people

• People always try to understand the robot’s intentions

• Robots need to deal with (unexpected) human behaviour

Humans and robots need to understand each other
Robot understands (intentions of) human

• Robot needs to recognize social cues
  • Action recognition
  • Intention prediction

• Robot needs to navigate in a human-friendly way
  • Personal space (Ríoz-Martínez, Spalanzani & Laugier, 2015)
Acceptable passing distance

(Neggers, Cuijpers & Ruijten, 2018)
Acceptable passing distance

- No difference between left and right

\[ Comfort = 1 + 5.708 \left(1 - \exp\left(-\frac{\text{distance}^2}{2(49.4)^2}\right)\right) \]

Acceptable passing distance: 80 cm

(Neggers, Cuijpers & Ruijten, 2018)
Human understands (intentions of) robot

- Human needs to feel safe
  - Perceived safety
- Humans needs to accept the robot
- Robot needs to provide cues
  - Verbal/non-verbal
  - Social/non-social
Cues in navigation

- Three cues
  - (Eye/ear) LEDs
  - Speech
  - Gesturing
- Three scenario’s
Cues in navigation

Humans and robots understanding each other
Research plans

• Determine shape and size of personal space under different circumstances
  • Different human activities
  • Different robot appearances, speeds, tasks
  • Different contexts

• Determine effect of different robot cues in several situations
  • Navigation
  • Asking for help
Conclusion

• For a smooth interaction it is important that humans and robots understand each other

• Robots should take personal space into account, and adhere to social rules in navigation

• The (social) cues provided by the robot should be recognizable and suitable to the situation

Thank you for listening!