

Surveillance Robot using Aurdino Microcontroller

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Abstract - In this paper I have concluded Survrillance Robot Using Arduinio Microcontroller.

INTRODUCTION

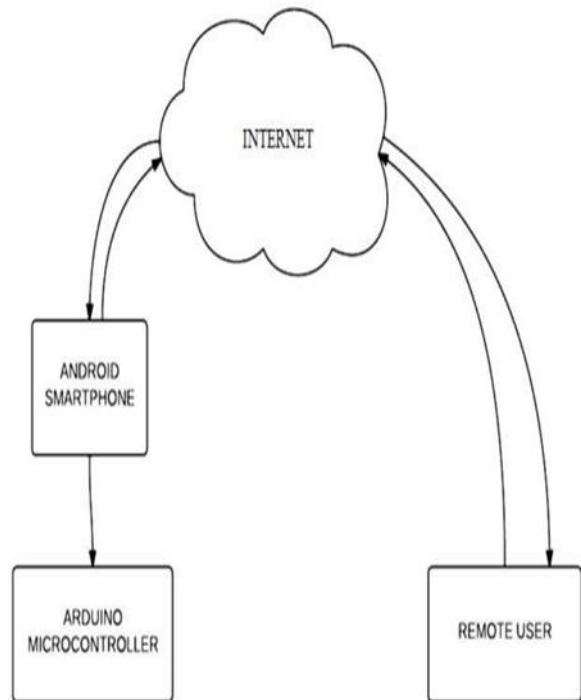
Surveillance is the process of monitoring a situation and are or a person. This generally occurs in a military scenario where surveillance of borderlines and enemy territory is essential to developing personnel near sensitive areas in order to constantly monitor for changes. But humans do have their limitations, and development in inaccessible places is not always possible. There are also added risks of losing personnel in the event of getting caught by the enemy. With advances in technology over the years, however, it is possibly to remotely monitor areas of importance by using robots in place of humans. Apart from the obvious advantage of not having to risk any personnel, terrestrial and aerial robots can also pick up details that are not obvious to humans. By equipping them with high resolution cameras and various sensors, it is possible to obtain information about the specific area remotely. Satellite communication makes it possible to communicate seamlessly with the robots and obtain real-time audiovisual feedback. Thus, in recent times, surveillance technology has become an area of great research interest. However, building a small robot for testing and research purposes proves to be extremely expensive. Primarily because a security robot would require certain components such as a GPS module (Global Positioning System), High resolution cameras, radios for satellite connectivity, etc. Each of these components are quiet.

2.SYSTEM DESCRIPTON

Our system consists of a remote computer and a robot. The robot is controlled by a user sitting at a remote

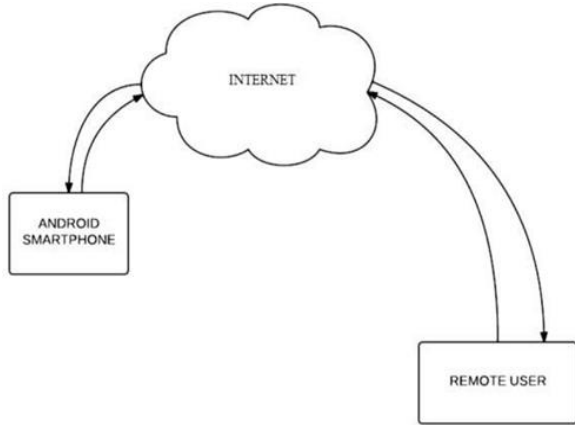
computer, over the internet. The robot consists of a smartphone running the Android operating system, an Arduinio omicrocontroller to control the robot motion and the requisite hardware.

The user controls the robot by sending control signals to the Android smartphone. The smartphone then forwards these signals to the Arduinio Microcontroller, which then moves the robot in required direction The camera on the Android smartphone is used to send video feedback to the remote user simultaneously over the internet. This enables the user to navigate the robot remotely. Additional processing can be performed on the video feed on remote computer. A visual representation is shown below.



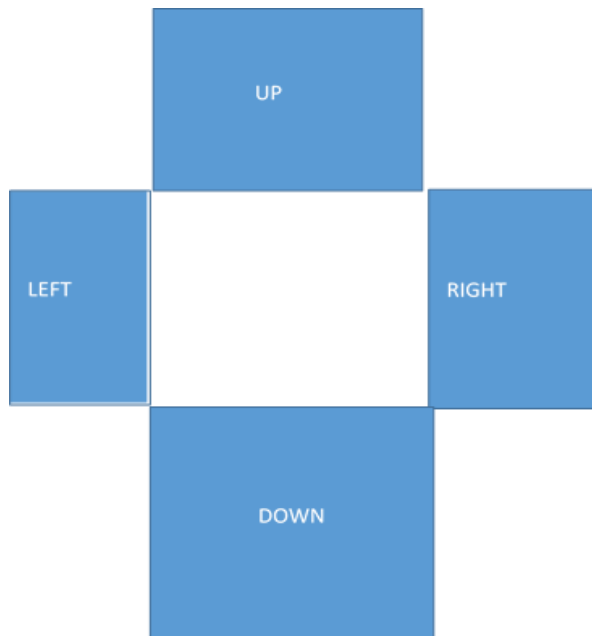
1. A basic overview of the system.

