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INTRUSION DETECTION SYTEM USING REGULATED PATROLLING ROBOT FOR APARTMENTS

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Abstract: The main objective behind this project is to develop a robot to perform the act of surveillance in domestic areas. Nowadays robot plays a vital role in our day to day life activities thus reducing human labour and human error. Robots can be manually controlled or can be automatic based on the requirement. The purpose of this robot is to roam around and provide audio and video information from the given environment and to send that obtained information to the user. In this project, one can control the robot with the help of mobile or laptop through Internet of Things (IoT) and also can get the live streaming of video both in daytime as well as at night with the help of wireless camera from the robot. The robot can be controlled both manually as well as automatically with the help of Arduino microcontroller. This robot also uses various sensors that collects data and sends it to the Arduino microcontroller which controls the robot behavior. Along with the obtained live streamed video output, user can also obtain the presence of object detectors. Thus the action of surveillance can be performed. Further advancement in our project can provide surveillance even in defense areas.

***Keywords*- Node MCU, Smart Camera, ESP-8266 microcontroller, MotorDriver**

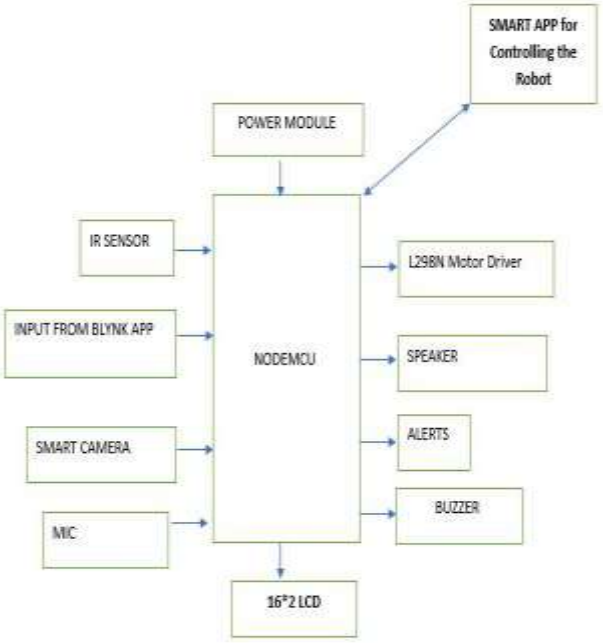
I. INTRODUCTION

Technology has brought a dynamic and tremendous change in robotics and automation field which ranges in all kinds of areas. Surveillance is the process of close systematic observation or supervision maintained over a person, group, etc. especially one in custody or under suspicion. Thus surveillance is mainly required in the areas such as border areas, public places, offices and in industries. It is mainly used for monitoring activities. The act of surveillance can be performed both indoor as well as in outdoor areas by humans or with the help of embedded systems such as robots and other automation devices. A robot is nothing but an automatic electronic machine that is capable of performing programmed activities thus replacing human work, providing highly accurate results and easily overcoming the limitations of human beings. Thus replacing humans in the surveillance fields is one of the great advancement in robotics.The robot consists of Arduino Uno microcontroller which acts as the heart piece of the robot. This robot also consists of DC motors, wheel chassis, battery,Wi-Fi module (ESP8266 12e) and various types of sensors such as ultrasonic sensor for obstacle detection, IR sensor for detecting pits.The robot can be either operated automatically or manually. User end communicates with the robot by implementing the concept of Internet Of Things. This can be achieved through arduino software, which is used for IOT developing projects. The commands are sent to the robot by means of arduino software and they are received by Arduino microcontroller via Wi-Fi module since both are interfaced with each other. Thus the robot can be controlled in a wireless manner. In this project, we use wireless transmitting camera that provides audio and video information that can be received at the user end.

II. PROPOSED METHODOLOGY

The system is divided into two key sections: the user section and the robot section. In this case, the user portion may have a laptop or a mobile device to communicate with the robot end. Thus, by using a laptop or a mobile device, the user section can be more portable than those who use a traditional stationary computer system. Our smart devices can be used for communication. To put the idea of expanding the range into action, we can connect the user section to the internet, which is the core premise of the Internet of Things. The Blynk software is used to connect the user system to the internet. This is used to create prototypes and IoT applications. Thus, we can transmit commands and simply control the robotic car using the Blynk program.At the robot end, we use an ESP-8266 microcontroller mounted on the robot's body or chassis, which is an intrinsic part of the robotic vehicle. The wheels are coupled to DC motors with 60 rpm each beneath the chassis. Each motor requires a 12v power, which is provided by an external battery source. The motors are linked to the Controller through a motor driver.Motor drivers are utilized for two motors and are used for amplification. The microcontroller is programmed using IDE software to move the robot in the proper directions. This is the corresponding manual mode operation. Several sensors, such as ultrasonic sensors, are also used and interfaced with the microcontroller via the I/O pins.The IR sensor works on the reflection principle, which means that obstacles are identified through signal transmission and reception. In Similarly, infrared sensors are used to emit and detect infrared radiations, allowing changes in temperature to be detected. Here, we are adding one more sensor called PIR for motion detection.When motion is detected, the camera rotates in that direction and also ir light on for visibility. A high resolution night vision camera with 360-degree rotation and verbal communication is another unique aspect of this project.

