Design and Implementation of Wireless Controlled Surveillance Robot using IOT & BOT

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Abstract— The project aims at designing a robot pertaining to the importance of security without the use of patrol services on road. The total system consists of a mobile robot with a camera mounted upon it and is controlled through the Bluetooth. This provides the user with wireless monitoring and controlling of the robot. The robot is designed in such a way that it provides high level surveillance using IoT (Internet of Things) & BoT (Bluetooth of Things). This system uses Video and Voice Oriented Protocol (VVOIP) through an application called IP Webcam. The proposed system is an embedded based robotic module which can be navigated using servo motors to get the accurate navigation. The user has an access of the video, transmitted from a remote area or any place under surveillance.
Key words: Robot, camera, wireless, surveillance, IoT, BoT, VVOIP, vide

I. INTRODUCTION

A mobile robot is a machine that is basically placed or mounted on a movable platform and can be operated with the help of certain instructions. The combination of mobile devices and robots are leading to new ideas in lots of fields. The design of a given robotic system often incorporates principles of mechanical engineering, electronic engineering, and computer science particularly artificial intelligence. Surveillance system with robotics control provides great solutions for various controlling purposes.

This project aims to design the importance of security without patrol services on road at night time. This also serves to be helpful in rescue operation. The robot is designed in such a way that it provides high level surveillance using IoT (Internet of Things) & BoT (Bluetooth of Things). This system uses Video and Voice Oriented Protocol (VVOIP) through an application called IP Webcam. It is an embedded based robotic module which can be navigated using servo motors to get the accurate navigation. The user has an access of the video transmitted from a remote area or any place under surveillance.

The proposed system is an implementation of the application for the mobile devices that run on Android operating system; which manually controls the Arduino based robot using wireless Bluetooth technology. It also describes the use of the camera mounted on the robot that can wirelessly transmit real time video feed onto the designed android application using Wi-Fi technology. The application allows the robot control interactions with the help of GUI.
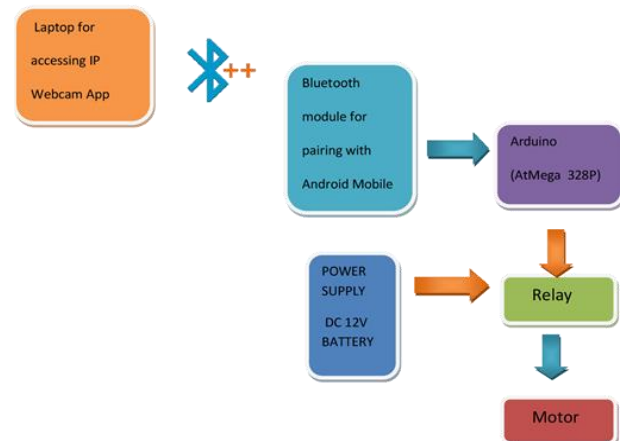
II. BLOCK DIAGRAM OF THE PROPOSED SYSTEM

Fig. 1: Block Diagram of Surveillance Robot.

The above diagram illustrates the block diagram of the proposed system.
It mainly consists of:

– Remote/host system/laptop: This is used to receive the video streaming of the surroundings in which the bot is placed.
– Bluetooth module: This is used to provide serial communication with the Arduino board. It receives commands from an android application and passes it to the Arduino board based on which the motors of the bot move accordingly.
– Arduino: This is a single board microcontroller, intended to make the application of interactive objects or environments more accessible.
– Relay: This is used in order to step up the incoming power coming from the Arduino microcontroller.
– Motor: In this system a 12V motor is used for the movement of the robot in a specific direction according to the given commands.
– Power supply: The power supplied to the robot is through a 12V and 7A battery which enhances the working of the bot efficiently.

III. DESIGN AND IMPLEMENTATION OF THE PROPOSED SYSTEM

A. Design:

1) Arduino Board:
Arduino is a single board microcontroller, intended to make the application of interactive objects or environments more accessible. The hardware consists of an open source hardware board designed around an 8-bit Atmel AVR microcontroller, or a 32-bit Atmel ARM. Pre-programmed into the on-board microcontroller chip is a boot-loader that allows uploading programs into the microcontroller memory without needing a chip/device programmer.

An Arduino board consists of an Atmel 8-bit microcontroller with complementary components to facilitate programming and incorporation into other circuits. Most boards include a 5 volt linear regulator and a 16 MHz crystal oscillator or ceramic resonator in some variants.

Fig. 2: Arduino Board.

2) Relay:

A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contractor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays".

3) DC Motors:

Almost every mechanical movement that we see around us is accomplished by an electric motor. Electric machines are a means of converting energy. Motors take electrical energy and produce mechanical energy. Electric motors are used to power hundreds of devices we use in everyday life. Motors come in various sizes. Huge motors that can take loads of 1000's of Horsepower are typically used in the industry. Some examples of large motor applications include elevators, electric trains, hoists, and heavy metal rolling mills. Examples of small motor applications include motors used in automobiles, robots, hand power tools and food blenders. Micro-machines are electric machines with parts the size of red blood cells, and find many applications in medicine.

4) HC Serial Bluetooth:

HC serial Bluetooth products consist of Bluetooth serial interface module and Bluetooth adapter. Bluetooth serial module is used for converting serial port to Bluetooth. These modules have two modes: master and slaver device. The device named after even number is defined to be master or slaver when out of factory and can't be changed to the other mode. But for the device named after odd number, users can set the work mode (master or slaver) of the device by AT commands.

