



UNMANNED SURVEILLANCE ROBOT USING SENSORS AND IoT

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Abstract: This paper presents about a surveillance type robot using an Arduino mega microcontroller. We have used four different types of sensor for the surveillance such as ultrasonic sensor, PIR sensor, flame sensor and air quality sensor. The main motive of our venture is to perform surveillance during night time in a warehouse, home etc. Our venture is made on a little body called chassis and it is moved with the assistance of motor and all the sensors are kept on highest point of the suspension. The primary thought process of venture is to observe in niche and corner of the home or distribution center in which CCTV camera can't cover a wide area. The sensor that we have utilized is useful in finding the harmful things encompassed in the home or stockroom that can be recognized by our robot. Also live video is being recorded by the night vision camera.

Index Terms: Iot, Arduino mega, sensors.

I. INTRODUCTION

Surveillance is the procedure in which individuals, places, or things are checked for the most part to influence, overseeing, coordinating, or securing them. Today there is a need for high observation particularly in touchy regions, military outskirts, government workplaces, open spots, security check focuses and even in the homes. Nation outskirts, open spots, government workplaces, and so forth comes in the class of open air reconnaissance while stockrooms, homes, carports fall in the classification of indoor observation. Both these reconnaissance can incorporate perception by methods for CCTV (Closed Circuit TV) cameras or by sending officers or spies close to the territory which must be inspected. In any case, CCTV and different cameras have their own disadvantages and requirements, for example, they have more blind sides and they can be covered over the focal points like gum or shower paint, likewise to cover the whole territory numerous cameras are required to achieve each niche and corner expanding the cost. Similarly people have their own impediments, for example, getting data from blocked off spots isn't conceivable; in the meantime human life is valuable and getting captured by the foe is moreover a hazard. In this manner people can't generally be utilized to get data from remote and hazardous spots. Our robot can be utilized for indoor reconnaissance and can be made to achieve the spots of interest for getting the data rather than installing cameras in the whole environment. With the utilization of our robot numerous human lives can be spared on the grounds that a perception can be made without

heading off to the dangerous spots, even if the robot is caught it can be destroyed without risking anything.

II. PROPOSED SYSTEM

Our framework incorporates a four wheel robot with a night vision camera. The robot is installed with Ultrasonic sensor, air quality sensor, PIR sensor, flame sensor. Arduino microcontroller controls the robot's motion, sensors, and other fundamental equipment (engines, skeleton, control supply, and so forth). The robot is associated by wifi module by means of web.

The robot is given a battery to control arduino, Sensors, motor driver. Once the arduino is on the robot gets associated with Internet through wifi hotspot. The live video and all the sensor information is sent to the client through web. at the point when robot enters the reconnaissance territory the live video could be an extraordinary help in surveillance. Similarly the sensor readings like air quality, PIR, fire are observed in the laptop.

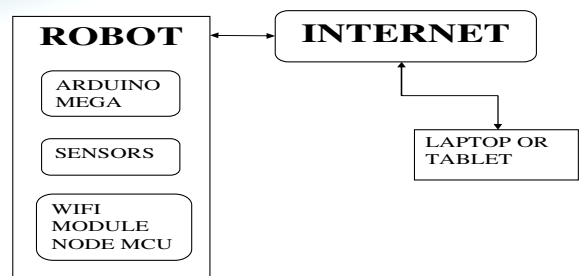


Fig.1. Overview sketch of the system



III. SYSTEM DESCRIPTION

Our system consist of a robot and it is operated automatically. The block diagram is shown in Fig. 2. The robot has four wheels and utilizes a differential drive component to move, in reverse and take left or right turn. The separation between the front and back wheel is kept minimum. This component offers better footing also, zero turning span

