

UTAR Service Robot Video Description Paper

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1 Introduction

Our team, UTAR was formed in Lee Kong Chian Faculty of Science and Engineering (LKC FES) in Tunku Abdul Rahman University (UTAR) in 2019. We have participated in RoboCup @Home Education Challenge @ KLESF 2019 in open category and RoboCup @Home Education Online Challenge 2020 in open category. The robot will perform in a virtual environment in Gazebo. The model added to the world is obtained from [8] and customized by referring [9][10].

2 Robot Setup

2.1 Hardware Overview

The robot has a turtlebot2 platform with Kobuki base and two Astra rgbd cameras. Bottom camera is used to provide laser scan reading for navigation; the top camera is used for object recognition tasks. The laptop microphone and speaker will be used for speech recognition and speech synthesis for this demonstration.

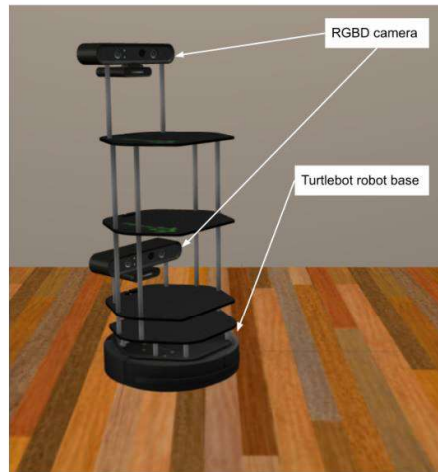


Fig. 1. Robot hardware

2.2 Software Overview

The software packages used on the robot is listed below.

- turtlebot_bringup, turtlebot_navigation, turtlebot_gazebo, turtlebot_follower [1][7] (turtlebot)
- find_object_2d [2] (object recognition)
- sound_play [3] (speech synthesis)
- Pocketsphinx [4] (speech recognition)
- gmapping [5] (Simultaneous Localization and Mapping -SLAM)
- cartographer [6] (Simultaneous Localization and Mapping -SLAM)

3 Competition Task Overview

3.1 Task 1 (Carry My Luggage)

As shown in Figure 2, the robot at the starting position will attempt to detect the human presence in front of it by using [2]. When the operator is present, the robot will greet the operator and wait for his or her command. [4] is used in recognizing the speech from the operator. Keywords in each command are identified with keyword spotting (kws) mode in [4]. If the command is to “carry”, the robot will respond by informing the operator to hand the bag over. After obtaining the bag, the robot listens for the “follow” command to follow the operator by [7]. Upon reaching the destination, the

operator will command “stop” and the robot will stop following. The robot will request a destination to go to and the operator will then specify it. The robot will navigate to the specified location accordingly. The integration of robot arm with [11] would be taken into consideration for the future development of automatic grasping.

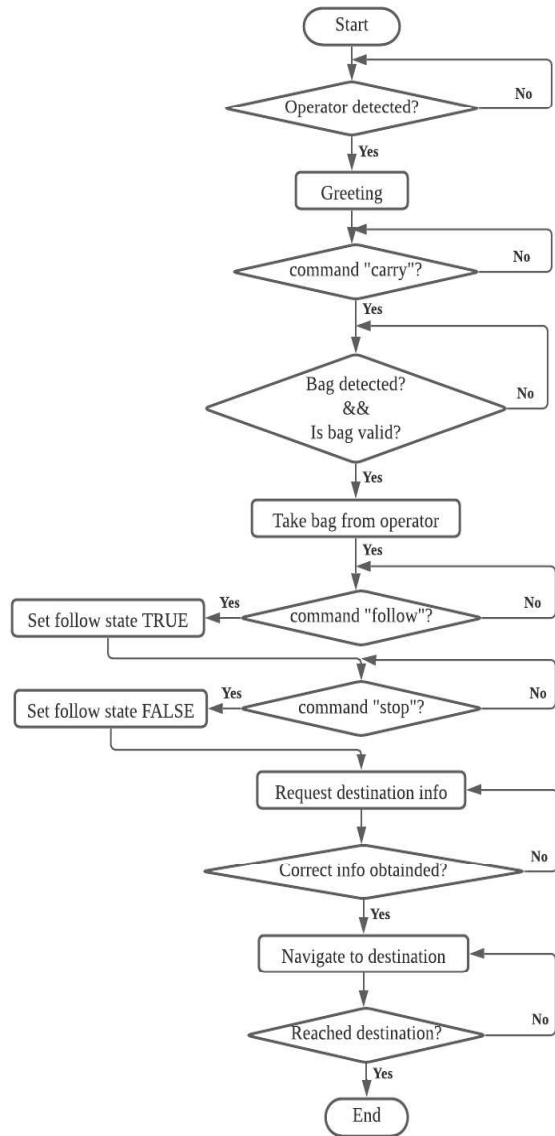


Fig. 2. Flow Chart of Task 1

3.2 Task 2 (Find My Mates)

As shown in figure 3, the robot starts with a greeting and request command from the operator by using [3][4]. At the same time, it also uses [2] to detect and record the location of the operator. After obtaining the command, the robot navigates with [1][7] to different landmarks such as the entrance, living room, and kitchen to find guests. After the robot reached each landmark, it will rotate until [2] detects a guest. Then, based on the location of the guest, it will navigate to the front of the guest to ask for info such as name and favorite drink with [3][4]. Besides, the location of the detected guest is recorded.

