CHAPTER1

1.INTRODUCTION

Rover may be a moving platform or vehicle equipped with totally different electro-mechanical gadgets. it's a hybrid product of natural philosophy and mechanics. Rovers square measure principally used for assembling knowledge or materials from places wherever accessibility is poor or dangerous. Rovers contain totally different variety of sensors and even mechanical facilities for varied applications. Sensors square measure usually meant for detection physical conditions of the realm like heat, electrical shock, smoke or perhaps detection the presence of live physical body. fashionable rovers square measure equipped with computer code and small controllers for swish and correct functioning. The aim of the Rover is to driftaround and provide video knowledge from the given atmosphere and to send that obtained knowledge to the user. With the obtained live streamed video output, the action of investigating is performed.

In 1954, humans were introduced to the world‘s first fully functioning industrial robot –The Unimate" and after that, scientists and engineers have come together to create dynamic and diverse changes in the field of automation and robotics to make the daily humane tasks easier and faster. The use of robots in development and automation fields is increasing day by day and there is no doubt about the future being largely controlled by robots and artificial intelligence (AI).The Surveillance System closely observes and analyzes the surrounding and get instant information about the conditions. It is mainly required in areas of high risk, borders, public places, and prison or in industries which is mainly used for monitoring behavior and activities of a group or any individual. The need of surveillance robots arises when the life

risk is too high and the user wants the information to be highly accurate. Robots are nothing but fully automated electronic and internetcontrolled devices that are capable of performing various tasks that a normal human might not be able to do. Thus, use of robots for surveillance is one of the greatest advancements in the field of automation. These multifunctional robots are able to perform tasks in dangerous situations like collapsing buildings or radioactive zones. One of its best uses is in the protection and rescue works after unexpected tragedy or unwanted invasions like Ukraine- Russia Cold war or tragedies like Chernobyl/Bhopal Gas Plant. There are many obstacles faced by the rescue forces during inspection of such sudden and unexpected events like narrow spacing, collapsing of damaged structures. It becomes difficult for an ordinary human to deal with such risky tasks to enter areas without knowing the present information. These robots being autonomous in nature are designed to perform efficiently withouthuman interference and have high mobility. Back in 1999, Kevin Ashton introduced the term ‗Internet of Things' to the world in one of his presentations. IoT connected people with everything on the internet from anywhere around the world and since then the definition of IoT has evolved and growth has rapidly increased. Nowadays, we can see the wide use of IoTin various fields to connect the world virtually and physically. The numberof devices connected via IoT as of 2021 are close to 30 billion and expected to react 75 billion in the year 2025 enumerated by Statista. This IoT Based Autonomous multi-purpose surveillance and rescue robot is built on mainly two systems, the motorized working of the robot with all the connections andsecond, the communication of the device with the user and smooth data transfer from the sensors to the cloud platform. These systems help in carrying out task properly. The main aim of this project is to combine thetwo different systems into one machine that would make them work

simultaneously and perform the required tasks. To achieve this aim, an IoT based monitoring system is also included with the robot which can be used to monitor by the user through their device. The main applications include:

1. Record video visuals and broadcast it to the user
2. Send data from sensors to the IoT channel
3. Can explore areas that are dangerous for human
4. Used for the inspection of border areas

CHAPTER 2

OBJECTIVE

Below is a list of objectives that we have determined are a requirement for our vehicle to meet. Each of these objectives are will be explained in the following subsections.

2.1 Autonomous Operation with Voice Commands

One of the major components of our design is the ability for the robotic vehicle to be controlled through voice commands. This is desirable becauseit allows the operator to command the vehicle without the use of manual controls. This means that the controller can be a light and small device that leaves the operator free to perform other tasks while still having control ofthe vehicle. The vehicle must also be able to operate autonomously. The more that the vehicle can operate on its own, the less attention that the operator has to put into controlling it. The operator should be able to simply give a command and then the vehicle should be able to carry out the command without extra input from the user. The operator can then simply watch the display to gain the visual information without having to worry about steering the vehicle.

2.2 Operation in Different Modes

Our design will feature three modes of operation to carry out different types of tasks. These three modes will be ‑survey‖, ‑find‖ and ‑track‖. The function of these three modes will be implemented in the software of the vehicle with the use of a microcontroller. The external components such as the servos and camera shall be interfaced with the software to serve as inputs

or outputs. For example, when a command of ―track‖ is given through the controller device, the software shall recognize the keyword and execute a subroutine that reads the input from the camera to find the designation. Then the software shall output to the servos the signals required to move the vehicle in the direction of the target while reading the input from the ultrasonic sensors to avoid collisions. A similar procedure shall be executed for the other two modes to ensure correct operation.

- Development of light security mechanisms.
- Security and privacy must be maintained from the information source (sensors in or on the body, nanoscale communications system, etc.) to the final destination.
- Wireless communication system.
- These systems mainly consist of high quality cameras, multiple computers for monitoring, servers for storing.
- Advance knowledge in the area of intelligent wireless networks.

