

Homie



Src: Images.google.com

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Abstract

We propose to make the 'Homie' Bot. We have seen that households frequently require helpers to perform multiple jobs and in the long run, this sometimes proves to be costly. The Homie bot will be capable of performing quite a few functions. Firstly and primarily, it will be able to search for objects and point them out/ pick them up for you. We plan to implement this through canvassing and RFID/QR code implementation. Furthermore, we plan to implement functionalities in machine learning and image analysis to allow the Homie bot to help in household chores such as sorting clothes for washing, etc. This of course, would require RGB interpretations of photos taken.

Also, through the use of raspberry pi, speech recognition by means of python, we plan to keep the Homie Bot connected to the internet at almost all times! It can make sure that you get your sports updates, weather updates, all through web scraping and python implementations. We plan to extend the capabilities of this bot on the run.

Motivation

As college students who reside at a campus hostel, we quite often lose our things. We see great potential in this Bot, as at one point we believe it will be useful in a way that it will be able to bring you important objects such as medicine boxes in times of need. Additionally, we would definitely find it entertaining and useful to have a Bot that can provide us with valuable information, examples as mentioned in the abstract by simply asking.

Basic Functionalities

- Canvas a room for objects and point out a specific object by moving to its location. We aim to achieve this through the use of RFID tags and/or QR codes and/or alternate identification technology. With regard to RFID tags, this can be achieved by tracking heat signatures of an RFID tag. QR code based functionality will work on the basis of scanning and pointing. Orientation might cause minor difficulties with the use of QR codes, however this problem is solved via the use of RFID tags. This process could also be sped up through the use of Image analysis (python libraries such as OpenCV, or matlab/Octave will help in the same)
- Stay connected to the internet via the Raspberry Pi and sockets through python. We will also attempt to implement a web scraper (or web spider per say) to search for an access information off the net and read the output out to the user. This will be implemented on python as well. If need be, a google/twitter (depending on the required platform) API may be used as well.
- Perform certain household tasks which may be implemented on the run.

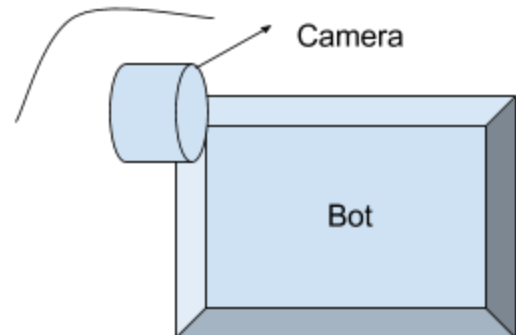
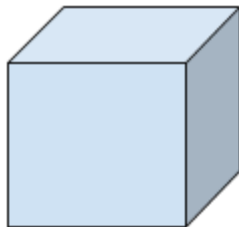
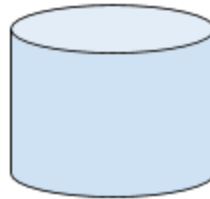
Material Required & Cost

- | | |
|---------------------------|----------|
| ● Raspberry Pi 3 Model B | Rs. 2900 |
| ● Logitech C270 HD Webcam | Rs. 1255 |
| ● 4 Motors | |
| ● L 293D Motor Controller | Rs. 340 |

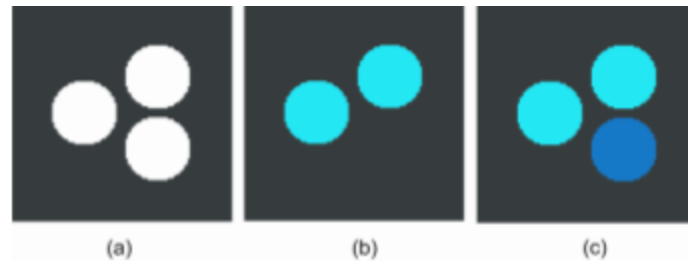
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|---------------------------|---------------------|
| • Ultrasonic Sensor | Rs 150-300 |
| • Jumper Cables | Rs 300 |
| • Breadboard | Rs 500-700 |
| • RFID Cards (UHF) | Rs 500 for 20 cards |
| • Bluetooth Module | Rs200-300 |
| • Tires | |
| • Servo Motor | |
| • Power bank/Battery Pack | |

Sketches

Consider two objects, one cylindrical and one cubical/cuboidal



One theory is that the bot can capture images of the objects and conduct an image segmentation to retrieve boundaries. If a match is found, the Bot can move towards the object and theoretically scan QR codes to find an object. RFID could be used for greater accuracy.



In case the image segmentation returns similar objects as demonstrated above, either certain color based analysis can be carried out, or the differentiation can be done with the help of QR codes as shown below

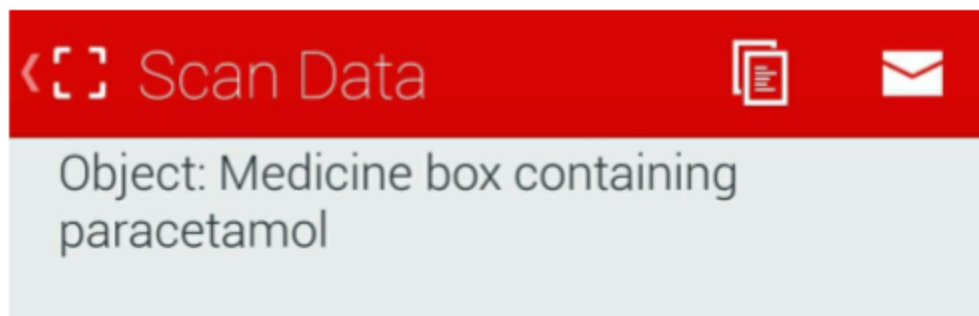


Information can be stored in QR codes. One possibility is that the bot can scan codes after analysing images to check whether the object is the one that we wish to search for.

QR and Segmentation Img src: images.google.com



I have generated a QR code containing certain information. On scanning this QR code, we get the information as shown below



Existing research and Models

Georgia Tech has come up with a PR2 Robot which works on RFID Technology, and it consists of an antenna on both shoulder, thereby moving towards the side with higher signal. In our model, we will try to enable image analysis to further help the analysis and identification of objects. We will also try to reduce the size and cost of the bot to enable accessibility and affordability.

Prospects

We can link image analysis with the internet so that it can analyze multiple images of the object and recognize it from various different angles.

Twitter API can be used so that it reads out your recent Tweets.

We can add a speaker so that it can respond to the questions you ask.

After scanning the qr code of the object we can also run a basic google search and get the products price from various online shopping sites.

It can bring certain objects such as medicine boxes in times of need. Also, timers can be set such that the Bot can bring you medicine at the right time. This application can be extended to many other objects.

Quite a few household chores could be automisable at later stages.

The final question - Is this possible?

Yes, several research papers have shown that UHF RFID tags can be used for localization of an object, however this hasn't proved to be accurate at times. We plan to try and improve on this accuracy by implementing methods such as but not limited to image analysis and QR code scanning.

References:

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<http://spectrum.ieee.org/autaton/robotics/robotics-hardware/robots-rfid-find-and-navigate-objects>

<http://www.qr-code-generator.com/>

<http://www.idea.org/blog/2011/09/05/what-are-qr-codes-and-how-are-they-useful-for-outreach/>