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IOT ROBOT

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ABSTRACT

The purpose of this project is to control robot with an interface board of the Raspberry Pi, sensors and software to full fill real time requirement. Controlling DC motors, different sensors, camera interfacing with raspberry Pi using GPIO pin. Live streaming, Command the robot easily, sends data of different sensors which works automatically or control from anywhere at any time. Design of the website control page and android application of Robot is done to control and monitor the robot activities. This system works on IoT concept which is Internet of Things, where all the physical devices will connect with digital systems. This will enable raspberry pi to be used for more robotic applications and cut down the cost for building an IoT robot.

1 Introduction

The research and development of raspberry pi controlled IoT based robot. It works as buddy or family member. IoT is Internet of thing where all the physical devices connects with digital systems, such as Refrigerator, TV, AC, Washing machine, Music system which can works automatically or control from anywhere. Data says by 2020 50 billions device will connect. Raspberry Pi is a credit-card sized computer. It is connected with the Internet and robot can be control as per my command.

Background/Motivation

User can see live streaming from computer device as website or phone application as camera is attached. Different buttons are there such as Forward, Reverse, Left, Right and Stop to control the Robot. Different sensors are attached with the device such as

Ultrasonic sensor, IR sensors to detect obstacle and distance and generate notifications and sends data to user. In smart home concepts it can add value in it. Security is always important at all the time, so there is unique login ID and password to control the Robot. First user have to sign up and using unique ID they will able to control it from anywhere at any time.

Aims & Objectives

To develop an IoT technology based Robot can be controlled by a mobile devices/ Laptops over the Wi-Fi from anywhere at any time.

The core objectives are:

- Gather system requirements
- Evaluate and study the platform required for the system
- Evaluate and study suitable development language, technologies and tools

- Evaluate Methods of Interface
- Program Raspberry Pi
- Interface board for dc motors
- Program Website & Control Page
- Evaluate and test the system
- Maintain system

1.3 Internet of Things

Internet of Things is visualized from three aspects: internet, things, semantic. The Internet of Things permits individuals and things to be associated anytime, anyplace, with anything and anyone, in a perfect world utilizing any way and any network. The enhancements made in the communication technologies, sensors and internet protocols made the IoT an enabling technology for all domains. The primary meaning of the IoT was from a things arranged point of view, where sensors were considered as things. Internet of things facilitates sensor communicates without the interference or involvement of humans and leads to the implementation of advanced class of applications. In the prime phase of internet of Things there is a revolutionary act in the mobile, internet and machine to machine technologies. With the further enhancements the Internet of things is expected to provide physical objects the power of decision making. An ample of physical objects are correlated with the Internet at an extraordinary amount accomplishing thought of the Internet of Things. There are likewise different domains and circumstances in which the IoT can assume a noteworthy part and enhance the nature of our lives. These applications incorporate transportation, automation, health care and

crisis response to common and man-made calamities where human decision making is troublesome. The Internet of Things endorse physical objects to think, see, listen and accomplish occupations by making them talk together, share data and facilitate decisions. The Internet of Things commutes the physical objects from traditional to smart by employing the fundamental technologies such as embedded devices, ubiquitous, communication technologies, pervasive computing and sensor networks and applications. The smart objects intended with the specific tasks comprise the domain level applications. The independent domain services comprise the ubiquitous and analytical services. The prime goal of Internet of Things is to assist the sensors and the actuators to correspond with each other. With a specific end goal to understand this potential development, rising advancements and benefit applications need to develop relatively to coordinate promote requests and client needs. The physical objects should be produced to fit user prerequisites regarding accessibility anyplace and at anytime. By the aid of new protocols the heterogeneous physical objects can communicate with each other. For delivering quality products to customer end, the architecture standardization must take place. Security and privacy are other vital prerequisites for the IoT because of the heterogeneity of the Internet associated objects and the capacity to monitor and control physical objects. Moreover, management and monitoring of the Internet of Things ought to happen to guarantee the

conveyance of high quality services to users at a low cost.the applications of IoT.