CHAPTER 3

CONCEPT

Our concept is to help Indian Army to run smooth operations without losing man power. The concept of our rover is to go in such area where no human can possibly go and collect the data. Human life is too precious to risk it, so here our rover comes in the play. where, this rover with the help of sensers and advance technology, can go in the area which are under attack or whereit is too risky for a human to possibly go, our rover withNode MCU / UNO(NodeMCU is a low-cost open source IoT platform. It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which was based on the ESP-12, Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), 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 batteryto get started.), Sonic Echo Sensors x2(An ultrasonic sensor is an instrumentthat measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object‘s proximity.), Smoke Detection Sensor(A smoke detector is a device that senses smoke, typically as an indicator of fire. Smoke detectors are usually housed in plastic enclosures, typically shaped like a disk about 150 millimeters (6 in) in diameter and 25 millimeters (1 in) thick, but shape and size vary. Smoke can be detected either optically (photoelectric) or by physical process (ionization). Detectors

may use one or both sensing methods.), IR Sensor(An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment. Infrared radiation was accidentally discovered by an astronomer named William Herchel in 1800.), Rover Chassis, RFID Reader(A radio frequency identification reader (RFID reader) is a device used to gather information from an RFID tag, which is used to track individual objects. Radio waves are used to transfer data from the tag to a reader.), DC Motor(DC motor is any of a class of rotary electrical motors that converts direct current (DC) electrical energy into mechanical energy. The most common types rely on the forces produced by induced magnetic fields due to flowing current in the coil. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor.), Servo Motor(A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.), Metal Detector(A metal detector is an instrument that detects the nearby presence of metal. Metal detectors are useful for finding metal objects on the surface, underground, and under water. The unit itself, consist of a control box, and an adjustable shaft, which holds a pickup coil, which can vary in shape and size.), is build in such a way that it can move undetected by the enemy radars, and eyes smoothly, to collect the data required by the Indian army. This rover comes with The Raspberry Pi 3(Model is the third generation Raspberry Pi. This powerful credit-card sized single board computer can be used for many applications and supersedes the original Raspberry Pi Model B+ Model B. Whilst maintaining the popular board format the Raspberry Pi 3 Model B

brings you a more powerful processer, 10x faster than the first generation Raspberry Pi. Additionally it adds wireless LAN & Bluetooth connectivity making it the ideal solution for powerful connected designs), Camera, Battery (Arducam CamerasESP8266), Vision Sensor(Vision Sensors/Machine Vision Systems analyze images to perform appearance inspections, character inspections, positioning, and defect inspections.), PIR Sensor(The passive infrared sensor, sensor that measures infrared light radiating from objects. PIR sensors mostly used in PIR-based motion detector PIR sensor can detect animal/human movement in a requirement range. PIR is made of a pyroelectric sensor, which is able to detect different levels of infrared radiation.). Our rover provides accurate data to the control system to tackle and create a better plan of execution for the army. The Rover Detects smokes and fire, land mine, number of enemy in the area, Night vision, camouflage to move undetected, follows the specific path, collect important data, etc.

CHAPTER 4

4. METHODOLOGY OF PROPOSED METHOD

First quadcopter & camera got power and turn on. Then quadcopter start mapping the area for 30 min. If any human live or smoke is detected while mapping it gives the location of that place immediately to the operator by sending an image. While quadcopter mapping the place rover also work simultaneously. To control sensors Arduino microcontroller is used. To control four-wheels of rover BTS7960 motor driver we have used and to control servo motors of mechanical claw & camera we have used servo motor driver module. Rover can‘t be access until the RFID is not matched. If RFID matched then rover follows the path provided by the operator. While surveying the area if any sensor got logic 1 then microcontroller activate all the sensors. If any human or smoke is detected by these sensors, then immediately alert the authorities. Among all these if battery is less then 10%then operator get a red light blinking and have to take back rover to the base station immediately.

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surveying the area if any sensor got logic 1 then microcontroller activate all the sensors. If any human or smoke is detected by these sensors, then immediately alert the authorities. Among all these if battery is less then 10% then operator get a red light blinking and have to take back rover to the base station immediately.

Adding to it this rover framework is also enabled with live streaming of the area, which can be easily seen on any android device or laptop on a webpage which will be enabled when we start the rover, It is also enabled with state of the art ultra-sonic sensors which help in collecting trash when any person is near the dustbin in simple terms if you want throw garbage manually in the dustbin you can go near the dustbin and the sensors will detect your presence, and by this the lid of the top dustbin will open and you can putyour trash into it. So our Framework in Simple words not only terms of segregating and collecting garbage but also helps in the surveillance.

This class of robots can be designed by following below mentioned methodologies

1. Choosing a rugged mechanical chassis.
2. Choosing a stable computational core for managing the robot.
3. Sensing physical world parameters for offering services. The above methods can be integrated into a system which serves the purpose of a smart IoT based Robot.

4.1 Mechanical Design And Chassis

Fundamentally, for any mobile robot whether on land, in air or under water is a mechanical base or platform actuated by electric motors. A commercial plastic-based trashcan with lid, sizes roughly around 12-14 inches wide and

32-40 inches high. This bin is partition into two parts, upper and lower respectively. Lower part is assembling with prototype vacuum cleaner and upper part is again partition into left and right. Left upper part is for wet waste and right upper part is for dry waste respectively covered with samelid integrated with ultrasonic sensors. The vacuum cleaner is mounted insuch a way that it should be near to ground and necessary space and vents can be used to improve cooling.

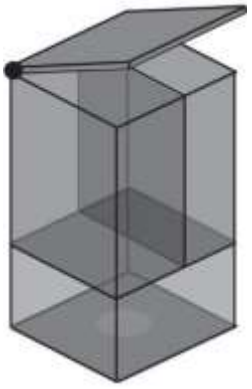

Figure 4.1: Design And Chassis

4.2 Computational Core

To be able to handle all computation, processes and sensor data acquisition and cost-effective board like Raspberry Pi 4B is required. It‘s full-fledged SoC (System on-chip) capable of connecting to local network/Internet via its gigabit Ethernet. The fan-less architecture doesn‘t require much power to operate. We used Raspbian OS based on Linux which can run python tools for simple yet power fuluser-friendly applications – video stream. It comes with bunch of General-Purpose Input and Output pins or GPIO for short so that we can easily interface a good number of sensors to sense the physical world parameters. C. Sensing Dynamic Environment: The smart trashcan should be able to sense waste in it and provide uninterrupted service, long

range infrared distance sensors can be used to know the trash status in bin by calculating distance and alerting client on overflow. In each partition separate infrared sensors are used. To automatically open trashcan lid servo- motor and ultrasonic sensor are connected with digital pins. Raspberry pi acquires video, images and stream it remotely to client on web application.

