SMART PHONE BASED INTERNET SHARING REAL-TIME ROBOTIC CAR SYSTEM FOR SURVEILLANCE APPLICATIONS USING BLYNK IOT

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Abstract

The world is being modernized day by day because of the revolution of technology. For increasing the efficiency of work, reducing life risk, escaping dangerous zones and reaching the places which are unreachable, people are struggling hard to develop newer technologies. Robotic system is such a technological advancement. The aim of the study is to design and propose a real time robotic car system for surveillance applications which is based on Blynk IoT. This system is designed using NodeMCU ESP8266 microcontroller and controlled by smart phone in the presence of Blynk IoT platform and At Home software. The system can be controlled remotely through GPS (Global Positioning System) module. It can share real time location, audio-video through the internet. The system can work both at day and night and can be moved to any direction such as, forward, backward or clockwise, anticlockwise. This system can be used for surveillance, detection purpose and observation purpose quite satisfactorily.

Keywords—Surveillance system, Blynk IoT, Robotic car, Motor driver, NodeMCU, Internet of Things.

I. INTRODUCTION

Surveillance is the process of monitoring a situation, an area or a person. This occurs in everyday life from the surveillance of a house to the surveillance of military scenario. Human surveillance is achieved by deploying personnel at/near sensitive areas to constantly monitor for changes. But humans do have their limitations. Besides, deployment in inaccessible places is not always possible. There are also added risks of losing personnel in the event of getting caught by the enemy. Moreover, distance monitoring is not always possible by human, especially, for limitations.

The work presented in this paper describes a new economical and efficient solution using IoT based robotic system for monitoring, surveillance and security purposes. This work approached robotic movement control through smartphone and computers. Many of the existing surveillance Robots were controlled through Bluetooth system where the range was limited. But, here, in this work, we have developed a Surveillance Robotic Car which can be controlled from anywhere through internet, hence, the limitation of range has been overcome. So, a dedicated application is created to control the embedded robotic hardware. The application controls the movement of the robot. The embedded hardware is developed on a "NodeMCU ESP8266 micro-controller and is controlled by a Smartphone based on the Android platform, Blynk IOT. The robot is able to move forward, reverse, left and right as well as the speed is controllable. Smartphone is being interfaced to the device by using a WIFI module. There is an on-board smartphone which is attached with the robot which can deliver us real-time video and audio output, respectively, with the help of smartphone's camera and microphone. An android app named 'At Home' is used to get this real time audio and video output for monitoring the desired area continuously. Moreover, the smartphone also can be used as a GPS module to track the exact location of robotic car. High power LED (Light Emitting Diode) is used which can be controlled via the app from anywhere that will accomplish the night vision system as well as deliver the clear video output of dark places.