The project is divided into 3 modules, each of which are explained in detail.



Android to user interface.

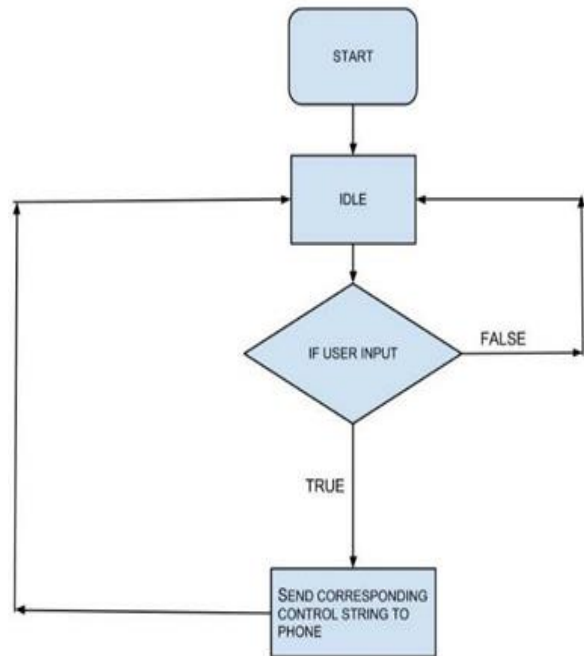
At the remote computer, the user can control the robot through a MATLAB that we created using the GUIDE toolset.



As seen in the figure, there are 4 navigation button to move the robot. There is also a window showing the live video feed from the robot. The slider above the feed allows us to control the brightness of incoming video. We have also implemented an auto contrast feature for it. The ability to record, save and play back the video is also implemented.

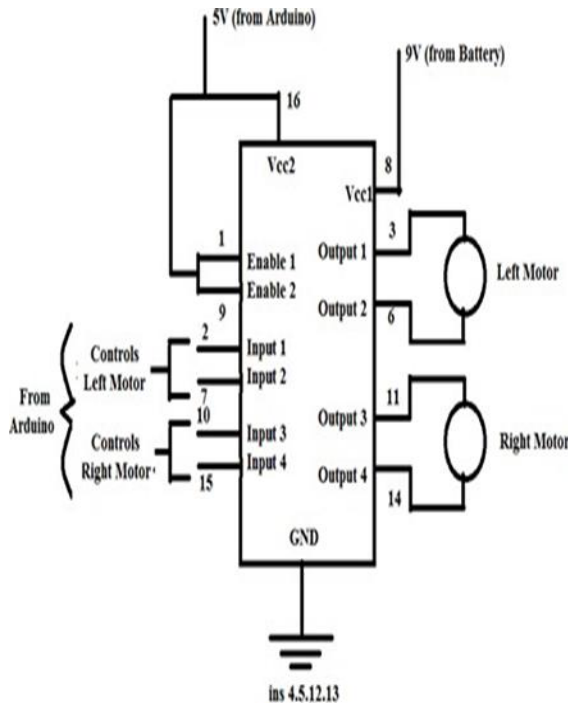
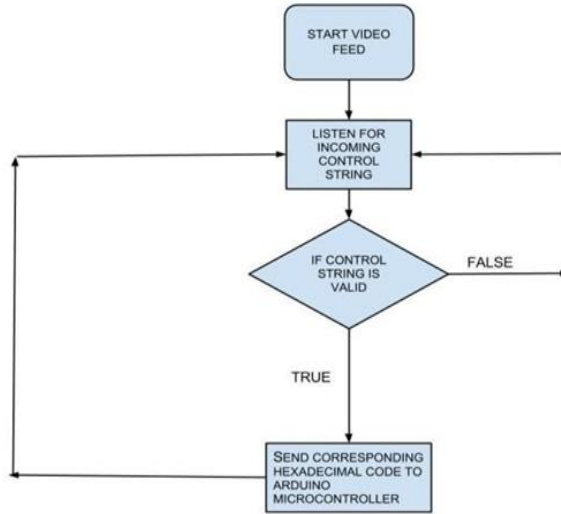
The android smartphone on the robot writes the video feed to a particular IP address which is set by the user. When the user clicks on the smart video button. a MATLAB timer is set off. This timer calls back on a read function at regular intervals of time. This function reads the image that is transmitted by the Android phone at that instant in time. The image is then passed

through the user-controlled brightness and contrast filters, and then displayed in the GUI. The interval at which the read function is called defines the frame rate of the video feed. A record feature is also implemented where in the sequence of RGB matrices of the frames are stored in a 4D matrix. This matrix is stored as .mat file, which can be played back later. Navigation of the robot, based on the video feed, is done using the buttons on the GUI, or through the arrow keys on the keyboard. When a particular button/key is pressed, a unique String assigned to it is sent to the same IP address. This String is read by an app on the Android smartphone.