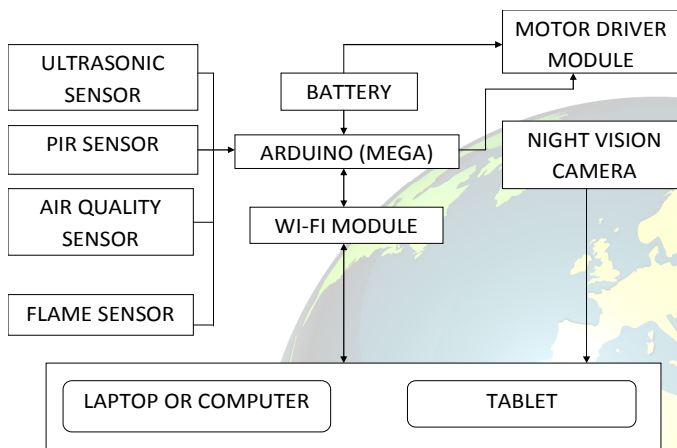


Fig.2.Block diagram

A. ARDUINO MEGA

Microcontroller that we have used here is arduino mega (2560). ARDUINO is open source equipment. It has both digital and analog input/output (I/O) pins which can be used to interface itself with various other boards and circuits. It additionally has serial communication interfaces (USB) which can be utilized for stacking programs to PCs. ARDUINO MEGA provides an integrated development environment (IDE). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller simply connect it to a computer with a USB cable or power it with a AC to DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Duemilanove or Diecimila.

- **V_{in}** - The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this

pin, or, if supplying voltage via the power jack, access it through this pin.

- **5v** - The regulated power supply used to power the microcontroller and other components on the board. This can come either from V_{in} via an on-board regulator, or be supplied by USB or another regulated 5V supply.
- **3.3V** - A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- **GND** - Ground
- **MEMORY** - The ATmega 2560 has 256 KB of flash memory for storing code (of which 8 KB is used for the boot loader), 8 KB of SRAM and 4 KB of EEPROM.
- **CLOCK SPEED** - 16MHz
- **RESET** - Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

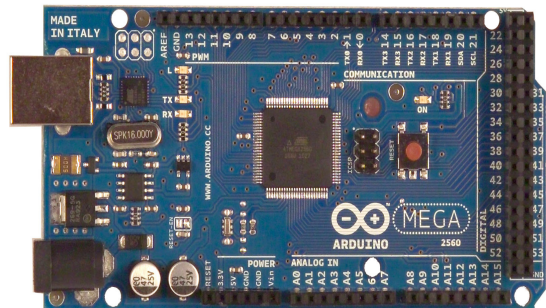


Fig.3.Arduino Mega board

B.MOTOR DRIVER MODULE

The driver module that we have used in our project is L293D. L293D contains two inbuilt H-connect driver circuits. In its common mode of operation, two DC engines can be driven at the same time, both in forward and turn around course. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will pivot it in clockwise and anticlockwise headings, separately. Enable pins 1 and 9 (relating to the two engines) must be high for engines to begin working. When an enable input is high, the associated driver gets enabled. As a result, the outputs



become active and work in phase with their inputs. Similarly, when the enable input is low, that driver is disabled, and their outputs are off and in the high-impedance state.

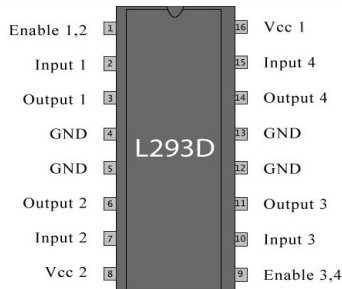


Fig.4.L293D IC

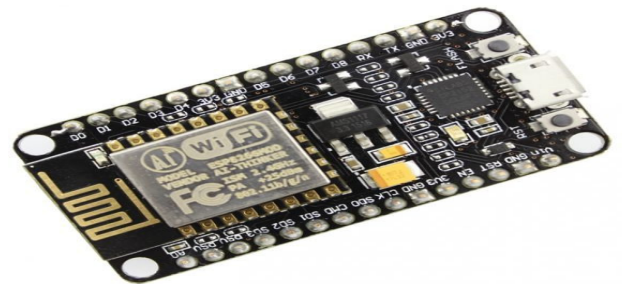


Fig.6.Node MCU (ESP8266)

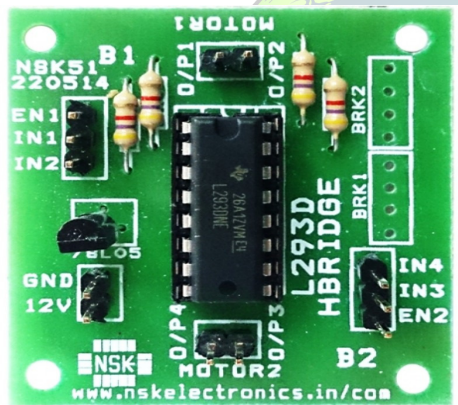


Fig.5.Motor driver(L293D)