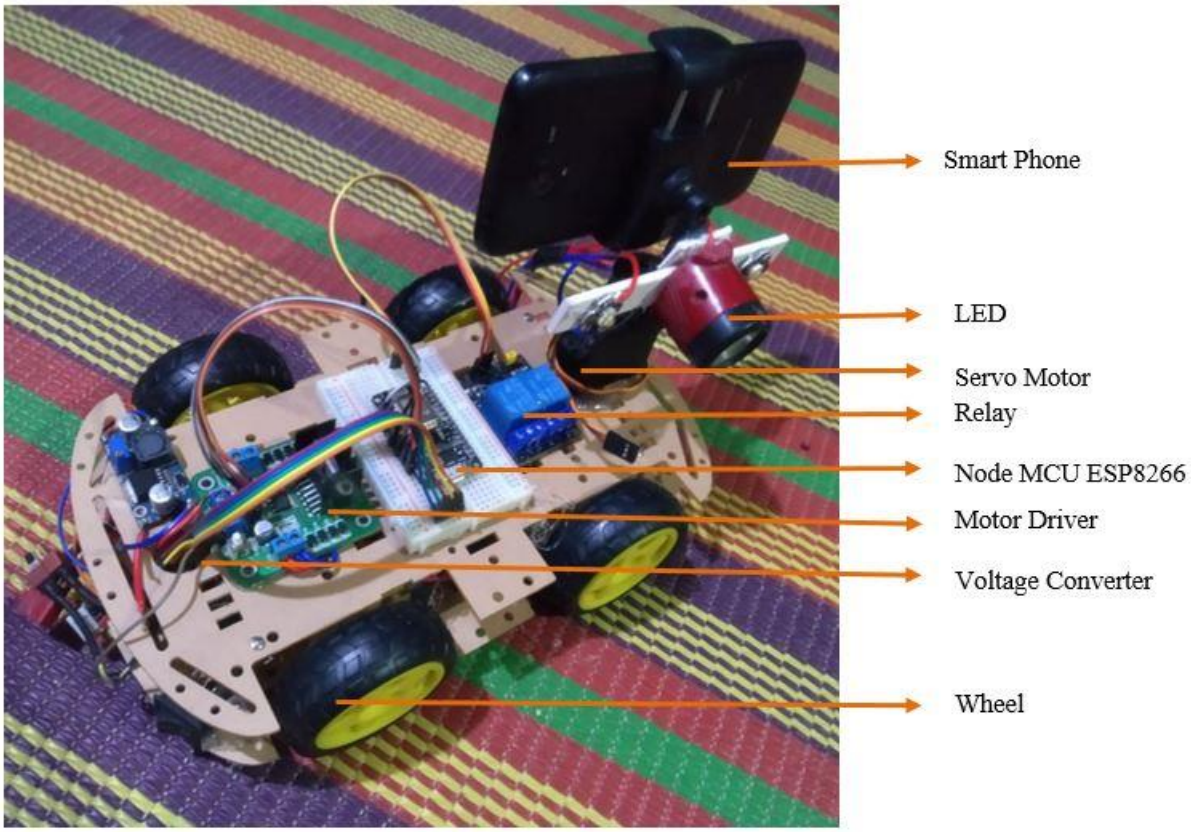

Figure.1 Hardware Setup of the Robotic Car

II. LITERATURE SURVEY

Remote control and monitoring of an Omni-directional mobile robot using Bluetooth with a smart device is presented in Seo (2011). The article developed remote control and monitoring application software too for the smart device. Authors tested the gravity steering mode and the remote monitoring mode for performance evaluation. For performance evaluation, the latency of wireless data transmission and the frame rate of the captured images are measured [1].

Azeta et al. (2019) developed a cost effective sustainable robot consisting of a video camera and Wi-Fi robot link for monitoring and surveillance. The robotic system uses an Arduino microcontroller with a motor shield as well as an Android smartphone for running the operating system [2].

Banduka (2015) presented a system consisting of a device with the Android operating system and the real-time control system for remote monitoring and controlling of industrial robots by using Android device and Wi-Fi communication. Remote monitoring of the motion of the robot is enabled in the monitoring mode by using 3D robot model or the trajectory of the end effector. The interaction between the human and the industrial robot is simplified by this model. [3]

Dharaskar et al. (2018) has presented a surveillance robotic car that uses Raspberry Pi working on Raspbian OS. This internet of things (IoT) based project uses USB web camera, two DC motor with Robot chassis and the Raspberry Pi to build the Robotic car setup [4].

Selvam (2014) developed a robotic vehicle for remote surveillance applications. The model uses Android application attached with wireless camera for monitoring. This robot has night vision capabilities and it can wirelessly transmit real time video. The communication between the transmitter and the receiver is done by Bluetooth module [5].

Mishra (2017) presented a radio frequency (RF) technology based spying robotic system attached with Wi-Fi camera which can work as a spy in the war field even in the darkness by using infra-red (IR) lighting. The system can transmit real time motion pictures. But it cannot be identified by the enemies in conflict area [6]

Han and Seo (2014) presented a model of a service robot system as an intelligent surveillance system for child monitoring. A cooperative server-client control scheme is developed having multiple users and a remote robot [7].

Kurkin et al. (2017) developed an autonomous mobile robotic system to monitor and forecast the state of environment of a coastal zone. This system can be operated for collecting information of monitoring, positioning, meteorology, vehicle control and obstacles detection [8].

