Team description of CIT Brains @Home

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Abstract. CIT Brains @Home has been newly set up in November 2015 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 team

CIT Brains @Home has been newly set up in November 2015 by the staff and students in Department of Advanced Robotics, Chiba Institute of Technology. The aim of this team is integration and presentation of research progresses in our department.

In this paper, we describe our present preparation for RoboCup 2016 and for further contribution in the league. Our robot is introduced in Sec. 2. Our interest in science and technology is described in Sec. 3. We conclude this description paper in Sec. 4.

2 Robot

The robot, which has no name, is mainly composed of a commercial mobile robot, two self-produced manipulators, and a head part that is composed of a microphone and Microsoft Kinect.

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).

This mobile robot has two silent brushless motors. Under the front bumper, an UTM-30LX-EW Scanning range finder is attached for navigation. Though

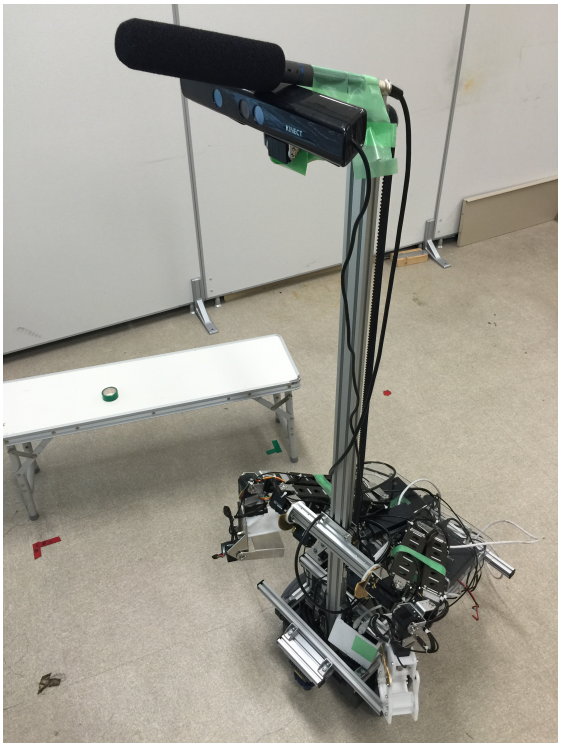

Fig. 1. The robot (It has still no name.)

these 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.

Head part A Microsoft Kinect at the top of the robot is used for detecting and following persons. For speech recognition, a directional microphone, ATM57a made by audio-technica corporation, is attached upon the Kinect.

Manipulator part The robot has two arms and each arm has a hand. They are shown in Fig. 2. The shapes of the left and right hands are different from each other. The right hand, which equips two square plate for sandwiching, is used for grabbing a snack bag or a round bottle. The left hand can pinch an object with its tips, or grab one with the inner side.

Cover of the robot We have never been prepared.

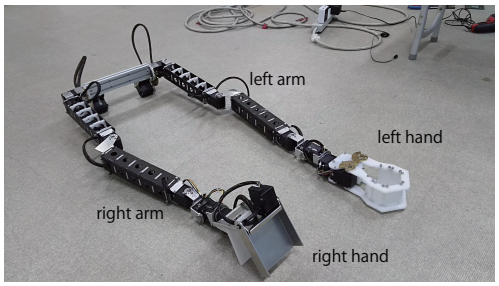

Fig. 2. Manipulators and Hands

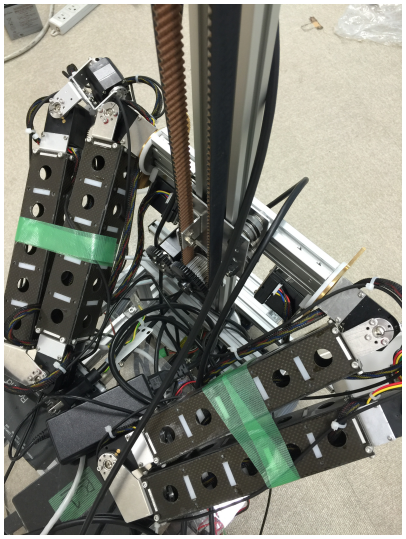

Fig. 3. Attachment of Manipulators

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.

2.3 Applicability of the robot in the real world

3 Innovative technology and scientific contribution

3.1 Scientific interest

Our basic idea to realize home-care robots is that they should try something even if they do not 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, when the owner asks his/her robot to bring cookies, he/she wants to eat cookies with a high probability. However, there is some some possibility that the owner only wants to fill his/her stomach. In the real life, there are some incidents (e.g. a

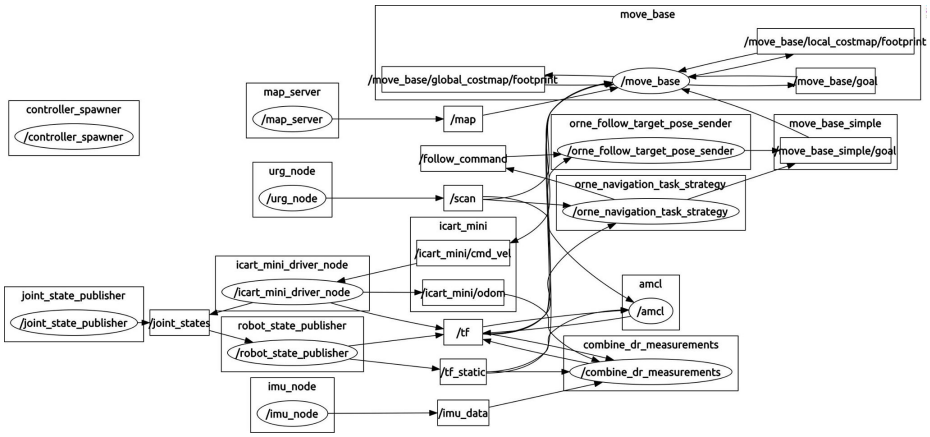

Fig. 4. Output of rqt_graph

construction noise) that makes the robot never be able to understand the word "cookies." We think that the robot should start moving in that case even if it does not have certain

3.2 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.

4 Conclusion

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)