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Simulation of Robotic Car Control using IOT

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***Abstract*— Robot control using Wi-Fi technology is an innovative tool to perform various experiments within Electronics and Telecommunication Engineering. Designing of such system needs the knowledge of physical components used, connected sensors, embedded system and various decision algorithm. As we already know human itself cannot perform many tasks that a Robot (machine) can do simultaneously. Robots are needed where there is no possibility of human interventions. Due to such restrictions, we propose a concept of designing a robotic car which can be controlled using IOT module. The motion controls of the robot are integrated on to a webpage. This project requires following modules (IOT) Wi-Fi Module, Router, Microcontroller, Wi-Fi Camera and Smartphone and laptop with which handles all basic functionalities of a Robot.**

***Index Terms*— Simulation, Wi-Fi, Module, DHT11, Arduino UNO, Driver, Motor.**

I. INTRODUCTION

Now a days, Wi-Fi technologies are integrated in nearly every modern personal computer operating system, most advanced game consoles and laptops, and many printers and other peripherals. Wi-Fi technology expanded to next level because Wi-Fi connection not only use to surf internet but Wi-Fi connection can be used to control home appliances such as television, stereo, room lighting, alarm and many more appliances wirelessly . The devices are completely autonomous, do not emit noise at work and have extensive features that make the surveillance as convenient as possible even for sucking users. The small sizes that the digital recorder has allow it not only to install in any room, but even if necessary – in the car. Hence it is possible to control a robot using a Wi-Fi connection. Here we are using non-autonomous Robot. On the robot, a Wi-Fi module is mounted which is interfaced with an Arduino UNO microcontroller. A controller is a client sitting on a computer or a laptop in range of Wi-Fi administers the robot. Whenever a client sends the control signal, it is transmitted wirelessly and is captured by the Wi-Fi module mounted on the robot. This signal is transmitted to microcontroller attached to it. Microcontroller analyse this signal and it takes appropriate action to rotate the motor i.e., either clockwise or anticlockwise. In the proposed system we are using smart phone as remote camera and the live video stream is viewed on the webpage .Due to this we can control the movement of robot either in forward or backward left or right directions. A Wireless Camera mounted on the Robot captures the video and transmits it to the client, which gives the current position of the robot. Based on that video we can determine whether we need to move the robot forward or backward. Keys pattern are designed on a webpage through which the robot will be controlled.

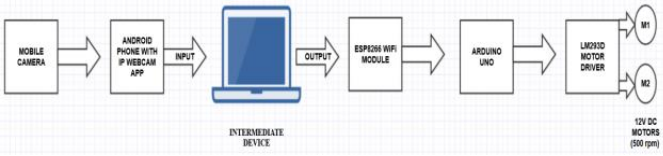

Fig 1: Block diagram of Robotic car controlled using Wi-Fi Module ESP8266

II. RELATED WORK

Natural or human induced disasters always cost in terms of money or lives. The outcome is always lots of carnage. In the past, post disaster rescue work was performed by human and rescue dogs. Humanitarian search and rescue operations can be found in most large-scale emergency operations. But, with the advancement of science and technology, intelligent robots (i-robots) equipped with advanced sensors and detectors are attracting more and more attentions from researchers and rescuers. The main problem encountered during any rescue operation of an earthquake or any natural disaster is to find the dead bodies or living beings surviving deep beneath the detritus. Human rescuers have very short time (48 hours) to find trapped victims in a collapsed structure otherwise the chance of finding victims still alive is nearly zero. Rescue operations get delayed in the absence of any suitable machinery and equipment. Also a lot of time is wasted while searching in an area where there is nothing to be found. This delay can further be increased because of blocked transport system after the earthquake. Therefore, Rescue Systems comprising of tethered Mobile Robots can be utilized for efficient rescue operations. Intelligent mobile robots also have the advantage of moving into gaps and small holes which is impossible for human beings and even trained dogs. The design of a controller intended for teleportation is also a reference. It is capable of controlling an anthropomorphic robotic arm through a LAN or via the Internet. The system uses several interdependent processing modules to provide numerous functionalities, and makes use of the already widespread Wi-Fi technology as its wireless communications medium. The user can control the robotic arm remotely and access its sensory feedback signals as well. The camera mounted on the robot arm takes images and transmits to the control station. The system has been designed with project portability in mind, and consequently will require minimal modification for other applications. The