The Android phone is connected to the Arduino using a USB OTG (On-the- Go) cable. Android provides support for USB connected devices through two modes of communication: USB host and USB accessory. In our case, the Android phone acts as the host and powers the Arduino .

The Android phone acts as a bridge for communicating between the remote computer and the Arduino. For this purpose, there are two separate apps running simultaneously on the phone. One of these is for transmitting the video feed to the remote computer. For this purpose, we have used a freely available Android app called IP Webcam. The second app is responsible for receiving control signals from the Remote User and relaying them to the Arduino microcontroller. A screenshot of the app is shown below.



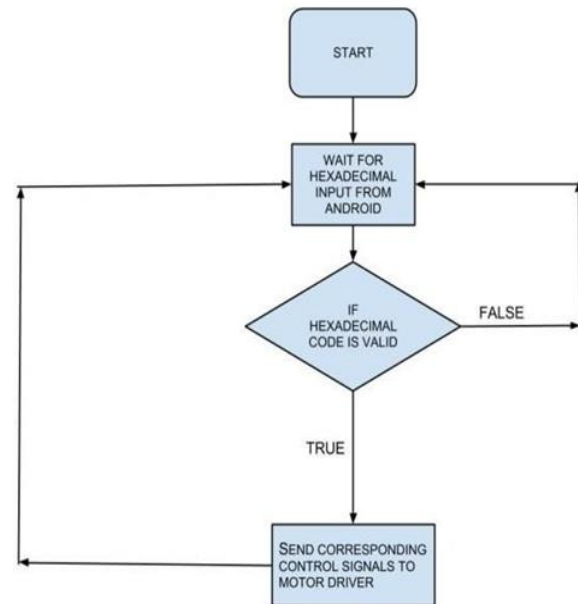
A. Arduino Implementation

In our system, we have used an Arduino Uno is a microcontroller board based on the ATmega328. The Arduino project provides an integrated development environment (IDE) based on Processing, and programming is done using a language based on Wiring, which is very similar to C++.

The Arduino microcontroller is configured to receive serial input from the app running on the Android smartphone, and subsequently control four DC motors (2 front and 2 rear).

Upon receiving the hexadecimal codes from the Android phone, the Arduino generates two control

signals per DC motor. For e.g, on receiving 0x00 to indicate a forward motion, the code on the Arduino sends one HIGH and one LOW on each pair of control signals. A backward motion would involve inverting of the same, and so on. Since the Arduino cannot directly power a DC motor due to insufficient current, motor drivers, with their own power supply are used. Each motor driver is capable of controlling 2 DC motors. Hence, two motor drivers are used. In our implementation, the Arduino sends the control signals to two L293D motor drivers each powered by a 9-volt battery. microcontroller the of an ubiquitous application of microcontroller in automobiles, robotics and industrial system has made its studies important. An Arduino board has a microcontroller and other extras that make its programming and debugging easy (Figure 1). An engineer just needs to install an Arduino IDE which is downloadable online on his computer from www.arduino.cc, write the program, compile it and load it into the board [4]. No need for a separate programmer that costs extra money.



Flowchart of depicting functioning of aurdino.

B. WIFI CIRCUIT.

Wi-Fi Circuit the Wi-Fi circuit consists of double antennas and MT7620 integrated circuit. The MT7620 is a router-on-a-chip that includes an 802.11n MAC and baseband. The data rate of MT7620 is 300Mbps and can be used in access points. The WiFi circuit is used to receive the commands from the computer, and then provides them to the microcontroller recognizes

these commands and controls the movements of the tank, camera, and robotic arm. In addition, the Wi-Fi circuit is used to send a live video that is recorded by the camera to PC. Figure displays the Wi-Fi circuit.

CONCLUSION

The robotic surveillance is very necessary, especially in dangerous environments. The results of the previous section lead to conclude that the surveillance robotic tank is implemented successfully. An excellent wireless communication between the user and robot is achieved using Wi-Fi circuit. The synchronization between the microcontroller and the GUI is seamless due to using the MT7620 integrated circuit. The use of servo motors in the robotic arm and camera enables them to move with precise angles. An Arduino platform is used instead of others since it is programmed by computer via USB port and there is no need to an external programmer device this reduces the cost and saves the time.

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