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Implementation of Spy Robot for a Surveillance System Using Raspberry PI

Dr. Karthikumar.K[1], Natarajan.S[2], Valli Nayagam.S[3] ,Venkatesh.S.M.K[4] ,Koushik.V.L[5]

Assistant Professor, Department of Electrical and Electronics Engineering, Vel Tech, Chennai, Tamil Nadu, India[1,2]

UG Student, Department of Electrical and Electronics Engineering, Vel Tech, Chennai, Tamil Nadu, India[3 to 5]

ABSTRACT: The advancement in technology today IOT makes all objects interconnected and it has been recognized as the next technical revolution. Health monitoring system using IOT describes the collection and interoperation of patient data collected from the sensors from the hospitals through IOT Technology. The collected sensor data will support the doctor in the emergency situation for the betterment and improvement of patient health. The hardware platform to implement the project consists of bio sensors and Raspberry Pi 3 Model-B equipped in a way to communicate with a doctor through the internet and smart phone. This proposed idea will help doctors to monitor the patient anywhere in the world and to know about the state of patient health. In this proposed idea the sensors gather the medical information of the patient that includes patient's body temperature and heart rate and a camera to lively monitor patient. After analyzing the data doctor can prescribe the medication based on the results. This prototype will minimize the burden on patients to visit the doctors every time for health check-up.

KEYWORDS: raspberry pi3, arduino, bio sensors**.**

I. INTRODUCTION

The entire proposed system consists of a Raspberry pi Model 3 board, PIR and IRs sensors, L298N motor driver, and robot chassis. The Raspberry pi is a credit card size single board small, inexpensive computer developed in the United Kingdom by the educational charity Raspberry pi Foundation. Raspberry pi has included software such as Python, Java, Scratch, Mathematica, Sonic Pi and more which enables users to teach programming and design animation, game, interesting video, etc [10]. In addition, programmers can also develop scripts or program using the Python language and it is the main core language in the Raspbian operating system. Python language has been used in this project to write the script for client/server communication. The Raspberry pi 3 Model-B is the 3rd generation Raspberry pi minicomputer with a 64-bit 1.2GHz quad-core processor, 1GB RAM, WiFi and Bluetooth 4.1 controllers. It also has 4 x USB 2.0 ports, 10/100 Ethernet, 40 GPIO pins, Full-size HDMI 1.3a port, Camera interface (CSI), Combined 3.5mm analog audio and composite video jack, a Display interface (DSI), MicroSD slot and VideoCore IV multimedia/3D graphics core @ 400MHz/300MHz. The GPIO18 (Physical pin 12) of Raspberry Pi is connected to the PIR motion sensor. The GPIO23 (Physical pin 16) and the GPIO24 (Physical pin 18) are connected to the Left IR sensor, and Right IR sensor respectively. The GPIO27 (Physical pin 13) and the GPIO22 (Physical pin 15) are connected to IN1 and IN2 of L298N module respectively, to drive the left motor. The GPIO20 (Physical pin 38) and the GPIO21 (Physical pin 40) are connected to IN3 and IN4 of L298N module respectively, to drive the right motor.

The Raspberry pi Camera V1 is 5MP static sensitive type camera. It is a small PCB on which an Omnivision OV5647 camera module [11].The pi camera module is connected to CSI port of Raspberry pi. When pi starts and logged in to desktop then type raspistill –o image.jpg command in prompt and press enter. The image will storing as *image.jpg* and able to view in GUI which will confirm the running of pi camera.Python script is used to control the pi camera and capture the image. A Passive Infra Red (PIR) sensor is a pyroelectric device which detects level of IR radiation from the living objects. The PIR device does not emit an IR signal, rather passively detects the infrared radiations coming from the human body in

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the surrounding area. The PIR sensor has a bunch of supporting circuitry. The detected infraredpulses are passed to FET amplifier circuit which willreset or set the sensor output. The PIR sensor will set the output (logic '1') when the living body within the range approximately less than 10meters and otherwise it reset the output. The PIR sensor module has three terminals: Pin1 is connected to the drain terminal, Pin2 corresponds to the output terminal of sensor, and Pin3 is connected to the ground.It is used in many systems because low-power, inexpensive and easy to interface with all type of microcontrollers.