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robot arm is controlled using a master-slave control methodology. Today human-machine interaction is moving away from mouse and pen and is becoming ubiquitous and much more compatible with the physical world. In the present generation the gap between machines and humans is being reduced with the introduction of new technologies to free from trouble the standard of living.. In this paper, include rigorous analysis of different techniques of "Human-Machine Interaction" This paper analyses the motion technology to capture gestures through an android smart phones with an inbuilt accelerometer and Wi-Fi module to control the movements of a robot. Sensors placed on robot continuously update the temperature and humidity values of surrounding area and display on mobile phone, LCD display. The signals of the Wi-Fi Module are controlled by the ARM 7 processor. Also a camera is equipped for remote view and the robot will automatically avoid obstacle and move when it is in operation without intervention from the operator.

III. WORKING

Laptop, Wi-Fi module and Smartphone are connected in same WLAN and an IP address is registered automatically by Wi-Fi module on robot. This IP address has to be written on a web browser and above page will be open up. This custom webpage includes all keys for operation and live video stream feature. There are keys namely Forward, Reverse, Left, Right, Stop and ON/OFF. When any key is pressed a signal from Wi-Fi router is transmitted and received by Wi-Fi module mounted on robot. The signal processed by microcontroller. This IC sends a signal to the motor driver IC L293D which drives the motor forward, reverse and steer accordingly. When Forward key is pressed microcontroller gives signals to motor driver IC which drives the motor in forward direction and similar operations for other controls. Figure 2 represents the entire simulation of the system using Proteus 8 Professional software that consist of the virtual components and instruments of the real world electronic components.

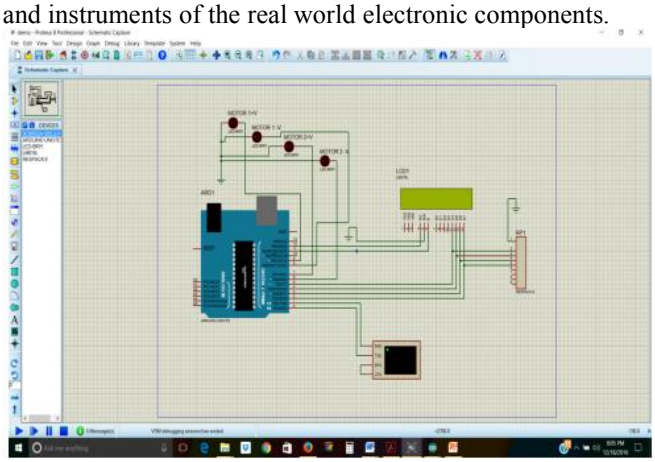


Fig 2: Simulation of Robotic car controlled using Wi-Fi Module ESP8266

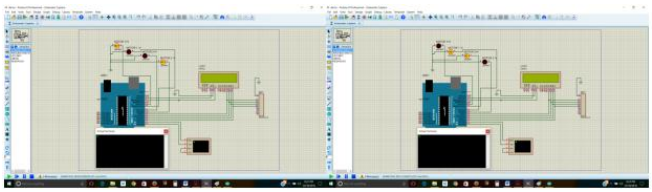


Fig 3. (a) Fig 3. (b)

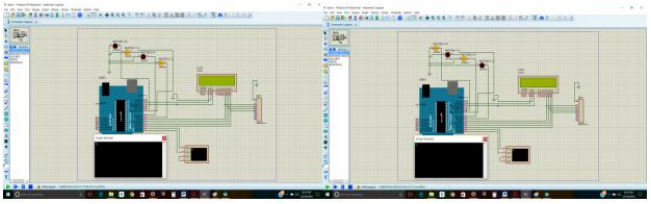


Fig 3. (c) Fig 3. (d)

Fig 3: LED representation of the direction of motion of robotic car.(a) Forward, (b) Reverse, (c) Left ,(d) Right. For each instruction through the virtual terminal of the simulator software, keyboard instructions like F or f, R or r, L or l, R or r & S or s are given. It controls the LEDs (M1, M2, and M3& M4) in the simulators which represent the operation of motors as follows.