III. METHODOLOGY

To develop a surveillance robotic car system which can be controlled remotely by using 'At Home' app via Blynk IoT platform that includes a robotic car with a smart phone which serves as IP Camera, Microphone and GPS module. This system delivers us real time high-resolution video, audio and location to the desired receiver phone or computer. The robotic car can be driven/controlled from any place since distance between the user and the robotic car is no more concern due to IoT application and internet sharing.

a. BLOCK DIAGRAM OF THE PROPOSED SYSTEM

Figure.2 shows the block diagram of the surveillance robotic car system using the android app. In this block diagram, the IoT based surveillance robotic car has been controlled by NodeMCU ESP8266. In this robotic car, NodeMCU ESP8266 is connected with servo motor, DC motor, relay and Blynk IoT server (via internet). A smartphone is attached with a servo motor which delivers the real time video and audio streaming and location. These are displayed and delivered into desired phone or computer via internet and software. Moreover, NodeMCU ESP8266 controls the dc motors too for Robot movements. The servo motors are controlled by the microcontroller for phone movements. A relay is connected to NodeMCU ESP8266 which controls the LED for night vision. The power unit consists of a DC voltage source. "NodeMCU ESP8266" microcontroller is used for controlling multiple tasks. NodeMCU ESP8266 serves as the brain of operation. The microcontroller receives commands sent by the user via the internet. The microcontroller does processing according to the command as well as control the system components.

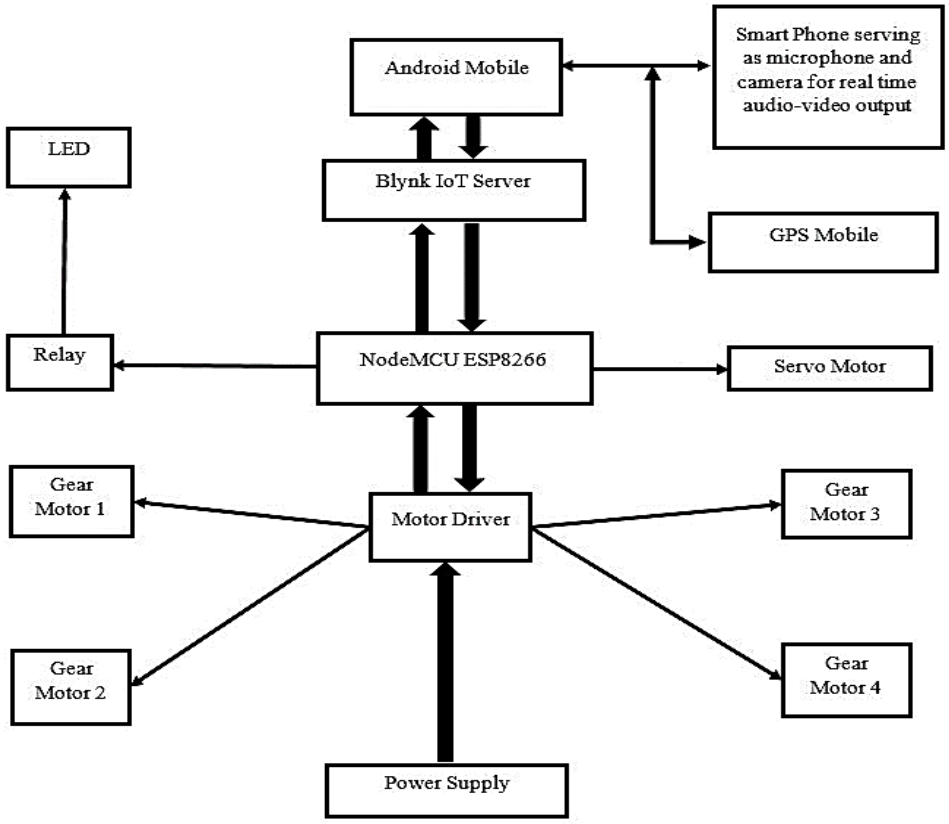

Figure.2 Block Diagram of Surveillance Robotic Car System Using Android App Via BlynkIoT.

b. ELECTRICAL DESIGN

The electrical design of the proposed model is given in Figure.3.