D.NIGHT VISION CAMERA

Night vision cameras utilize a few unique techniques to deliver pictures. One uses reflected light to see a picture and alternate uses warm vitality created by the viewed object. The two kinds are utilized as a part of an assortment of occupations, including security, chasing, angling, and warfare. There are a couple diverse sorts of night vision: One that most surveillance cameras utilize, and one that night-vision goggles utilize. The most well-known type that is utilized on most surveillance cameras is infrared (IR) night vision, which depends on infrared light. Night vision film from surveillance cameras dependably looks high contrast since human eyes can separate amongst high contrast superior to anything they can see with different shades of hues, similar to red or blue. Thus, most night vision cameras change to a monochrome channel to make it simpler for us to see the picture.

C.WIFI MODULE

NodeMCU is an open source IoT platform. It incorporates firmware which keeps running on the ESP8266 Wi-Fi SoC and equipment which depends on the ESP-12 module. The firmware utilizes the Lua scripting language. It depends on the eLua venture, and based on the Espressif Non-OS SDK for ESP8266. As a chip, the ESP8266 is likewise difficult to access and utilize. You need to patch wires, with the suitable simple voltage, to its PINs for the most simplest tasks, for example, driving it on or sending a keystroke to the "PC" on the chip. Furthermore, you need to program it in low-level machine language that can be interpreted by the chip equipment. While this level of integration isn't an issue when the ESP8266 is utilized as an implanted controller contribute mass-created gadgets, it is a huge burden for specialists, programmers, or students who need to try different

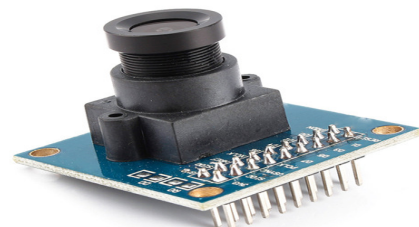


Fig.7.Night vision camera



IV. SENSORS USED IN OUR PROJECT

B. AIR QUALITY SENSOR (MQ-135)

A. ULTRASONIC SENSOR (HC-SR04)

In general ultrasonic waves are delivered by the bats and dolphins which help them to discover any deterrents while they are flying/swimming. Likewise ultrasonic sensor are used to discover any hindrances by sending high recurrence waves. An ultrasonic sensor is also a sensor which measures the separation of individual bulk bodies by sending the sound wave of particular frequency. This sound wave is reflected after the crash with particular bulk bodies and this wave is collected back by the ultrasonic receiver. Span is estimated by premeditating sending and getting time of this sound wave.

Span is measured by the equation:

$$\text{Span} = \text{Sound speed} \times \text{time taken} / 2$$

Ultrasonic sensor has a radius area of 3cm to 3m and also has high recurrence, high sensitiveness and high intrusive power and in this manner it can undoubtedly distinguish the outside or profound articles and it can be effectively interfaced with microcontroller or any sort of controller.

In our venture it is mainly utilized for maintaining a strategic distance from the obstacle.



Fig.8.Ultrasonic sensor



Fig.9.Working of ultrasonic sensor

The MQ series of gas sensors uses a little radiator inside with an electro synthetic sensor these sensors are delicate to a scope of gases are utilized at room temperature. MQ135 liquor sensor is a SnO_2 with a lower conductivity of clean air. When the hazardous gas exists, at that point the sensor's conductivity increases more increasing more along with the gas intensification rising levels. By utilizing basic electronic circuits, it change over the charge of conductivity to coincide output signal of gas concentration. The MQ135 gas sensor has high affectability in smelling salts, sulfide, benzene, steam, smoke and in other damage full gas. The air quality sensor has a small potentiometer that allows the regulation of the load resistance of the sensor circuit. The 5V power supply is utilized for air quality sensor.



Fig.10.Air quality sensor (MQ135)

C. PIR SENSOR

PIR sensors enable you to detect movement, quite often used to recognize whether a human has moved in or out of the sensors scope. They are little, economical, low-power, simple to utilize and don't wear out. When the PIR sensor is sit without moving, the two channel recognize a similar measure of IR, the encompassing sum transmitted from the room or dividers or outside. At the point when a warm body like a human or creature cruises by, it first catches one portion of the PIR sensor, which causes a positive differential change between the two halves. When the warm body leaves the detecting region, the invert happens, whereby the sensor produces a negative differential change. These change pulse are what is identified. You can adjust the sensitivity if your PIR is excessively delicate or not sufficient (clockwise makes it more sensitive). The detection range of PIR is between 5m and 12m.