4.3System Implementation

After getting all hardware & rugged chassis for rover, firstly we connect GPIO pins with L298N‘s H-bridge driver circuit input pins and ultrasonic sensors pins. The fundamental block diagram shows connection of various components. A pocket router or dongle is connected to Raspberry Pi 4B for network connectivity, Raspberry Pi acts as web server. For optimized performance we have used recommended operating system distribution called Raspbian OS as it is specifically designed for Raspberry Pi. To remotely access this system, we need static IP (Internet Protocol) address,but pocket router or dongle doesn‘t provide static address instead it provides dynamic IP. To resolve this problem DDNS (dynamic domain name server)is used, which possesses more satisfactory functions and is easy to develop and convenient for use. A DUC (Domain Update Client) service runs in background in Raspberry Pi which automatically updates current IP address of Raspberry pi provided by service provider with domain name. Theseallow us to access robot remotely using domain name.

The user can able to access the robot with wheel drive control buttons on the webpage. The web application is developed on MVC (Model View Controller) Python-Flask framework. The webpage can be used to monitor and control the robot by displaying nearby video, and to decide the direction of the robot to go. The Raspberry Pi GPIO (General Purpose Input and

Output) pins are connected to L298N‘s driver circuit, so when user clicks on buttons corresponding macro is called from the python script resulting in the corresponding GPIOs being made LOW or HIGH. The Raspberry pi Camera V1 is 5MP static sensitive type camera is used. The Raspberry pi camera continuously captures the image and it is saved on the SD card of theRaspberry pi module as well as video stream displayed remotely on web application. The video stream is in gray-scale format. The gray-scale image format was chosen because video-frames in gray-scale format is much faster to stream and consumes one-third of the bandwidth required for streaming same video-frames in RGB or any other color format similar to RGB format.

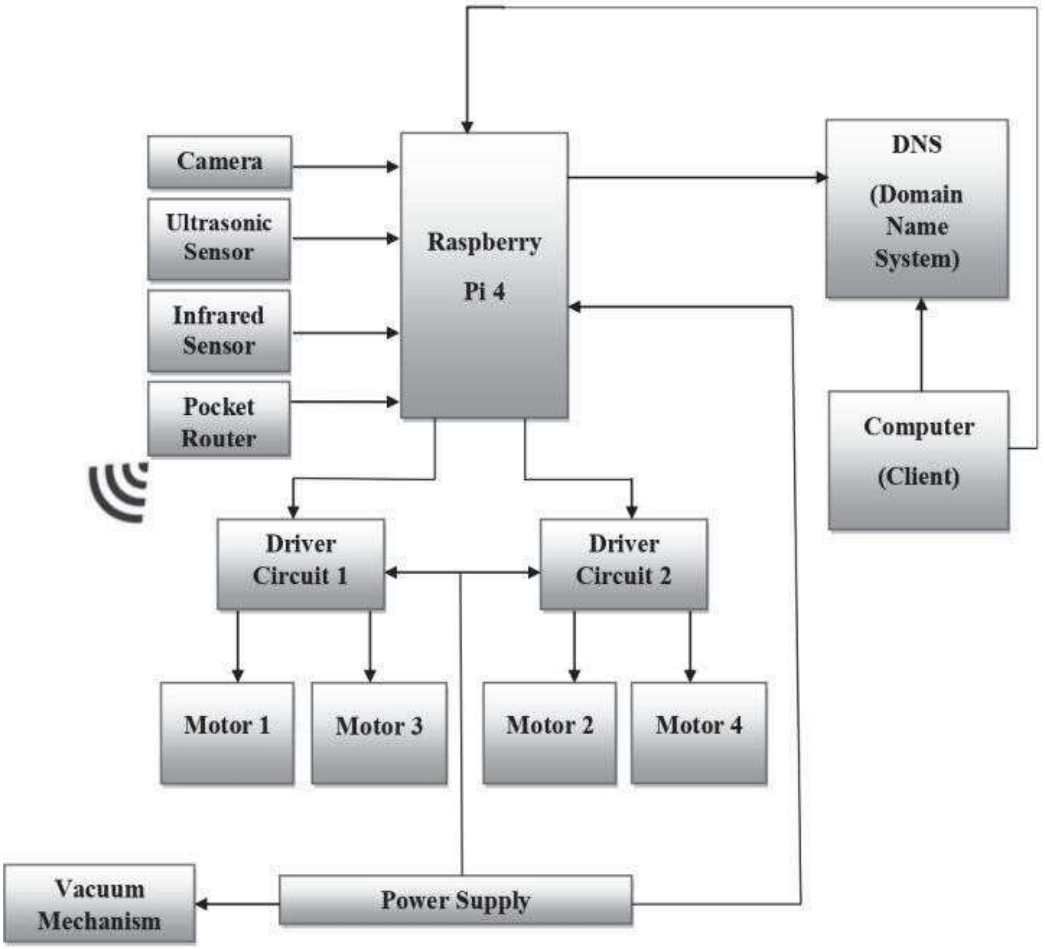

Figure 4.2: Raspberry pi implementation

To monitor status of squander in trash bin an infrared sensor is used in each partition. The device emits an infrared radiation and receives the radiation which is reflected back from the target object. The sensor measures the distance to the target object by measuring time between emission and reception of the infrared radiation. It uses single infrared element for both emission and reception. On trash bin overflow, an alert message is sent to user remotely so that user can dispose the squander manually. Trash collecting bin lid's open automatically, so visually Impaired and crippled individuals can adequately utilize it. An ultrasonic sensor is mounted beneath the lid which perceives any article like a hand for example, and command servo-motor to open lid. After certain time lid closes automaticallyif no article is being sensed. The sensor measures the distance to the target object by measuring time between emission and reception of the wave. The distance can be

4.4 Calculated Using The Formula

Distance (L) = 1/2*T*C

Where L is the distance of the object from the sensor, T is the time between emission and reception, and C is the acoustic velocity, c = 340 m/s of ultrasonic wave.

