World Robot Summit

Service Robotics Category
Tasks and Scoring (Draft)

World Robot Challenge

Program

Service Robotics Category

World Robot Challenge

〈Background〉

- The Competition will be helpful to solve social problems stemming from rapidly aging population and declining birthrates through technology that works alongside humans to provide a variety of services.
- As we enter the age in which robots will become a part of people's lives, there is a need for robots that can perform a variety of services in cooperation with humans.
- There is a need for service robots that can work safely and reliably with people and for technologies that create the environment necessary for developing such robots. These include AI learning through which humans and robots engage in advanced communication, Big Data information-sharing through clouds, collection and use of information gathered through IoT technology, etc.
- Human resource development (training) is indispensable in the development of robotic technology and social implementation of robots.

This category aims for the realization of future home/future convenience stores, and to realize its core component, which is work through collaboration and communication between humans and robots.

The world first competition to implement service robots available at convenience stores

Challenges

Partner Robot Challenge

Setting tasks equivalent to housework and making robots that complete such tasks

Future Convenience Store Challenge

Making robots to complete tasks
(e.g.) shelf-stocking and replenishment multiple types of products such as foods, interaction between customers and clerks and cleaning restrooms

● **Needs in the Service Industry:** To deal with a decline in working population due to aging society and to mitigate hard burden of clerks and the elderly

● **Objective :** To share parts of housework (e.g. tidy-up, cleaning) and retail works (e.g. shelf-stocking and interaction between customers and clerks)

● **Expected technological Element :** Collaborative technology between humans and robots

* With regards to competition details in 2020, stated details are all present assumptions and the final details will be confirmed by referring to the progress of technology and the results of pre-competition which will be held in 2018.

World Robot Challenge

Partner Robot Challenge

Tasks

Partner Robot challenge is divided into two leagues. In each league, the participants will compete the total score.

Partner Robot Challenge (Standard Robot Platform League)
*Utilized Standard Robot Platform (HSR)

1. Robot Guides Test
2. Hearing Robot Test
3. Assisted Service Robots Test
4. Open Demonstration Test

Partner Robot Challenge (Simulation League)

1. General Purpose Service Robot (Simulation)
2. Interactive CleanUp (Simulation)
3. Human Navigation (Simulation)
4. Simulation Finals

World Robot Challenge

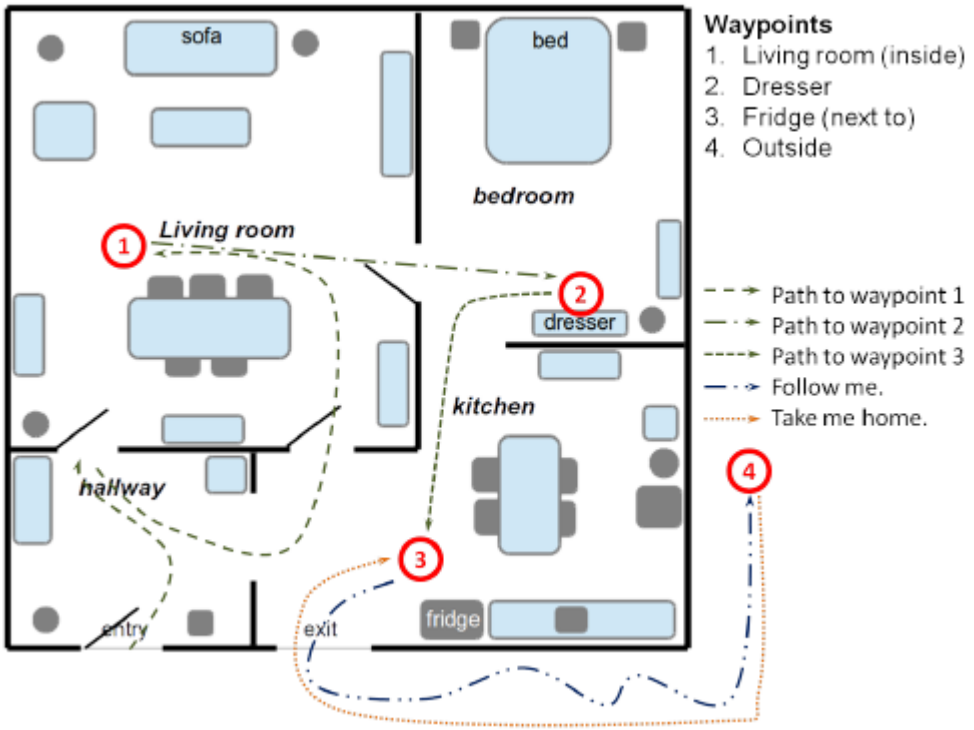
Partner Robot Challenge (Standard Robot Platform League)