The motors assembly includes the Robot chassis and two DC geared motors. The L293D IC is a dual H-bridge motor controller, which is typically used to control the motor speed and direction. This driver module is supplies a high current and high voltage to connected DC motors have developed by C.Nagarajan et al [12-14]. It can drive up to two DC motors 1A each.The Raspberry pi 3 comes with inbuilt WiFi and Bluetooth controller features. An inbuilt WI-Fi controller is used for connecting Raspberry Pi to WI-Fi router and the router is connected to the local area network (LAN) for providing internet connectivity to the Raspberry pi. Once the IP assigned to Raspberry pi and it establishes the internet connection with LAN through a router.

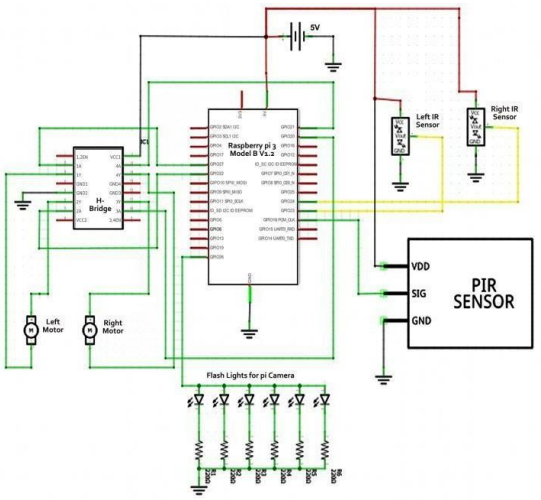

Figure 1. The schematic diagram of the proposed system

The schematic diagram ofthe spy robot for a surveillance system is shown in Figure2. The major intention of this system is to capture images when the human-being is present in the Robot's ambient and transmit it as soon as possible to the storage which can be accessed through a webpage. The Robot is developed by using DC geared motors, which is controlled through the GPIO pins of the Raspberry Pi. The Python programming language is used to operate the robot. Furthermore, the webpage is used to monitor the status of the sensors and the action of spy robot is controller though IoT. The Raspberry pi camera continuously captures the image and it is saved on the SD card of the Raspberry pi module. This image is displayed on the webpage using HDML and PHP scripts [13]. Buttons for every function have been created. When a button is clicked upon, the corresponding macro is called from the python script resulting in the corresponding GPIOs being made LOW or HIGH. Then the IR sensors determine the obstacles and show the status of each IR, and according to the state of the obstacle the robot moves the opposite direction. In addition, the LDR sensor is used to provide a flashlight for camera at night.

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II. SOFTWARE DESIGNAND IMPLEMENTATION

Python Source Code for Raspberry Pi

The entire system is based on a Raspbian operating system like Linux platform. The Raspbian OS is based on Debian that optimizes the Raspberry Pi hardware. The programming language which is utilized for coding is Python. Python referred to as a widely used high-level programming language for general-purpose programming. Python language is created by Guido van Rossum and was released in 1991. Besides Python is interpreted language which has a design philosophy that emphasizes code readability. It uses white space indentation to delimit code blocks rather than keywords or curly braces. A syntax which permits users to express concepts in lesser lines of code than possible in languages such as Java or C++. Python programming language has a compiler that runs automatically when the Python source code (.by file) is executed in the terminal, and the .pic file is generated [14]. The Figure 3 illustrates the software design flow of spy robot for a surveillance system. Basically, the functionality of system clarifies the cyclic phase rotation for robot movement. From the flowchart, the invoking sequence and the relationship between various functions are visualized.