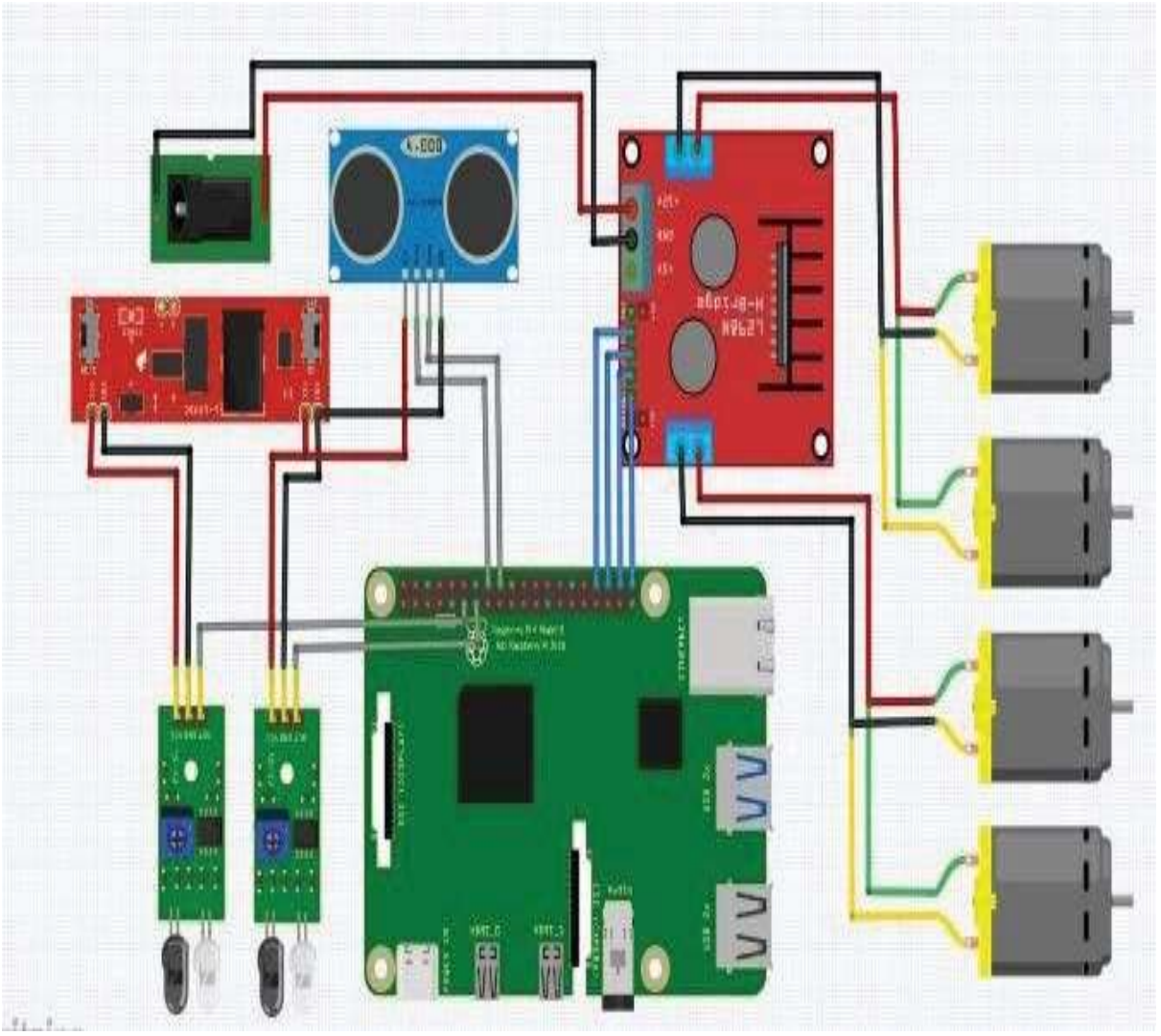

Figure 4.3: Board

The video stream is of resolution 640x480 in gray-scale format, so net data rate is given as:

Data Rate = Resolution * Frame Rate * bit depth

(Color Dept Factor = 12 bit per pixel [Mono-Chrome])

Total Horizontal Pixels X Total Vertical Pixels = Resolution

640 X 480 = 307,200

Resolution X Refresh Rate = Result

307,200 X 30=9,216,000

Result X Color Depth Factor = Net Data Rate

9,216,000 X 12 = 110,592,000

As 1 bit = 1.25 X 10-7 Megabyte

CHAPTER 5

5. LITERATURE REVIEW

5.1 PAPAER 01

Author :- Md. Nahidul Alam1, Md. Saiam2, Abdullah Al Mamun3, Md. Musfiqur Rahman4, and Umma Hany5

Topic Name :- A Prototype of Multi Functional Rescue Robot Using Wireless Communication

Introduction :- The main issue of a disaster place is that the delay to rescue the victims. In a disaster place, it became impossible to find the victim as soon as possible. the major reasons is the small number of technical rescuer teams. It‘s also difficult for the rescuers to go inside the rubble because of toxic gas, hazardous material, high temperature. Rescue mechanical technology has been recognized by the National Research Council's ponder "Making the Nation More secure.