III. DESIGN



1) **ESP-12E Wi-Fi Module (esp8266):** ESP8266EX offers a complete and self-contained Wi-Fi networking solution; it can be used to host the application or to offload Wi-Fi networking functions from another application processor. When ESP8266EX hosts the application, it boots up directly from an external flash.ESP8266EX is among the most integrated Wi-Fi chip in the industry; it integrates the antenna switches, RF balun, power amplifier, low noise receive amplifier, filters, power management modules, it requires minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area.

2) **IR Sensor:** The IR Sensor-Single is a general purpose proximity sensor. Here we use it for collision detection. The module consists of an IR emitter and IR receiver pair. The high precision IR receiver always detects an IR signal. The module consists of 358 comparator IC. The output of sensor is high whenever it IR frequency and low otherwise. The on-board LED indicator helps user to check status of the sensor without using any additional hardware. The power consumption of this module is low. It gives a digital output. Based on a simple basic Idea, this IR obstacle sensor is easy to build, easy to calibrate and still, it provides a detection range of 10- 30 cm. This sensor can be used for most indoor applications where no important ambient light is present. It is the same principle in ALL Infra-Red proximity sensors. The basic idea is to send infra red light through IR-LEDs, which is then reflected by any object in front of the sensor.

3) **Buzzer:** The electric buzzer was invented in 1831 by Joseph Henry. They were mainly used in earlydoorbells until they were phased out in the early 1930s in favour of musical chimes, which had a softer tone.Early devices were based on an electromechanical system identical to an electric bell without the metal gong. Similarly, a relay may be connected to interrupt its own actuating current, causing the contacts to buzz. Often these units were anchored to a wall or ceiling to use it as a sounding board. The word "buzzer" comes from the rasping noise that electromechanical buzzers made.

4) **L293D Motor Driver IC:** L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. The l293d can drive small and quiet big motors as well, check the Voltage Specification at the end of this page for more info. The L293 and L293D devices are quadruple high current half H-drivers .The L293D is designed to provide bi directional drive currents of upto 1A at voltages from 4.4 to 36 V. The L293D is designed to provide bi directional drive currents of upto 600-m A at voltages from 4.5V to 36V.Both devices are designed to drive inductive loads such as relays, solenoids, DC and bipolar stepping motors as well as other high current/high voltage loads in positive supply applications.

5) **DC Gear Motors:** Electric motors are broadly classified into two different categories: Direct Current (DC) motor and Alternating Current (AC) motor. In this article we are going to discuss about the DC motor and it's working. And also how a gear DC motors works. A DC motor is an electric motor that runs on direct current power. In any electric motor, operation is dependent upon simple electromagnetism. A current carrying conductor generates a magnetic field, when this is then placed in an external magnetic field, it will encounter a force proportional to the current in the conductor and to the strength of the external magnetic field. It is a device which converts electrical energy to mechanical energy. It works on the fact that a current carrying conductor placed in a magnetic field experiences a force which causes it to rotate with respect to its original position. Practical DC Motor consists of field windings to provide the magnetic flux and armature which acts as the conductor.

6) **Wireless Camera:** We have introduced most advanced technology for V380 Indoor Security IP Camera, integrated with various features of HD 1080P 60fps, POE(Power Over Ethernet), P2P and Auto HD IR-CUT and so on, which bring you a very and vivid image and also offers a immersive illusion. Beside, with 360 degree globe panoramic IP Camera,viewing what is in range of the camera, you can also have a video surveillance in every corner of your house as well. Built-in microphone

and speaker, there is no problem for talking with someone wherever the IP Camera is set up directly from your mobile device. V380 Camera also will be provided with cloud service, all of you will not worry about the loss of video and you can record all playback what you want. Moreover, V380 IP camera is for surveillance and monitoring, truly achieves families protection, it can be regard as a baby monitor when you are on business, also can use for pets in the daily life, which you can enjoy the happiness even when you are abroad. Never lose such a household artifacts.

IV. INSTALLATION

1) **Arduino IDE:** Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Fig 1: Arduino board

2) **IoT Cloud –Blynk:** Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it and do many other cool things.Blynk is a platform with iOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet It's a digital dashboard where you can build a graphic interface for your project by

Fig 2: IoT Cloud-Blynk

simply dragging and dropping widgets. It's really simple to set everything up and you'll start tinkering in less than 5 mins. Blynk is not tied to some specific board or shield. Instead, it's supporting hardware of your choice. Whether your Arduino or Raspberry Pi is linked to the Internet over Wi-Fi, Ethernet or this new ESP8266 chip, Blynk will get you online and ready for the Internet Of Your Things.