HTML JavaScript

HTML provides the basic structure of sites, which is improved and customized by other technologies like CSS and JavaScript. CSS is used to control presentation, layout and formatting. JavaScript is used to control the performance of different elements. Bootstrap is the most popular HTML, CSS, and JavaScript front end framework for developing web pages, mobile web sites and more. Bootstrap is completely free to use.The Internet of Things (IoT) can be considered as a global network which enables the communication between human to human, humantothings and thingstothings [15]. It is anything in the world by providing unique identity to each and every object. The commands can be sent through the web page with the help of internet. The user control command can be sent from anywhere in the world through web page. The robot is controlled from remote place which isolates the human being from dangerous environments.

As the main code is being executed, first, the robot will move forward, checks for human-being in the field, and IR sensors checking for obstacles might come before the robot, the robot will do these processes simultaneously. When the user giving inputs from the webpage, it is stored in server as a text file. At robot end the Raspberry pi running the python script which will read the text file and execute the command according the user inputs. The Raspberry pi is connected the H- bridge IC L293D which will control the direction of motors based on command received from user. From the website the user clicks on the forward button, the robot moves forward and similar movements are achieved for reverse, left and right. Once spy robot gets turned on, user can see the photograph of moving living objects in web page which are taken by pi camera.

Figure 4 shows the web page of secured spy robot for a surveillance system. The webpage can be used to monitorand control the spy robot by displaying all sensor status, and

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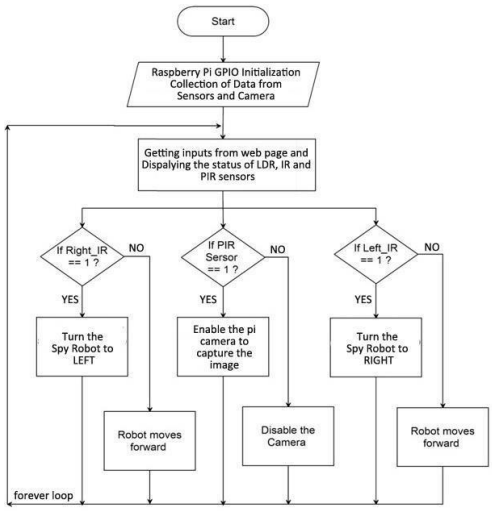

Figure 2. The software design flow of Spy Robot for a surveillance system

Figure 3. shows the web page of secured spy robot for a surveillance system

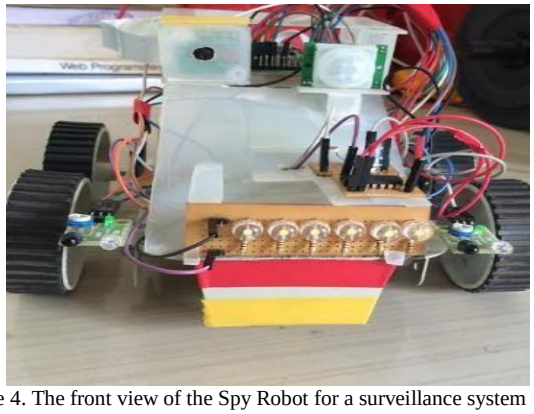

Figure 4. The front view of the Spy Robot for a surveillance system

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III. CONCLUSION

The Spy Robot used for this secure purpose can operate effectively in order to collect various types of information that required by users. For instance, the presence or absence of the unwanted folks in war areas whose are not allowed in such areas can be determined by the PIR sensor which sends a signal to the Raspberry Pi when a human - being is in the ambient of the Robot. In turn, the Pi triggers the camera module immediately to capture an image and send it to the web page. The PIR sensor and proximity sensors are activated depend on external stimuli via IoT. The control room collects this information for later reference. The brain of the spy robot is the Raspberry Pi minicomputer. The Robot is operated by three modes. Firstly, only run the code and leave the Robot to navigate freely based on the sensor status. Secondly, control the moving to a specific direction by the Laptop Keyboard. Thirdly, monitor the information available on the web page, and control accordingly with various buttons.

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