Method :- A. Mapping and Detecting Human B. Rover System & Workflow Mechanism C. Nanobot Workflow Operation

Result :- The main aim achieved from this design is that all sensors are providing data accurately. Nanobot is also giving proper thermal imagining. While any sensors got logic _1‘ then all sensors start providing data. In this

paper, we have divided the robot into three parts, which collect data from three perspective points & provide data to the rescuer team.

5.2 PAPAER 02

Author :- James H. Lever

Topic Name :- AUTONOMOUS ROVER FOR POLAR SCIENCE SUPPORT AND REMOTE SENSING

Introduction :- This paper reports outcomes of recent field deployments of the solar-powered Cool Robot, which was developed as an autonomous platform for towing or carrying scientific instruments in Greenland and Antarctica. The Cool Robot is an autonomous solar-powered mobile robot designed to serve as a roving platform for measuring spatial- temporal phenomena in polar regions.

Method :- An aerosol instrument package was developed by the Univ. of New Hampshire and includes an optical particle counter and an aethalometer integrated into an environmental enclosure with GPS, data logger, and battery pack. The interface to the package is comprised of a laptop that is programmed through a GUI to specify sampling protocols for the payload.

Result :- The Cool Robot supports long duration, autonomous science campaigns in polar regions through a unique low-profile solar-powered design coupled with simple navigation software and a user interface that allows flexible selection of sampling protocols.

5.3 PAPER 03

Author:Praphulla M P, Sushma M, Gayathri M A

Topic Name:-Surveillance Rover: The Future of Defense

Introduction:- Surveillance is the monitoring of behavior, activities, or information for the purpose of influencing, managing or directing. This can be done by observing conditions prevailing on ground from a distance via CCTV, by intercepting the information that was transmitted electronically or through post. It can also be done manually by humans who gather the intelligence information. Surveillance is used by governments for intelligence gathering, prevention of crime, the protection of a process, person, group or object, or the investigation of crime. My RIO is a real time embedded evaluation board developed by National Instruments. It provides real time response needed to control the actions of surveillancevehicle. Its processing speed is almost ten times more than that of general micro-controllers and microprocessor, which decreases the response time. Program can be circuited with Lab VIEW, fused with My RIO, and can be operated in wireless mode.

Method: Autonomous vehicle navigation is achieved and all controlling actions are implemented wirelessly. The surveillance conducted by vehicle is safe, reliable and real- time response is obtained. Obstacles/Objects detection is successfully implemented with increase in its range of operation, than previously existing ones. Human life can been dangered while exploring inaccessible terrains, hazardous mines etc. Such system acts as a reliant substitute in place of humans and serves the purpose efficiently. Result: The work described in this paper was supported by GSSS Institute of Engineering and Technology

for women, Mysuru. The authors would also like to express their gratitude towards Department Electronics and Communication Engineering and our project guide Padma For their valuable insights and guidance.

5.4 PAPER 04

Author:- Prof. Kalpana R. Bodke

Topic Name:- Surveillance Robot controlled using an Android app.

Introduction:- The advent of new high-speed technology and the growing computer Capacity provided realistic opportunity for new robot controls and realization of new methods of control theory. This technical improvement together with the need for high performance robots created faster, more accurate and more intelligent robots using new robots control devices, new drivers and advanced control algorithms. This project describes a new economical solution of robot control systems. In general; the robots are controlled through wired network. The programming of the robot takes time if there is any change in the project the reprogramming has to be done. Thus they are not user friendly and worked along with the user preferences. To make a robot user-friendly and to get the multimedia tone in the control ofthe robot, they are designed to make user commanded work. The modern technology has to be implemented to do this.

Method:- The project is designed to control a robotic vehicle using an android application. Bluetooth device is interfaced to the control unit on the robot for sensing the signals transmitted by the android application. This data is conveyed to the control unit which moves the robot as desired. Remote

operation is achieved by any smart-phone/Tablet etc., with Android OS, upon a GUI(Graphical User Interface) based touch screen operation. Transmitting end uses an android application device remote through which commands are transmitted. At the receiver end, these commands are used for controlling the robot in all directions such as forward, backward and left or right and captures the video and transmits to TV through RF signal At the receiving end the movement is achieved by two motors that are interfaced to the microcontroller. Serial communication data sent from the android application is received by a Bluetooth receiver interfaced to the microcontroller. The program on the microcontroller refers to the serial datato generate respective output based on the input data to operate the motors through a motor driver IC. The motors are interfaced to the control unit through motor driver IC.

Result: We have two results i.e. the hardware and the software result. The hardware includes the robot which runs on DC motors. The input to the motors is provided by the L293D motor driver shield. The input to the driver shield is provided by the Arduino board. The navigational inputs are given bythe user to the Arduino board using the android application via Bluetooth. The Arduino board, on receiving the signal, processes it and produces the appropriate output. The communication between the android application and the Arduino board takes place using the Bluetooth module which isinterfaced with the Arduino board. It provides serial communication between the application and the Arduino.

5.5 PAPER 05

Author:- K. Krishnaveni, P Gopi Krishna, K.Shivani, B. Ravi teja

Topic Name:- Design And Development Of Surveillance Robot.