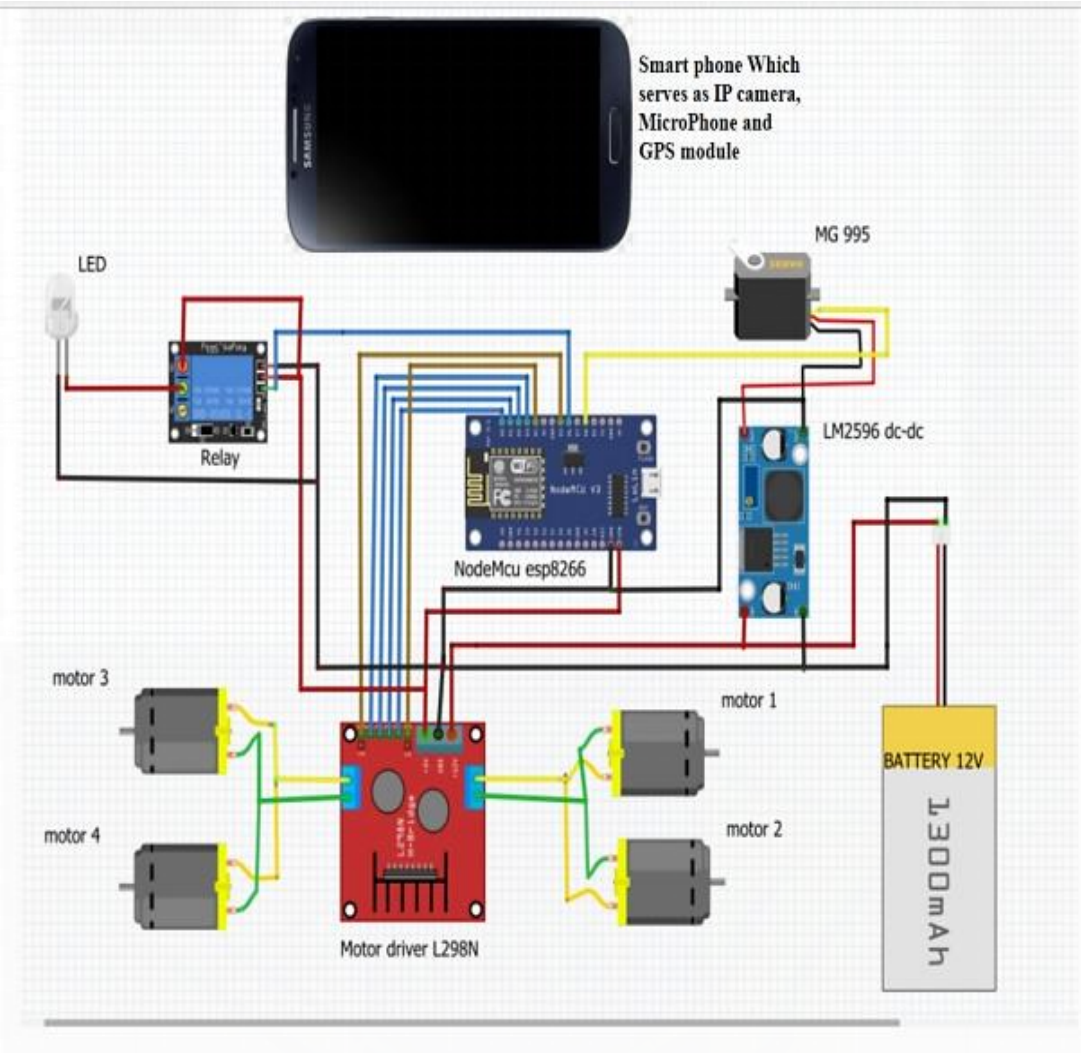

Figure.3 Electrical Circuit Diagram of Robotic Car Operations

Table.1 presents the electrical components required to develop the proposed system.

Components	Quantity	Description
NodeMCU ESP8266	01	Microcontroller
Motor driver L298N	01	Controlling DC motor
Servo motor MG995	01	To rotate peripherals
Relay Module	01	For switching purpose
DC motor	04	For movement of robotic car
Voltage regulator LM2596	01	Voltage controlling and converting
Battery	01	Power supply unit
LED	02	Night vision purpose
Smartphone	01	Transmit real-time audio, video and location

Table.1 Electrical Components

Table.2 shows the specification of components connection with NodeMCU ESP8266.

Name of the component	Component pin	NodeMCU ESP8266's pin
Motor Driver L298N	5V	V_{IN}
	GND	GND
	D0, D1, D2, D3, D4, D5	IN1, IN2, IN3, IN4, ENA, ENB
Relay	V_{CC}	5V
	GND	GND
	IN1	D6
SERVO MG995	SIGNAL	D8

Table.2 Specification of Components with NodeMCU ESP8266

IV. OPERATIONS OF THE SYSTEM

The surveillance system works both at day and night. We have performed several tests. Figure 4 shows real-time imaging output from Robotic car during daylight. And Figure.5 shows real-time video footage (in image form).