Step 1

First you must have your Arduino board (you can choose your favorite board) and a USB cable. In case you use Arduino UNO,Arduino Duemilanove, Nano, Arduino Mega 2560, or Diecimila, you will need a standard USB cable (A plug to B plug), the kind you would connect to a USB printer as shown in the following image.

Step 2 Download Arduino IDE Software

You can get different versions of Arduino IDE from the Download page on the Arduino Official website. You must select your software , which is compatible with your operating system (Windows, IOS, or Linux). After your file download is complete, unzip the file.

Step 3 Power up your board

The Arduino Uno, Mega, Duemilanove and Arduino Nano automatically draw power from either, the USB connection to the computer or an external power supply. If you are using an Arduino Diecimila, you have to make sure that the board is configured to draw power from the USB connection. The power source is selected with a jumper, a small piece of plastic that fits onto two of the three pins between the USB and power jacks. Check that it is on the two pins closest to the USB port. Connect the Arduino board to your computer using the USB cable. The green power LED (labeled PWR) should glow

Step 4 Launch Arduino IDE

After your Arduino IDE software is downloaded, you need to unzip the folder. Inside the folder, you can find the application icon with an infinity label (application.exe). Double-click the icon to start the IDE.

Step 5 Open your first project

Once the software starts, you have two options:

- Create a new project.
- Open an existing project example.

To create a new project, select File --> New.

Here, we are selecting just one of the examples with the name Blink. It turns the LED on and off with some time delay. You can select any other example from the list.

Step 6 Select your Arduino board

To avoid any error while uploading your program to the board, you must select the correct Arduino board name, which matches with the board connected to your computer. Go to Tools -> Board and select your board

Here, we have selected Arduino Uno board according to our tutorial, but you must select the name matching the board that you are using.

Step 7 Select your serial port

Select the serial device of the Arduino board. Go to Tools -> Serial Port menu. This is likely to be COM3 or higher (COM1 and COM2 are usually reserved for hardware serial ports). To find out, you can disconnect your Arduino board and re-open the menu, the entry that disappears should be of the Arduino board. Reconnect the board and select that serial port.

Step 8: Upload the program to your board

Before explaining how we can upload our program to the board, we must demonstrate the function of each symbol appearing in the Arduino IDE toolbar.

V. RESULTS AND DISCUSSION:

In this Project, the overall design for a video streaming wheel robot which is controlled using Nodemcu and a webpage designed using Blynk and Arduino. This is mainly a surveillance robot which streams live video via camera module through internet and displayed on the smart mobile which is used to control the robot movement. The robot's movement is manual and can be monitored/controlled on the webpage. After the installation and setup of the blynk and smart camera the following steps were used in order to check the outputs of the project.

Fig 3: Total Robot image at Stop Position & Controlling App Screen shot

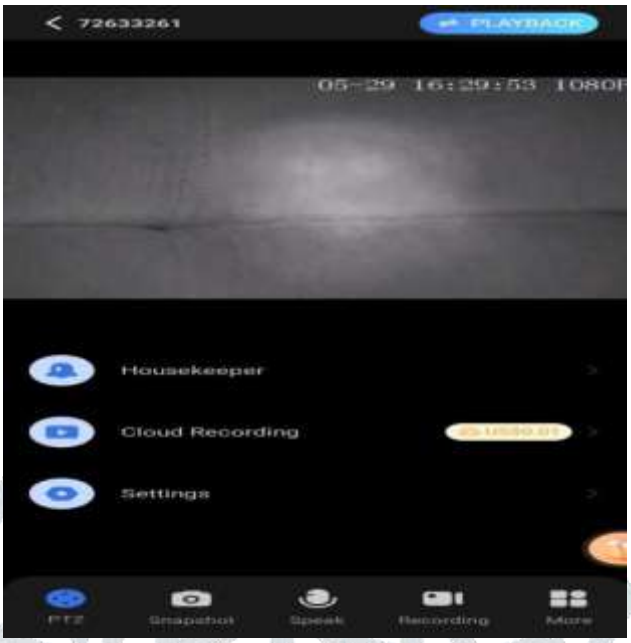


Fig 4: Camera position and live in Smart Mobile

Fig 5: Controling the robot in Smart Mobile

VI. CONCLUSION

In this project the framework for making a robot for surveillance purpose is proposed. It overcomes the problem of limited range surveillance by using the concept of IOT. We can control the robot with the help of laptop/mobile manually. Automatic monitoring can also be done. Our proposed robot is small in size thus maneuvering into area where human access is impossible. Wireless technology is one of the most integral technologies in the electronics field. This technology is used to serve our project as a supreme part of surveillance act. This provides highly efficient and a cost effective robot that replaces human work and reduces human labor and performing monitoring works in a well effective manner.

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