Introduction:- Now- a-days industries are becoming modern and they automated the technology to perform various risky jobs. This robot is helpfulto minimize the life risk of the humans and the animals. With the advancetechnologies of the wireless communication technology in robots there can bean autonomous robot car which will be controlled manually. Surveillance isthe process of continuous monitoring of the territory which is essential formilitary security. Here the robot is controlled by using internet in PC orAndroid mobile phone through the webpage. And the camera present tothe robot captures the data and sends the data to the controller throughinternet. An computerized surveillance robot is used for safety-consciouswhich includes at airports, museums and government installations and so on.The wise software should reveal security cameras and detects if anydifficult behavior takes place. Having an automatic surveillance robotic vastlyincreases the productivity of the human operator and increases coverage ofthe surveillance so that human can do best the operation or navigation ofrobot alternatively getting damage in the wars. Method: First, we have tomake a robot by Node MCU through which the web page and the beaglebone black board microprocessor connects to the power supply. By usingUSB cabled camera module connected to the beagle bone black board and itshows the live streaming data in the system through the internet. It can giveonly online live streaming depending upon

that we can navigate the motion

of the robot. In our project we have used an 18megapixel camera for the image processing of the data through the web page and in the webpage,we will have the live streaming data and we can control the robot in the webpage. Here, the Beagle Bone Black works with an operating voltage of 5v.The USB Camera is enabled with the USB host to given input to the BeagleBoard-xM processor. The operation of the Beagle Board-xM processor is to compress and quality image for determining the motion of the camera filed and then displayed on webpage.

Result:-In this Project, we have described overall design for a video streaming wheel robot which is controlled using Beagle Bone Black and a webpage created using HTML and JavaScript. This is mainly a surveillance robot which streams live video via camera module through internet and displayed on the webpage which is used to control the robot movement. The robot‘s movement is manual and can be monitored/controlled on the webpage. After the installation and setup of the beagle bone the following steps were used in order to run the project.

Step-1:Updating of the image i.e. the camera tracks the live motion of the system and it updates the images or live stream to the webpage.

Step-2:The USB cable is included in the beagle bone which provides the convenient way to provide both power to Beagle and connected to the system. It should always be powered. The SD card inside the Beagle Bone ought to be inserted in away that it's far inserted in advance ofimpartingpower.USR0 is configured in the Beagle Bone at boot to blinking a heartbeat pattern. USR1 is configured in addition the mild in the course of theaccesses of the SD cards.USR2 is configured besides the mild at some stagein CPU pastime.

Step-3: Enabling of network connection in the Beagle boneset up. A network adapter should be shown up if connected through USB. The access point password is used to default the Beagle bone when the board includes the WIFI

.

5.6 PAPER 06.

Author:- Divakar U1, Ningaraju , Sudarshana Chakravarthy, Suraj Sharma ,

Harish S, Pawan Bharadwaj

Topic Name:- IoT based Multipurpose Surveillance Robot.

Introduction:- With the various and fast advancements in the field of Automation and Robotics, robots are playing a vital role in simplifying the lives of human beings by reducing human errors and human labor. A surveillance robot is a robot used for spying/monitoring purposes. Any remote/inaccessible areas can be monitored using surveillance robots. Surveillance is the method of systematic close observation of person or area of suspicion. Surveillance is mainly required in the area of defense, intelligence gathering, disaster affected areas and in public places. Nowadays, tracing, tracking and attacking enemy troops indifferent areas proves to be a tedious task for army personnel. There is always a chance of loss of the lives of soldiers on the battlefield and during emergencies. To develop a technology that serves the high speed and advanced capacity to control the robots and to devise new methods of

control theory. To realize the above standards, some technical improvements along with the need for high-performance systems are required to create a faster, reliable, accurate and more intelligent robot. This can be devised by advanced control algorithms, robot control devices and new drivers. To meet the requirements, we can use multimedia to control the user-friendly robot.

Method: - Hardware requirements are as follows,ESP8266 (Node MCU): - The ESP8266 is a Wi-Fi module which is used to provide internet access to the microcontroller. The commands are provided to the microcontroller via Blynk App to control and monitor the motion of the robot. Motor driver(L298N): - As the name suggests, it is mainly used to drive motors. A single L298N is capable of running two DC motors at the same time; Also, the direction of the two motors can be controlled independently. The motor driver is used as an amplifier, to amplify the voltage supply to the motors. The motors operate at 12V, but the microcontroller provides only 3.3V to 5V at its output pins. DC Geared Motors (30 RPM): - A DC motor is an electrical machine that converts electrical energy into mechanical energy.In a DC Geared Motors, the i/p electrical energy is the direct current (DC) which is transformed into the mechanical rotation. Robot Chassis & Wheels: -It‘s a simple accessory that particularly supports the making of a robot. Chassis is a very essential component not only in constructing robots but also for many mechanical devices. The components that are interfaced are handled by a chassis for connecting components and accessories on it.IR sensor: - IR Sensor Module is an electronic device, that emits the light in order to sense some object of the surroundings. Infrared (IR) sensors are also capable of measuring/computing the heat being emitted by an object and detecting the motion.

Result: - This paper presents a multipurpose surveillance robot that can be used in military applications for both spying and detecting landmines. We can also use this robot for detecting hazardous gases during rescue operations where humans cannot get inside due to tight spaces.

5.7 PAPER 07

Author: - Xi Vincent Wang and Lihua Wang

Topic Name: - A literature survey of the robotic technologies during the COVID-19 pandemic

Introduction: - Since the late 2019, the COVID-19 disease has been spread worldwide. It leads to critical challenges to almost all countries in the world. Until November 2020, there have been 57,639,631 confirmed COVID-19 cases with 1,373,294 deaths globally, according to the statistics of the World Health Organization (WHO) [1]. Different approaches and technologies are suggested to support the treatment and control of the pandemic, including robotics.