This process is repeated until it finished patrolled all the landmarks. After that, it will navigate back to the operator and report the info (e.g.: name, gender, favorite drink, and location) of every guest with [3][4]. In addition, the gender of each guest is determined by matching the detected guest with the sample picture by using [2]. Also, the location of the guest is reported as the nearest landmark around the respective guest.

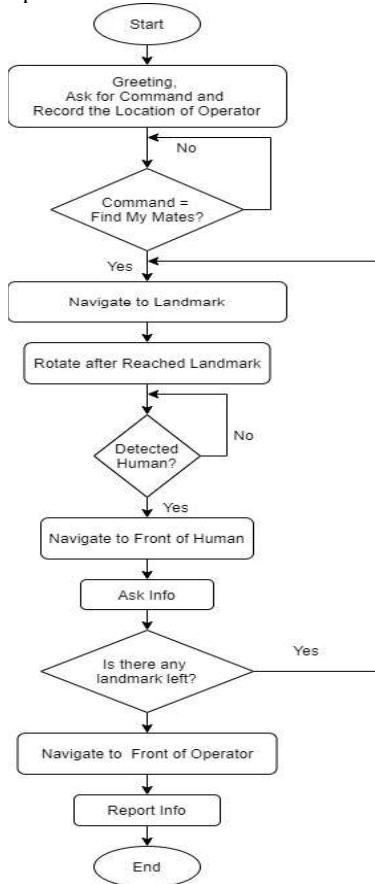


Fig. 3. Flow Chart of Task 2

3.3 Task 3 (Receptionist)

The robot will be initiated and headed to the entrance with [1] by saying “GO” using [3][4] from the user. At the entrance, it will look for incoming guests using [2]. As the guests are detected, [3][4] is used to acquire information like name, favorite drink as well as age followed by a confirmation procedure using a specific keyword. Then, the guest is being directed to their respective empty sofa or chair seat based on their age. After the available seat is detected with [2], the robot will face at the seat direction and make a brief introduction (name and favorite drink) of the new guest. If an existing guest is detected as looking for an empty seat, he/she (John) will be introduced to the new guest before heading to the empty seat. All the introduction of guest and empty seat is done using [3][4]. Finally, after the new guest has got seated, the robot will either go back to the home position or entrance if there is a new incoming guest.

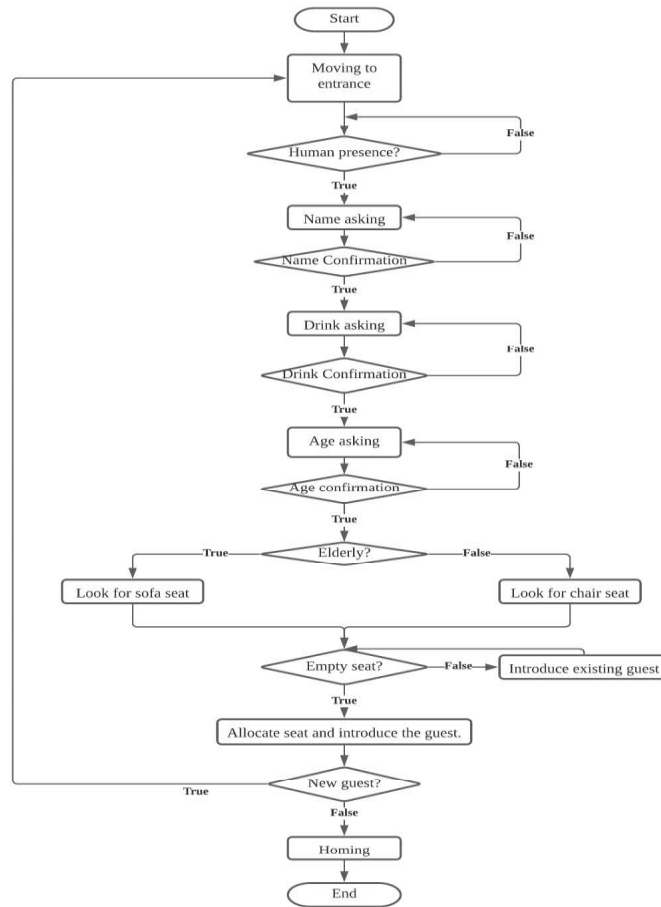


Fig. 4. Flow Chart of Task 3

4 Link to Videos

<https://drive.google.com/drive/folders/1toxgjnHgwowgGaOXIzUtok-UzSK1vmVk?usp=sharing>

References

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