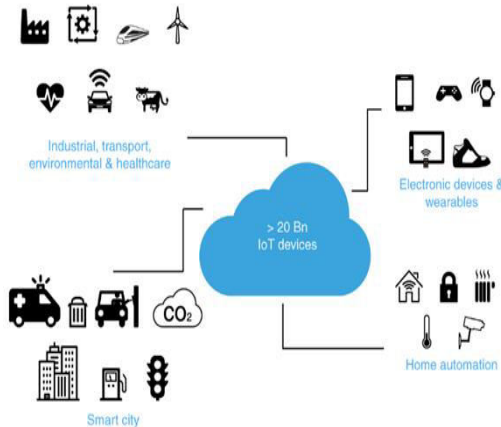


Figure 1.1: Potential Applications of Internet of Things

2 Design Methodology

The design consists more on actual planning of hardware part than the code to be created. A number of software and hardware implementation techniques were used to design and develop the system. Fig. 1 shows the block diagram of system. This section can be divided into many parts: Raspberry pi controller, Wifi dongle, Camera design, Power supply adapter, Ultrasonic sensor, IR sensors, and Motor control design. Block diagram is shows as below:



Figure 2 The initial block diagram for IOT Robot

Block diagram numbering are shown as below:

No.	Item	No.	Item
1	Raspberry Pi 3	6	IR Sensors
2	SD Card	7	Left Side DC Motor
3	Raspberry Pi Camera	8	Right Side DC Motor
4	5V Adapter	9	L293D Motor Driver Board
5	Ultrasonic Sensor	10	Battery

Table 2 No & Item included of Block Diagram

Components Details:

Different components of block diagram is described in details below.

Raspberry pi 3

The Micro SD card is used for installing OS and the complete project will be done with python coding. The board has specification:

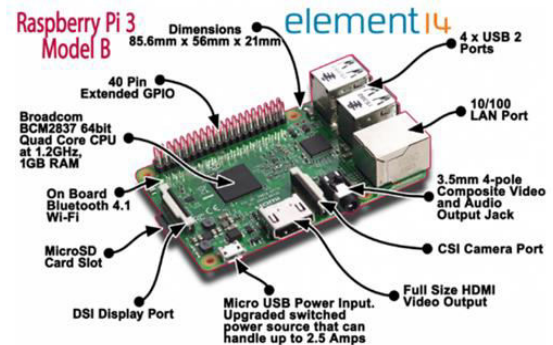


Figure 1.1 Raspberry Pi B+ model

- ARM Cortex-A53 1.4GHz CPU
- 1GB RAM
- 40 GPIO pins
- Ethernet Port
- Combined 3.5mm audio jack and composite video
- Camera Interface
- 4 USB ports
- Full HDMI port
- Display Interface
- Micro SD card Slot
- Video core IV 3D graphics core
- Wi-Fi and Bluetooth

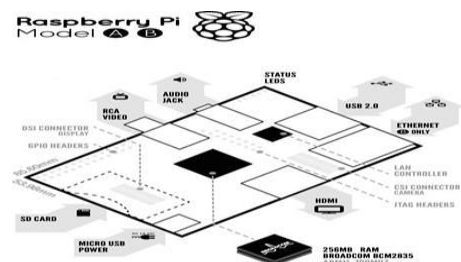


Figure 2.1.1 Structure of Raspberry Pi B+ model

Raspberry Pi Camera

The Raspberry Pi camera board contains a 5 MPixel sensor, and connects via a ribbon cable to the CSI connector on the Raspberry Pi. In Raspbian support can be enabled by the installing or upgrading to the latest version of the OS and then running Raspi-config and selecting the camera option. The cost of the camera module is 1600Rs. In India (10 May 2015) and supports 1080p, 720p, 640x480p video. The footprint dimensions are 25 mm x 20 mm x 9 mm. Since Raspberry Pi has a ready-to-use socket for camera cable, no extra cables or power supplies are needed.