In the past, some researchers briefly summarized the robotic applications during a pandemic. Khan classified the robot utilizations in healthcare in different categories, including receptionist, nurse, ambulance, telemedicine, serving, cleaning, spraying/disinfestation, surgical, radiologist, rehabilitation, food, and outdoor delivery robots. Zeng et al. [7] reviewed the robot applications based on the desired locations, i.e., robots in hospitals,

communities, airports, transportations, recreations, hotels, restaurants, attractions and scenic areas. Those reviews have provided an overview of the robotic achievements so far. However, there is still a lack of detailed analysis from the robotic technology ‘s perspective. Therefore, it is necessary to discuss the key robotic technologies combating the pandemic and to identify future research trends. Thus, in this research, a literature survey is conducted, aiming to systematically analyses the research achievements so far.

Method: - The methodology of the literature survey is based on six stages as described underneath. Formulating the research questions: as mentioned, the main objective of this literature survey is to analyze valuable robotics research during the pandemic and identify future research trends. The reported work aims to answer two Research Questions (RQs) underneath:

RQ1: What are the main research contributions to combat the pandemic from the robotic technologies ‘perspective?

RQ2: What are the promising supporting technologies needed during and after the pandemic to help and guide future robotics research?

Searching the extant literature: the next step is searching the literature and making decisions on the suitability of the materials to be included in the review. In the proposed work, there are two main stages. At Stage 1, the exhaustive coverage is established to be as comprehensive as possible to ensure that all relevant studies are included. Discussions are established based on the all-inclusive knowledge base to identify the mainstream of robotics research relevant to infectious diseases. Stage 2 consists of presenting the materials that are representative in the given field. The

searching criteria are narrowed down from infectious diseases to robotic technologies in the pandemic scenario specifically.

Screening for inclusion: at this phase, the collected materials are screened to guarantee the applicability. The output of the searching at stage 2 is processed based on predetermined rules, e.g., including robotic technology and excluding work focusing on medical research.

Assessing the quality of primary studies: in addition to screening the literature for inclusion, the quality of the selected references is also assessed, based on the scientific value in the research design, methods, and reported results.

Result: - In practice, digitalization and automation did not progress fast before 2020 due to multiple reasons. The cost of robots is high and the implementation is hesitating against the cheap labor. There are political and social concerns of the fear and unknown consequences, while some of the technologies are banned at the legal level. However, the pandemic crisis forced the digital transformation to some degree. Until late 2020, the pandemic was still not well controlled globally. Many automation devices and systems have been deployed worldwide to fight against the crisis. Robot is one of the promising devices as it provides physical functionalities with effective social distancing among the patients and the medical staff.

In this work, the achievements of the robotics research during the pandemic are reviewed and discussed. To answer, the literature so far is analyzed based on the supporting technologies, while the TRL is identified. The future research trends and essential techniques are also addressed, including AI, 5 G, big data, wireless sensor network, HRC and haptic control to answer.

5.8 PAPER 08

Author:-Hinthapatla Sri Varshini, Mohammad Arif Khan, Yogita khandge and Ranjana Ubale

Topic Name:- TELEPRESENCE SURVEILLANCE ROVER

Introduction:- In today‘s world, the development of science and technology has introduced the concept of virtual reality and robotics. The term virtual reality means _near-reality‘. This concept enables people to be at more than one place at a single time. This robot enables to observe the people and their surrounding without being physically present. It helps one person feel more connected by giving a virtual presence where one can't give in physical. Robots have increased widely in today‘s world. In almost all industries, the concept of robotics is used as they are user friendly. The Robot used in this project uses a rechargeable battery. Telepresence uses virtual reality technology. The telepresence robot gives a virtual reality experience that can be felt by the user even when the robot is in any remote location. This paper explains the working of the robot and capturing of the visuals by RPi camera, how to configure Wi-Fi and interfacing servomotors with Raspberry Pi and geared motors with Arduino. It explains how the data is received, as signals, from an android application and sent to Raspberry Pi and Arduino. The mini rover camera is stationary. As the rover moves, the camera moves

along. In the proposed system, we have the facility to rotate the camera accord.

Method:- Raspberry Pi is the brain of this project. RPi receives input data from an android phone via WIFI which is further sent as controlling pulse to the servo motors attached with the camera which rotates the camera in 2 axis plane. The android smart phone also sends the input directional data to the Arduino UNO board from a Bluetooth electronics app for the movement of the telepresence surveillance robot. The geared motors are interfaced with the Arduino UNO board via motor driver IC (L293D) at the end of the navigation system.

Result:- After the proper assembly of hardware and installing followed by running the required software we demonstrated that the telepresence surveillance robot can provide HD colored live video in a region anddirection as per our requirement. This paper has presented on the robot and capturing of the visuals from RPi camera. The person watching visuals from camera the directional data are transferred as the head moves. In the case when the head moves very fast, the transfer data rate is high. This, in turn, requires the Raspberry Pi to process the data very quickly. The app should beprogrammed in such a way that the Raspberry Pi board gets enough time to process the data and prove it as input to the servos. The currently designed robot is suitable to run over only smooth surfaces. The stronger body of the robot will allow it to run over rougher terrains. In the military, this robot can be sent for monitoring instead of a soldier. In this way, only the robot gets damaged and no life is lost even if there is an unexpected attack. The robot can be used for surveillance in the house where the owner wants to keep an eye on his home. In Medical, when the doctor is not available to go on

rounds, the robot can be used to check the state of the patient. They can even provide home care assistance to the elderly. The robot can be used in fire and rescue operations if it is made fireproof.

5.9 PAPER 09

Author:- Dr. HameemShanavas

Topic Name:- Design of an Autonomous Surveillance Rover using Simultaneous Localization And Mapping.

