Abstract

Robots are more and more popular nowadays, and people never stop imaging how these technology will improve their lives. Still, their costs set a high bar for general public to access them easily. In Duckie-Lotita, we propose a low-cost and high-performance system, which arms with three modes of services: Guard, Maid, and Velvet. Users are able to monitor the housing environment, welcomed by the robot while entering the house, and assign the robot to specific room through online panel.

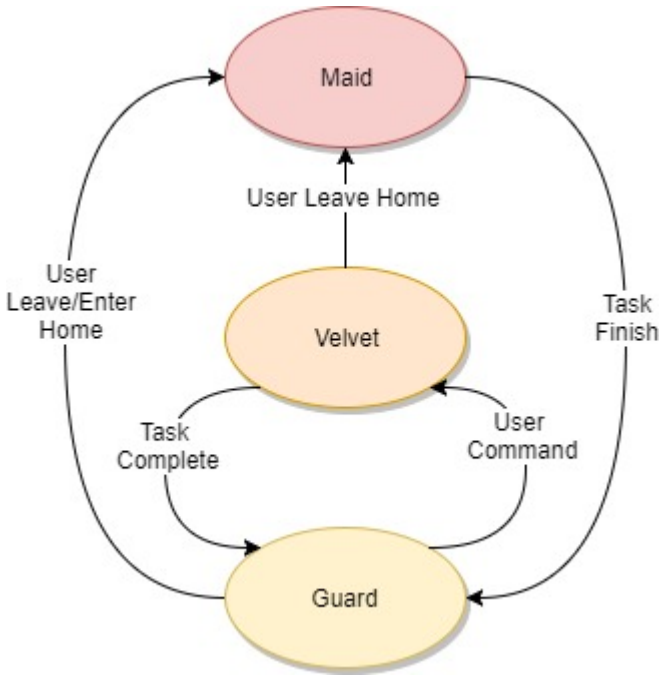
Introduction

As the rising of technology, many types of automation equipments are springing up. They give human a brand new convenient and efficient way to complete some tasks, especially robotics. There are several kinds of robotics, such as industrial robot, service robot and collaborative robot. In particular the industry trend for robot technology to provide well services to people at home. For instance, Zenbo. However, it is still expensive for general public. As a result, we hope to design a system with low cost and good performance.

The system includes three service modes: Guard, Maid, and Velvet. In Guard mode, the robot will travel around the house routinely to monitor the environment of rooms, upload the datas of rooms, and report the abnormality of energy consumption. In Maid mode, by race recognition technique, the server will recognize the user’s face, and command the robot to arrive the door to welcome user coming back home. In Velvet mode, the user can assign location to robot through the control panel.