Fig 3.a: F or f instruction turns M1 and M4 ON which means Forward motion of motors in real time.

Fig 3.b: B or b instruction turns M2 and M3 ON which means Reverse motion of motors in real time.

Fig 3.c: L or l instruction turns M2 and M4 ON which means Left motion of motors in real time.

Fig 3.d: R or r instruction turns M1 and M3 ON which means Right motion of motors in real time

IV. RESULT

There are two modes that are designed for the hardware and described in this paper. The first mode is wireless control mode and the second mode is for obstacle avoidance mode. When the car is operated in first mode, the only method for controlling the car is by operation from the smartphone via Wi-Fi (IOT). The basic functions are forward, left, right and reverse movements as well as a stop actions based on the inputs of arrows pressed in the user interface. In second mode, the car keeps going forward until an obstacle appears within a defined threshold distance. After exploring the barrier, it will stop and waits for the command from the user.

V. COMPONENTS USED

A. NodeMCU

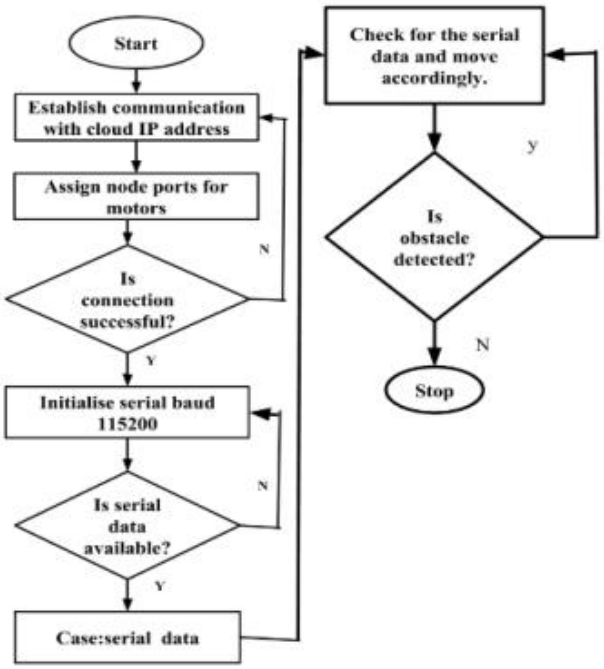
The NodeMCU is an open source software and hardware development environment. The ESP8266 Arduino compatible module is a low-cost Wi-Fi chip with full TCP/IP capability, and the amazing (IoT) thing is that this little board has a MCU gives the possibility to control I/O digital pins via simple like programming language.

Figure axis labels are often a source of confusion. Use words rather than symbols. As an example, write the quantity "Magnetization," or "Magnetization *M*," not just "*M*." Put units in parentheses. Do not label axes only with units. As in Fig. 1, for example, write "Magnetization (A/m)" or "Magnetization ($A \cdot m^{-1}$)," not just "A/m." Do not label axes with a ratio of quantities and units. For example, write "Temperature (K)," not "Temperature/K."

B. Motor Driver (L293D)

The L293D is a 16-pin Motor Driver IC which can control a two sets of DC motors simultaneously in any direction. The L293D is designed to provide bidirectional drive currents of up to 600 mA (per channel) at voltages from 4.5 V to 36 V.

C. Workflow



VI. CONCLUSION

It was possible to control the robot over the internet in a very cost efficient and user friendly way. This method can be used for any robot with Bluetooth communication system. The robot can be used in any disaster case for scouting of distressed areas. It can supply live video feed going to places inaccessible for larger mechanical devices or human. The robot can be used for spying and surveying reported places especially in Warfield. This can be used for live feed from any region needed to be looked out for.

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