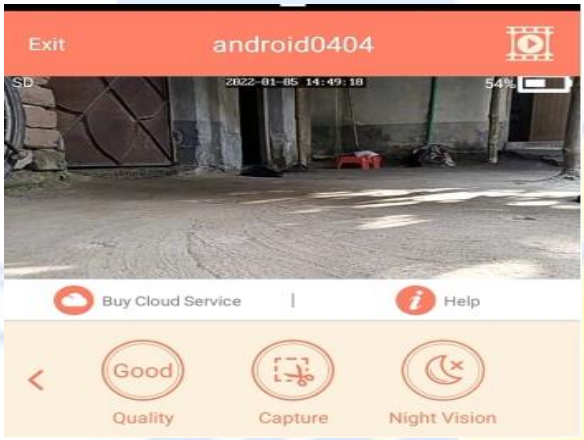

Figure.4 Real-time Imaging Output from Robotic Car During Daylight

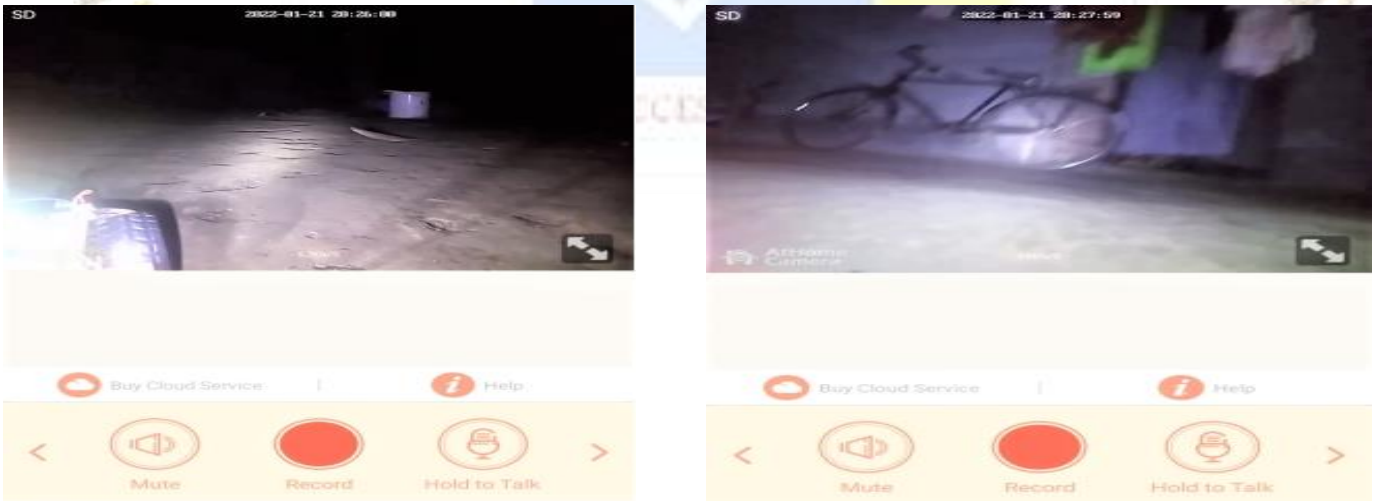

Figure.5 Real-time Imaging Output from Robotic Car During Night (Night Vision)

This technology is able to deliver real time audio and video output at both daylight and darkness. LED helps to get the clear footage of dark area. Both audio and video can be done live streaming using 'At Home' app/software on smartphone and computer. Figure.6 shows arrow keys interface of the app/software for controlling the robotic car system.

Figure.6 Arrow Keys Interface of the App/Software

In this system, smartphone is used as the input device. Here, a technology has been developed by which user can control the robotic car and LEDs from any place in the world as well as can monitor the real-time audio/video with location tracking system. Ultimately, IoT based surveillance robotic car has been controlled through internet using smart phone or computer. Here, user only needs to touch the button on the smart phone or click the operations key on computer to control the robotic car in his desired directions.

V. CONCLUSION

The smart phone based real time robotic car system for surveillance has been implemented interfacing android smart phone with Wi-Fi module. Through this system, we are able to perform real time surveillance from any distance and we can locate actual position of the robotic car. The application of this system are: border surveillance, fire detection, observation of garage, garden, super-shop, airport etc, hostage rescue, miilitary operations etc. The system is easy to use and it helps us in distance monitoring. The maintenance cost is low and the system is sustainable as well.

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