5) Softwares used:

a)   Arduino software:

The Arduino Integrated Development Environment is a cross-platform application written in Java, and is derived from the IDE for the Processing programming language and the Wiring projects. It includes a code editor with features such as syntax high-lighting, braces matching and automatic indentation, and is also capable of compiling and uploading programs to the board with a single click. A program or code written for Arduino is called a "sketch". Arduino programs are written in C or C++. Users only need define two functions to make a run able cyclic executive program:

Setup(): a function run once at the start of a program that can initialize settings.

Loop(): a function called repeatedly until the board powers off.

b)   IP Webcam:

IP Webcam turns your phone into a network camera with multiple viewing options. View your camera on any platform with VLC player or web browser. Stream video inside Wi-Fi network without internet access. Optional video cloud broadcasting is supported for instant global access.

Two-way audio supported in tiny Cam monitor on another android device. Use IP Webcam with third-party MJPG software, including video surveillance software, security monitors and most audio players.

c)   Bluetooth SPP Pro:

The software for the Bluetooth client communication tools i.e; Bluetooth slave mode, Bluetooth serial communication can be tested. This can connect a Bluetooth MCU and PC serial port. This supports android 4.0 version of the system.

If the connected Bluetooth device is not paired, the system will automatically prompt you for pairing. Bluetooth pairing is successful and can be connected again and again.

This can only connect Bluetooth serial module devices as they are generally used for MCU serial communication.

B. Implementation:

The camera in the mobile device attached to the robot, captures live data of the surroundings and transmits it to the host device through the internet. The user at the host device observes the data on a laptop using a specific application called IP Webcam. Accordingly, the movement of the robot is achieved through a Bluetooth application which is in turn accessed through another mobile device. The robot is equipped with a Bluetooth module, an Arduino board, a 4-channel and 2-channel relay module, 3 servo motors and 4 wheels. The Arduino receives commands from the HC Bluetooth module and thus passes the signals to the motors to enable the movement of the robot. This way the surroundings of the robot are brought under surveillance thus eliminating the need of human effort.
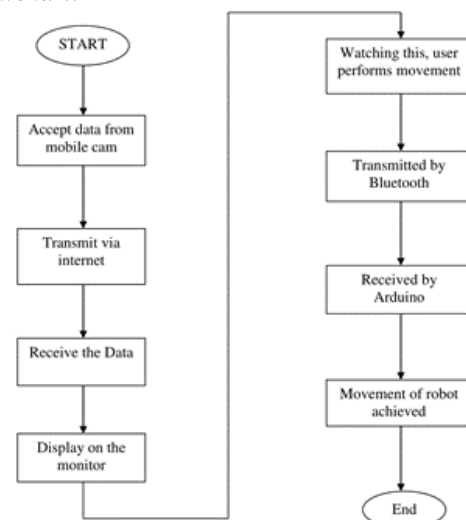
1) Flowchart:

Fig. 3: Flow Chart illustrating the mechanism of the system.

IV. RESULTS

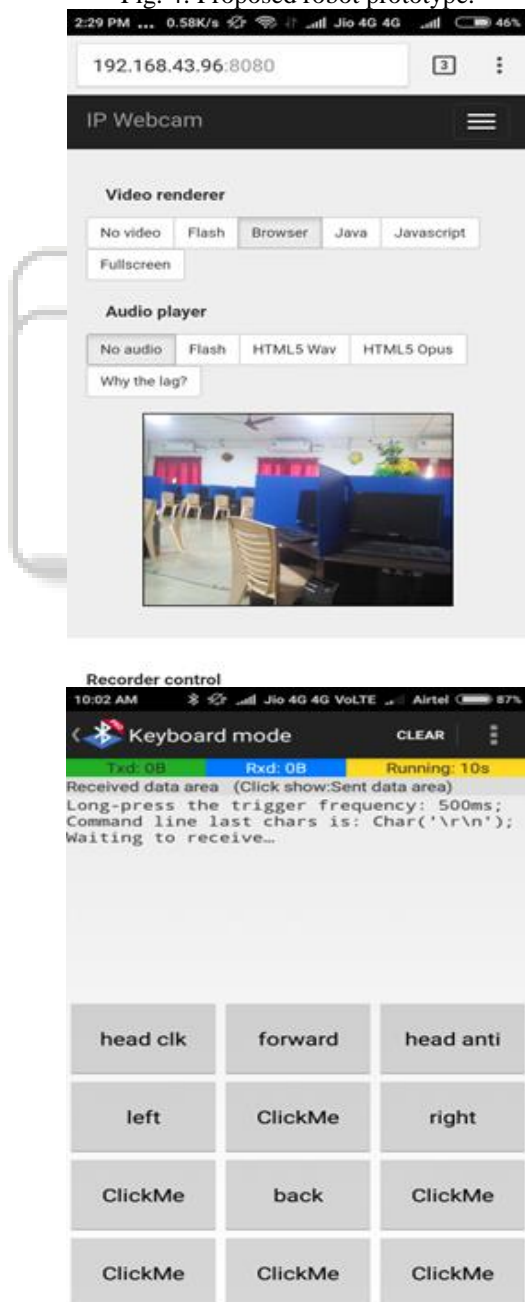Fig. 4: Proposed robot prototype.

Fig. 5: Live video streaming with robot control GUI.

Thus the implementation of the proposed project has been successfully carried out through the design of a wireless controlled surveillance robot which works using IoT & BoT.

A. Applications:

− Industrial facilities,
− Manufacturing plants and warehouses,
− Parking lots,
− Chemical plants, oil & gas facilities,
− Solar farms and photovoltaic power plants,
− Physical security of critical infrastructure,
− Resorts, golf courses, beach patrols, and more.

V. CONCLUSION

In this paper the video streaming and surveillance using a wireless android based robot is implemented. The robot is successfully controlled using an android application through the wireless Bluetooth technology. Even the real time video feel is successfully achieved using the Wi-Fi technology on the designed android application.

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