Task1 (Robot Guides Test)

1. Entering: The robot enters the area when the door opened.

2. Guiding: The robot stops in front of the owner, briefly explains the guiding method.

3. Waypoint 1 (path planning): The robot navigates to Waypoint 1 that is reachable via, at least, two paths, each one requiring the robot to go through a door which will be shut as the robot approaches.
   The robot may:
   - Take a different path.
   - Open the closed internal door.



Task1 (Robot Guides Test) (Cont.)

4. Waypoint 2 (obstacle interaction): Immediately after reaching Waypoint 1, the robot goes to and reach at grasp (or place) distance Waypoint 2, a placement location (e.g. a shelf). A large obstacle will prevent the robot from getting close to its destination, having the robot to identify it and interact with it.
   Possible actions include:
   - Gently move the obstacle (e.g. if the obstacle is an object).
   - Gently ask the obstacle to move away (e.g. if the obstacle is a human).
   - Wait for the object to move away by itself (e.g. if it is unable to identify the type of obstacle).
   - The obstacle will clear or be cleared after roughly a minute.

5. Leaving the arena: The robot passes through Waypoint 3 and leave the arena through the indicated door.

* The maximum time for this test is 15 minutes.

Scoring (Robot Guides Test)

- Reaching Waypoints
- Avoiding Obstacles
- Starting a new path after reaching a closed door
- Opening the door and continue instead of plan a new trajectory
- Outstanding performances (Special bonus)
- Not attending (Penalty)

Task2 (Hearing Robot Test)

1. Doorbell event: When the doorbell rings, the robot goes to the door to greet the visitor, obtain the visitor's name and purpose, and inform the owner.

2. Telephone call event: When the telephone rings, the robot goes to the telephone to answer the call, obtain the caller's name and purpose, and inform the owner.

3. Emergency smoke alarm event: When one of the smoke alarm rings, the robot alerts the owner on the location of the alarm that rings.

*The maximum time for this test is 15 minutes.

Scoring: Accuracy and Speed

Task3 (Assisted Service Robots Test)

1. Entering and command retrieval: The robot enters the arena and drives to a designated position where it has to wait for further commands.

2. Command generation: A command is generated randomly, depending on the command category chosen by the team.

3. Command categories: The team may choose from the following three categories:
   (1) Category I: Tasks with a low difficulty degree.
   (2) Category II: Tasks with a moderate difficulty degree.
   (3) Category III: Tasks with a high difficulty degree or with incomplete/erroneous information.

4. Task assignment: The robot is given the command by the owner and may directly start to work on the task assignment. The robot must prove it has understood the given command by repeating it.

Task3 (Assisted Service Robots Test) (Cont.)

5. Returning to the owner: After accomplishing the assigned task, the robot has to move back to the owner to retrieve the next command (i.e., go back to 1. without the need of re-entering the arena). The robot can work on at most three commands. After the third command, it has to leave the arena.

6. Exiting the arena: After accomplishing the assigned task, the robot has to leave the arena.

* The maximum time for this test is 15 minutes.

Scoring: Accuracy and Speed

Task4 (Open Demonstration Test)

The Open Demonstration Test consists of a demonstration and an interview part. It is an open demonstration, which means that the teams may demonstrate anything they like.

1. Setup and demonstration: The team has a maximum of seven minutes for setup, presentation and demonstration.

2. Interview and cleanup: After the demonstration, there is another three minutes, where the team answers questions by the judge members. During the interview time, the team has to undo its changes to the environment.

During the demonstration, the team can present the addressed problem and the demonstrated approach.

- A video projector or monitor, if available, may be used to present a brief (max. 1 minute) introduction to what will be shown.
- The team can also visualize robot's internals, e.g., percepts

Scoring (Open Demonstration Test)

Following evaluation criteria:

- Overall demonstration
- Human-robot interaction in the demonstration
- Robot autonomy in the demonstration
- Realism and usefulness for daily life (Can this robot become a product?)
- Novelty and (scientific) contribution (+contribution to the community)
- Difficulty and success of the demonstration