Team description of CIT Brains @Home

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Abstract. CIT Brains @Home has been newly set up in November 2016 as a derivational team from the world-champion team in the humanoid league and from a team that participates in an outdoor mobile robot competition in Japan. Through participation in @Home league, we contribute actively to the study of natural decision making in home environments and to packaging of our past/future software/hardware as reusable and open ones.

1 The aim of the team

CIT Brains @Home has been newly set up in November 2016 by the staff and students in Department of Advanced Robotics, Chiba Institute of Technology. The aim of this team is integration of research progresses in our department.

2 Robot

The robot, which has no name, is mainly composed of a commercial mobile robot, two self-produced manipulators.

2.1 Hardware

Mobile robot part We use i-Cart mini[2] as a mobile robot part with some modifications. In our department, this robot is also used for Tsukuba Challenge, which is an annual competition on outdoor navigation of mobile robots held in Japan. Our customized robot from i-Cart mini is named ORNE (ORNE for Robot Navigation Engineers).

Though the motors are very silent, they have an ability to make the robot move on public streets. This mobile robot has two drive wheels whose diameter are 155[mm], and one rear caster whose diameter is 100[mm]. Each of the drive wheel is connected to a slient brushless motor.

Under the front bumper, an UTM-30LX-EW Scanning range finder is attached for navigation. A Microsoft Kinect at the top of the robot is used for detecting and following persons.

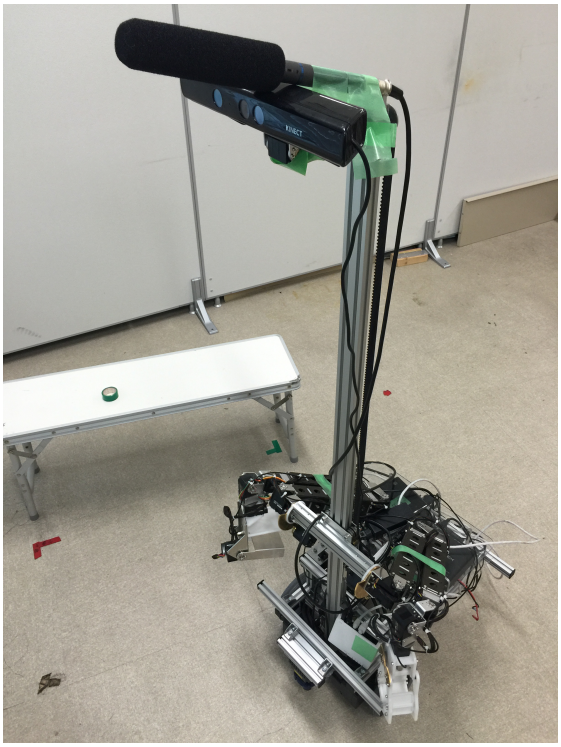

Fig. 1. The robot (It has still no name.)

Manipulator part The robot has two manipulators, which are called arms hereafter. Each arm has

Two kinds of hand are attached to the manipulators respectively.

Cover of the robot We have never been prepared.

2.2 Software

Figure 4 shows the structure of software. The robot operating system (ROS) used as the framework of our software. Since we need to construct software in short term, we have reused nodes for Tsukuba Challenge (modules named `orne_...` in the figure). The software for Tsukuba Challenge also contain open source nodes (`move_base,amcl...`) and nodes for i-Cart mini (`icart_...`).

These reused nodes are controlled by `orne_navigation_task_strategy`, which is a simple Python script.

Fig. 2. Manipulators and Hands

Fig. 3. Attachment of Manipulators

3 Innovative technology and scientific contribution

Our basic idea to realize home-care robots is that they should try something even if they have certain information what they should do. Some mistakes will occur when the robot acts without certain information. However, a decision making rule that permits mistakes will make a robot accomplish more tasks than another rule that waits for perfect information.

We also think that decision making with this loose policy will generate a natural communication between a robot and its owners. For example, a person want to eat cookies with a high probability when the owner asks his/her robot to bring cookies. However, there is some some possibility that the owner

4 Externally available components

We have developed a ROS module for servo motors made by Kondo Kagaku Co., Ltd. as our first contribution[1]. We will publish our software through GitHub.

5 Applicability of the robot in the real world

References

1. CIT-Brains: citbrains/kondo_driver — GitHub. https://github.com/citbrains/kondo_driver, (visited on 2016-02-15)
2. T-frog project: Robot Frame i-Cart mini. http://t-frog.com/products/icart_mini/ (2013), (visited on 2016-02-09)

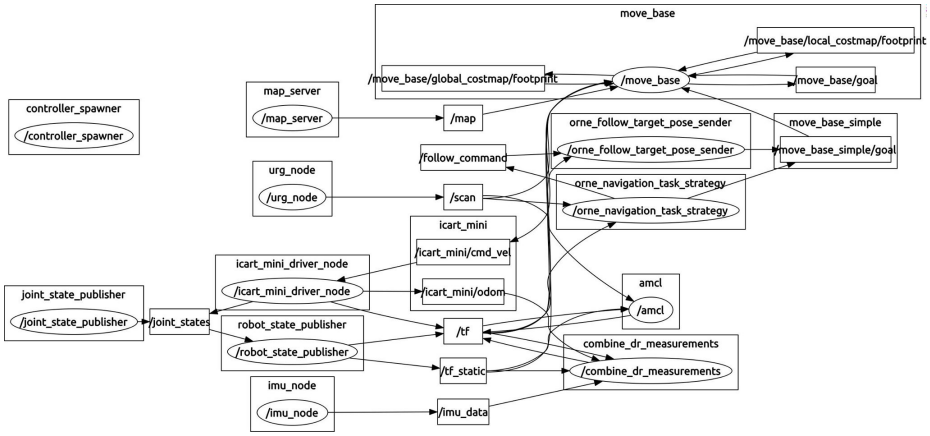

Fig. 4. Output of rqt_graph