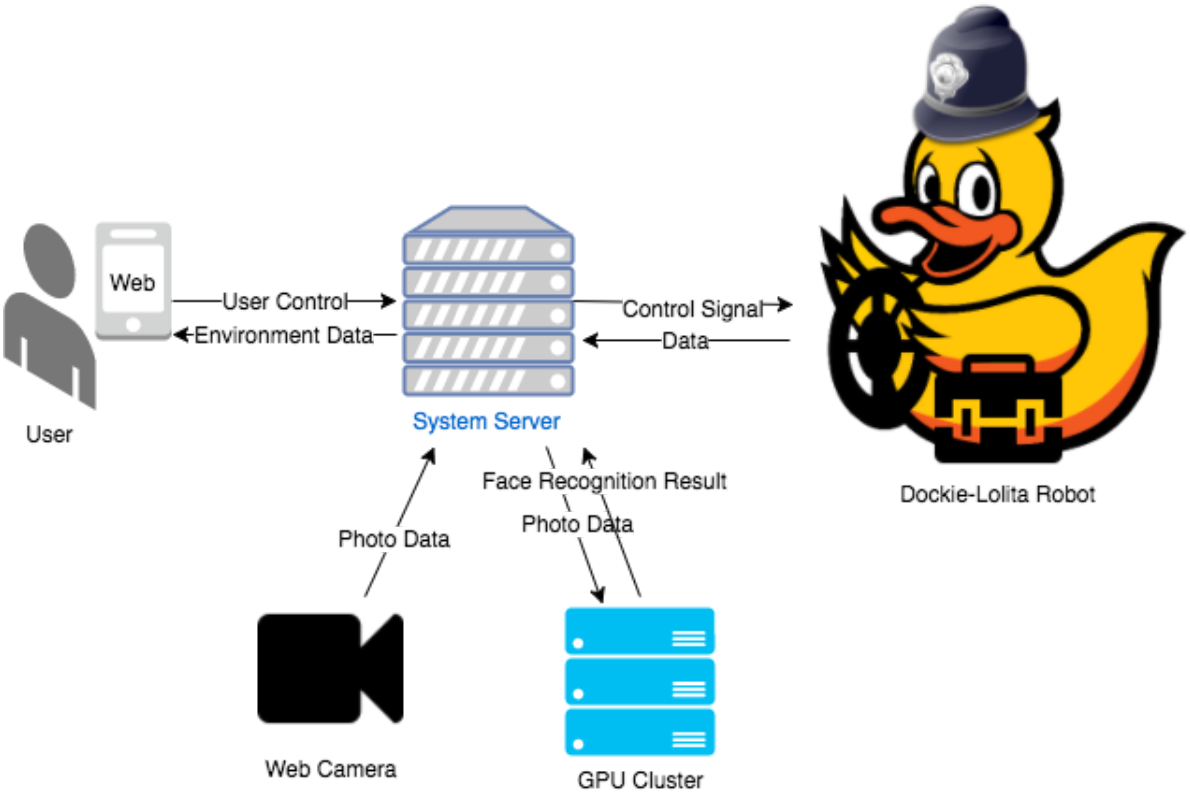
System architecture & Equipment

SYSTEM ARCHITECTURE



Robot

1. In Guard mode, environment datas are uploaded to the server routinely.
    a. To Velvet mode: Room assignments
    b. To Maid mode: Users enter or leave the house
2. In Velvet mode, the robot can be assigned to a specific room.
    a. To Maid mode: Users enter or leave the house
    b. To Guard mode: User commands
3. Whenever the user is leaving or coming home, the robot will enter Maid mode.
    a. Back to original mode after 5 seconds.



System Backend

The backend of Duckie-Lolita act as the communication medium between the system, the robot, and users.

1. The face recognition result from the GPU clusters will return to the server, and then the server will inform the changes of the state to the robot.
2. An online control panel is presented for users to change the state of robot. The user commands will be translated into car commands in the server, and be send to the robot.
3. The robot will send back the environment data of the house to the server.