5.1 Flow Chart

The flow chart describe the necessary steps to execute once in the beginning, then when the Raspberry Pi turn on all the compilation files and video streaming file execute at its own using startup.sh file.



Figure 5.1 Flow Chart to Control Robot

5 Results

The aim of the project is to develop a Robot on IoT based concept. It is working as buddy or family Member because you have to command it and control from anywhere at any time. If a personal wants to find something he/she has to command it from live steaming can see the actual scenario at that place and easily find out that object. It works as to take care for children's, pet at home, too. Carrying out unit test is kind of a pre-release of the system. Performing unit test in presence of supervisor ensures that final product had met all requirements. Unit

test results listed described in below showing table:

No.	Test case description	Test Result
1	Webcam image display	Accepted
2	Move Forward	Accepted
3	Move Reverse	Accepted
4	Turn Left	Accepted
5	Turn Right	Accepted
6	Stop	Accepted
7	Ultrasonic sensor reading	Accepted
8	IR Sensor reading	Accepted

The screenshots of the smart home app developed has been presented in Figure bellow.

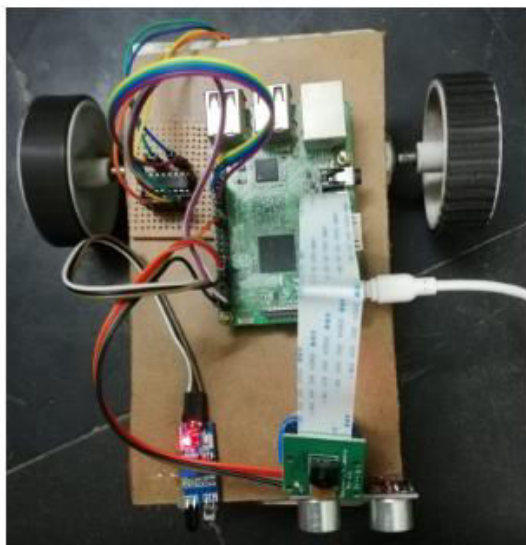


Figure 5.2.2 IOT Robot Structure

Discussion / Conclusion / Future Work

- During the whole period of the project I gained of lot of knowledge on the raspberry pi, motors and programming in java, MySQL. If we talk about the achievements out of the project when starting to do the project it was to control the motors using raspberry pi on a robot and transmit that data via any wireless technology to another device and able to

collect the data and control the robot or raspberry pi in a real time instance. Out of which all the work was completed. The main achievements that I gained out of the project were that I got to learn programming in kava and could learn how to program a user interface web page. Another main achievement was I could learn and understand the raspberry pi technology, the wide applications of raspberry pi and IoT. There are lots of many other areas where the raspberry pi could be used for robotic applications and that are the reasons for me to choose this project.

Conclusion

To get to the aim of a project there will be always a set of objectives, to achieve that objectives we need to know how where and with what resource is the step towards completing the objectives taken. Now in this project too to get to the aim of the project there was a set of objectives, which gradually changed as the project research was completed and then while testing a certain technology the objectives again changed due to the failure of the method. Now the first thing of the project is a good research, I had to do a wide and a strong research before I started to put my objectives as this technology was new in market.

The research for the project was done using Advanced Google search and also from the search engines available in the student portal like tutorials and raspberry pi.

Future Work

In the future this raspberry pi technology can be used in various different fields of

work. The buddy robot can be made autonomous with the help of more sensor, gyroscope, compass and a GPS. So that it can be set to a target or a specific area where in can monitor. The robot can also be developed into an advanced robot toy for young people. Others future works described below:

- Face recognition: All the family members face images are stored in controller when an unknown person will come at door, it will create alert and click the image and send it to user.
- In changing the Mechanical design work using the same concept, different functions as Open the door, Turn on/off switch, bring newspaper for user, etc work can be done.
- Adding the Pneumatics design in Mechanical design robot can walk, go up and down and it will be control from anywhere at any time.

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