Fig.11.PIR sensor

D.FLAME SENSOR

Fire sensors can perceive impacts and flares by evaluating the levels of radiation in nature. Other UV sources, for instance, lighting, bend welding and even sunshine would all have the capacity to trigger the sensor. A fire sensor can frequently react speedier and more precisely than a smoke or heat detector because of the systems it uses to recognize the fire.

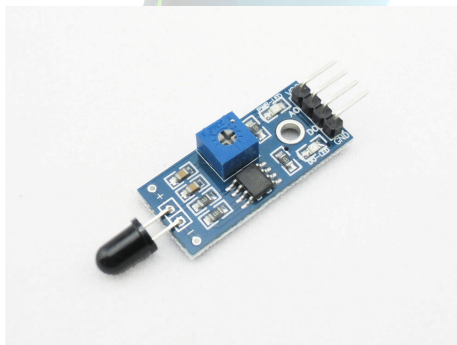


Fig.12.Flame sensor

V. HARDWARE RESULTS

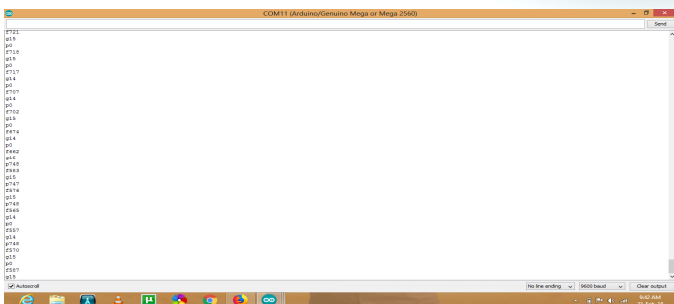


Fig.13.Results

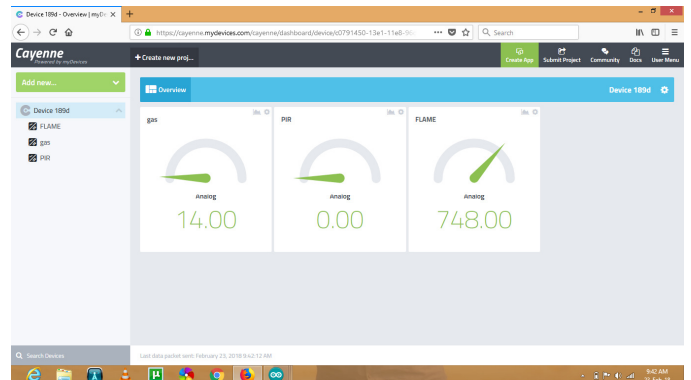
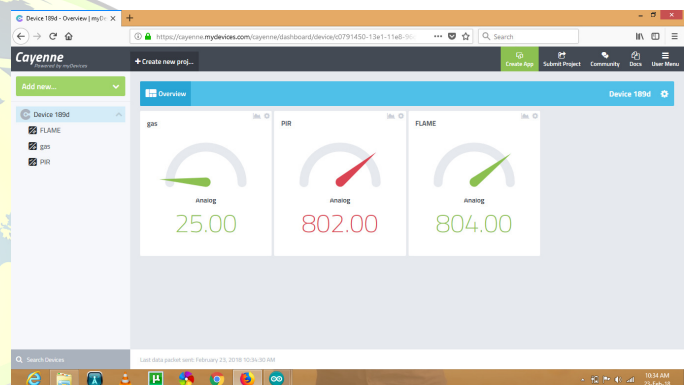


Fig.13.IoT results



VI. CONCLUSION

A relative investigation of surveillance robot is completed and a plan for building a economical robot is proposed. The framework has all the required sensors and extras helpful in any surveillance. It can quantify the temperature and moistness esteems and can distinguish hurtful gases if present. For indoor utilize, it can recognize gas spill in home or industry, observation of shopping center, parking area, office, industry, bank, museums. It can likewise perform military reconnaissance like spying adversary base, investigating obscure adversary region, hazardous removal. And furthermore night vision camera is utilized to perform observation in both day and night and the video is recorded live in workstations or tablet for the safety reasons. If there is any danger like flame, leakage of hurtful gas an alarm message will sent to the comparing higher officers who is in-charge for the specific area.

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