EQUIPMENTS

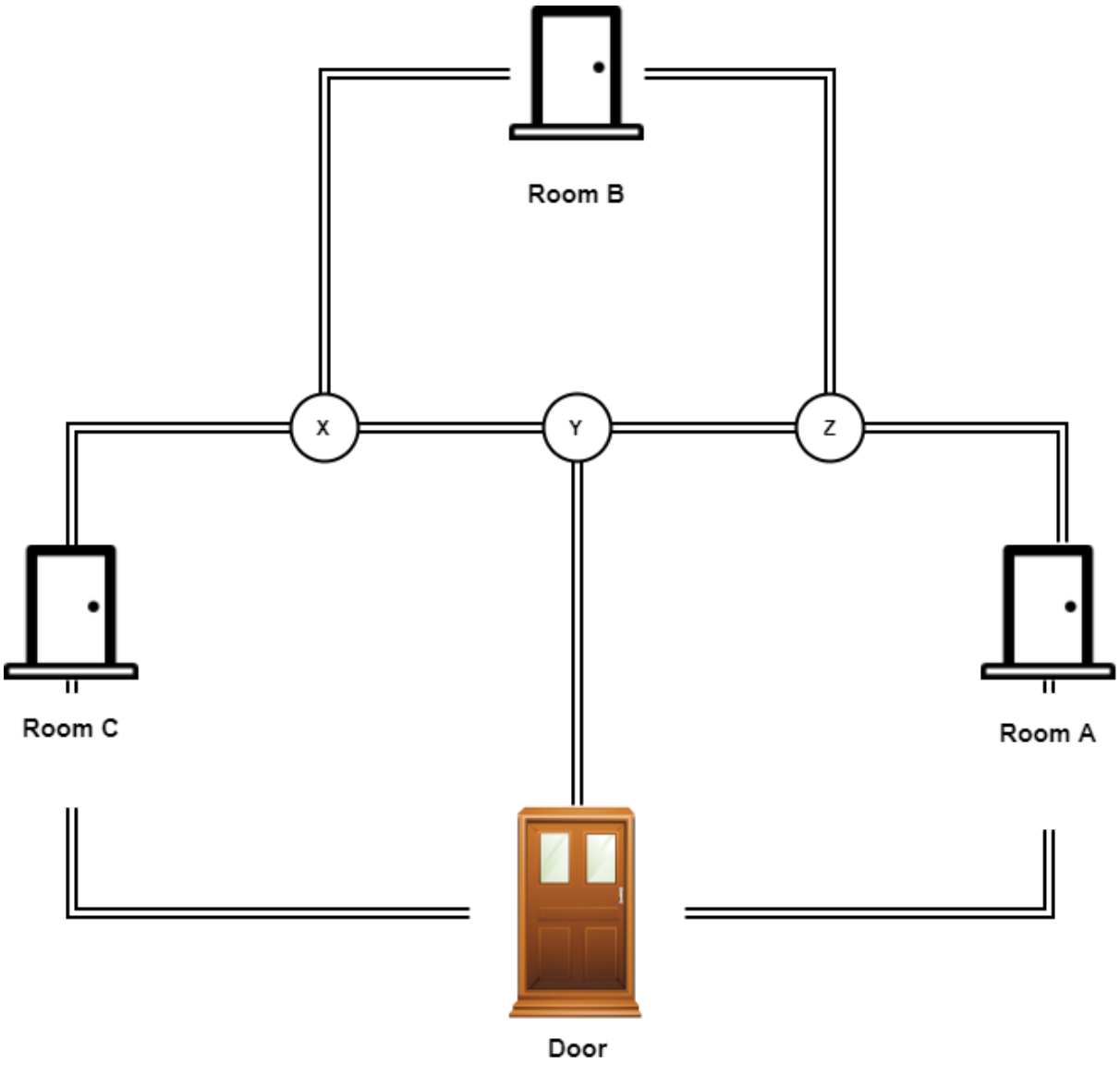
Exploring Environment

In order to exploring environment, we need some sensors in our Duckie-Lolita, including thermometer, hygrometer, ambient light sensor and sound sensor.

Object Avoidance

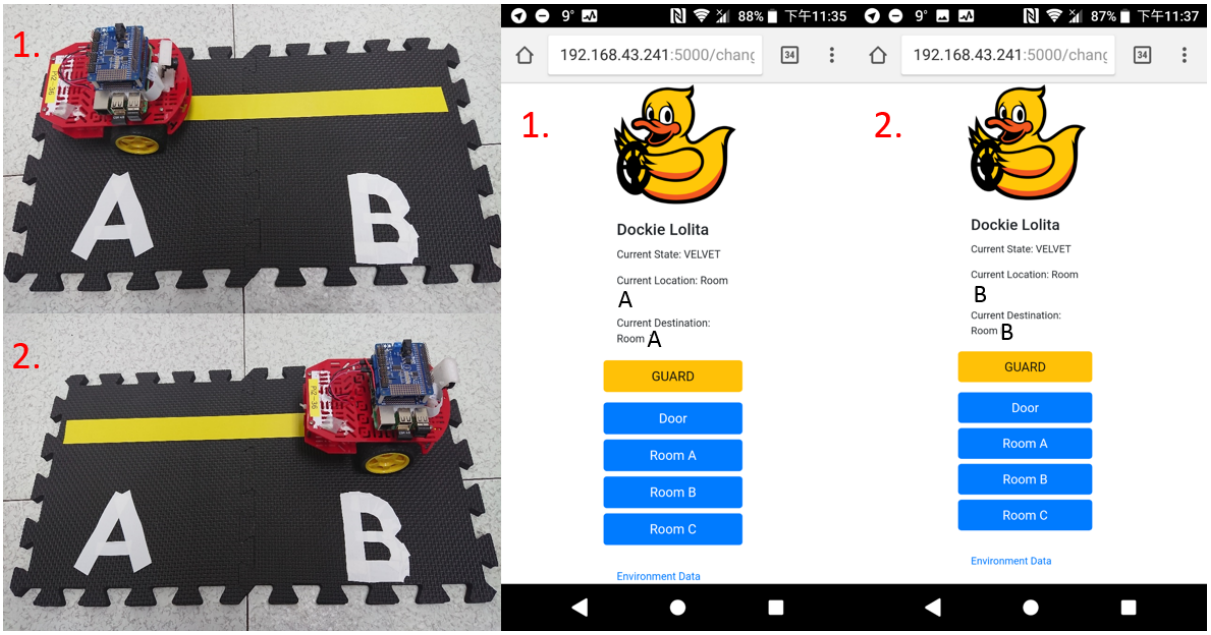
We implement object avoidance by using three ultrasonic sensors. Duckie-Lolita will know how to avoid obstacles by the variance of ultrasonic.

Functions & Approach



1. In order to let duckie go to the assigned room with shortest path, we construct a map and implement the algorithm- Dijkstra algorithm in our duckie and server.
2. face recognition.
3. In order to explore our environment and record sensor data, we use Arduino connected with sensors. After that, our duckie publishs command and subscribes sensor data from Arduino. Duckie can upload data to server and represent data to user.

Result



Application & Future Work

Duckie-Lolita system can be deployed to many applied fields such as campus area department stores etc. As a service robot, Duckie-Lolita can come to people's needs timely and reliably. Also, by providing detail information about the environment, the user is able to monitor their places easily. For the future work, we could further explore more complex context such as sending meals to a specific table or customer in the restaurant or paroling a shopping mall as a security guard in late night, where the robot needs to be much faster and more reliable. As for the further exploration under the context of housing environment, we could build up the system for the smart-city base on Duckie-Lolita.

References

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