Testing a fully autonomous robot salesman in a real scenarios

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Introduction

- Robots in real scenarios
- Robots built to interact with people in a natural way
- Interaction against non-expert users
- Open-ended scenarios
- The challenge for the robot: changing the course of action in a short time lapse
Introduction

- To cope with this we develop RoboCog
- Task-Oriented modules that share and update a common representation of the world
ADAPTA Scenario

Objective:

● The robot assumes the role of a salesman, that moves in a large shopping area and tries to convince potential clients to follow it to the interactive advertising panel

● The robot should work in uncontrolled, populated, dynamic environments

● The robot should be autonomous
Gualzru, the robot
Issues in preliminary tests

- Following people forever
- Getting lost after a while
- Unable to correctly hear/understand people in noisy environments
- ‘No’ means ‘no’
- Facing the person during the conversation
- Near mode required
- Slow approach, fast retreat.
Paper’s target

- Test a robotic salesman in the context of the ADAPTA scenario

- How?
  - Testing the Gualzru’s capabilities and limitations in real scenarios
  - Evaluating these capabilities through questionnaires
  - Condition: First time users

- Why?
  - Mainly to define future improvement actions
Experimental Setup

- Hall of the University of Málaga, 70 m²
- 3 consecutive mornings
- Questionnaires similar to BEHAVE-II
Experimental Setup

● Sample:
  ○ 50 random people
  ○ 16 questions

● 4 Blocks:
  1. Navigation
  2. Conversation
  3. Interaction
  4. Overall sensations
Navigation

1.1 Do you feel safe when the robot approaches you?

Mean value: 4.31
Standard deviation: 0.95

1.2 Does the robot invade your personal space?

Mean value: 0.96
Standard deviation: 1.37

1.3 Do you think robot movements are natural?

Mean value: 2.62
Standard deviation: 1.23

1.4 Have you stepped away from the robot, because you feared you could collide?

Mean value: 0.96
Standard deviation: 1.46
Conversation

2.1 Have you understood what the robot told you?
- Mean value: 3.57
- Standard deviation: 1.28

2.2 Do you think the robot understood you?
- Mean value: 2.7
- Standard deviation: 1.37

2.3 Could you maintain a coherent conversation?
- Mean value: 2.96
- Standard deviation: 1.38

2.4 Do you think the robot has a pleasant voice?
- Mean value: 3.13
- Standard deviation: 1.29
Interaction

3.1 Did the robot get blocked during the interaction?

- Mean value: 1.39
- Standard deviation: 1.72

3.2 Do you think your interaction with the robot was natural?

- Mean value: 3.11
- Standard deviation: 1.11

3.3 Was the conversation fluent?

- Mean value: 2.85
- Standard deviation: 1.22

3.4 Did the robot seem to be controlled by a person?

- Mean value: 0.87
- Standard deviation: 1.44
Overall sensations

4.1 Did you enjoy the experiment?

Mean value: 4.31
Standard deviation: 0.88

4.2 Do you think the experiment was not interesting?

Mean value: 0.7
Standard deviation: 1.32

4.3 Would you like to repeat the experience?

Mean value: 4.28
Standard deviation: 1.32

4.4 Would you recommend other people to interact with the robot?

Mean value: 4.52
Standard deviation: 0.86
Conclusion

● Behavioral:
  ○ The robot is perceived as safe and interesting
  ○ People enjoy the experience
  ○ Gualzru reacts coherently, from a human point of view, in nearly all situations
  ○ Limited in conversational abilities.

● Technical:
  ○ Gualzru works autonomously
  ○ Gualzru completes the task, again and again
  ○ Improve relocation process
Future work

● Improve conversational abilities
  ○ Improve speech recognition in noisy environments
  ○ Complementary interaction methods
    ■ We will add a touch screen as reinforcement

● Improve navigation abilities:
  ○ Add a RFID relocation, provided by a partner of the ADAPTA project
  ○ More natural and smoother motions
Questions