Introduction: - Building and industrial areas are commonly targeted by thief ‘sand intruders putting the lives of humans or valuables at risk. Recently, robots have found to be useful to provide surveillance and prevent such unauthorized access from taking place. With the advent of mobile robots capable of solving complex tasks and achieving real-time decision-making capability, autonomous robot has become a norm. Autonomous Mobile Robot is a robot that can navigate by itself through an unknown environment.The AMR can sense its environment, create a model of it and localize itself within this environment. This enables the AMR to further create a navigation plan and dynamically execute this plan using a planning and path finding algorithm. This is known as Simultaneous Localization and Mapping. In a majority of SLAM based algorithms, some differentiable features in the map are noted as landmarks. When a robot moves across the map, the distances from these landmarks is taken as the feature extraction values for the robot to localize itself. In this study, an Autonomous Surveillance Robot which can map and indoor environment is designed and implemented. The

Electronic design procedure has been explained in detail and functionality like video stream using a webcam, videorecording and speech recognition is implemented.

Method: - The mapping process we have chosen to implement SLAM is mapping. In, the paper discusses implementation of mapping on ARM based embedded system. The mapping process running on the system can create a 2D map of occupancy from the laser and the pose data that is read by the

mobile robot. The experimental results that were carried out show the accuracy of the mapping process. In, a fruit mapping mobile robot on a simulated agriculture land was simulated on gazebo simulator to increase the efficiency and quality of the crop monitoring and their treatment. The paper proposed a means to generate a map in simulated area through SLAM and detection of the fruits using visual sensor. Once the mapping process is performed, global path planning for the mobile robot is required for autonomous operation. The Adaptive Monte Carlo Localization algorithm is used for this purpose. In, for the locomotion of the robot, a microcontroller has to be used which gives the motion commands tithe robots motors.

Result: - Once the different soft-wares installed on the robot are tested, the robot is run around different territories to build the map. The map is built and dynamically saved on the robot's computer and live streamed to the development computer. Once the map is built and saved, the coordinates for navigation are given as inputs to the robot. The robot then starts its autonomous navigation, real time updating of the map and live streaming of the webcam video feed to the development computer. Once the complete setup is built, tested and checked for errors, it can be mounted on any kind of

chassis, depending on the application being built for. Such systems can act as remote surveillance systems when the user is not present in the location of the robots. They can be used to monitor the security critical areas near borders 24/7 without any hassle and loss of precious soldier lives. Such systems can also be added to any prevailing security system to make it more robust and user friendly. It can be used in war zones and landmine detection to move in unknown territories.

5.10 PAPER 10

Author:-TejasBamne, Siddhi Jadhav, Shrutika Borkar,Shailesh Kokare, Mr. Pravin Alone.

Topic Name:- DESIGN AND FABRICATION OF SURVEILLANCE ROVER USINGROCKER BOGIE MECHANISM.

Introduction: - Surveillance is that the technique for perceptive a location, apart or someone for defense and security purpose. This activity continuously happens in an exceedingly military, police, public places and even in homes these days for watching and to regulate the dirty activities. We choose a rocker-bogie mechanism for our mechanisms a result of its extremely stable suspension that is capable of operative in multi tract surfaces whereas keeping all wheels to bear with ground. This mechanism is that the suspension arrangement employed in Mars rovers introduced for Mars expert and conjointly used on Mars Exploration Rover (MER) and Mars laboratory (MSL)) missions. the bogie will resist the mechanical failurescaused by the cruel atmosphere on MARS. So as to travel over the obstacle, the front wheels are forced against the obstacle by the rear wheels. The

rotation of sternwheel then lifts the front of the vehicle up and over the obstacle. the center wheel is that the ironed against the obstacle by the rear wheel and force against the obstacle by the front, till the upraised up and over. Finally, the rear wheel is force over the obstacle by the front 2 wheels. throughout every wheel's traversal of the obstacle, forward progress of the vehicle is slowed or utterly halted. These rovers edge and climb over the obstacles by having wheels raise each bit of the suspension over the obstacle one portion at a time. This system

uses a Spy camera as a watching camera. Six DC motors square measure every connected to the wheels and controlled via a Bluetooth module. This watching automaton will climb stairs simply as a result of it uses a rocker bogie suspension in order that the automaton will monitor the state of the complete area. Especially, the investigation activity is employed in the main for human as a result of the individuals were doing all bootleg work against the government and at identical time to safeguard them from those activities. The arrival of technology has brought a revolutionary modification within the field of AI, particularly in the automation sector. The usage of AI is increasing day by day, that reduces the human work however the efficiencyof labor will increase altogether department from military to our home and even in hotels. Today ‘s life has modified a lot in each activity because of usage of Smartphone. The people can do all works victimization sensible phone and that they will operate any system by developing Associate in Nursing application, which may be put in the sensible and providing varied applications on different operative systems. Especially, the mechanical man OS is one of the necessary sources, that is on the market in open and helps in building the applying for several activities for people in their day these days life.

Method: -DC Gear Motor: An electric machine that converts electrical energy into mechanical energy. The working principle of a DC motor is that every time a current-carrying conductor sited in the magnetic field experiences a mechanical force DC motor the input electrical energy is the direct current which is converted into the mechanical rotation. We will be using a 60 premotor with a 12V DC motor the electrical motor is an electromechanical device that produces motion by turning electrical energy into a mechanical one. Wheels: Wheels are usually in the pairs, connected bya rod of wood or metal known as an axle. Our wheel design may not be optimized in terms of strength and weight reduction. Our project wheel diameter is 70mmSurveillance Camera: The device works Wi-Fi module and includes Android and iOS smartphones with the free mini camera app to configure. This mini spy camera can records without Wi-Fi too, all you have to do is insert an SD card and turn it on.PVC Pipe Material: A thermoplastic material derived from common salt & fossil fuels the pipe material has the longest track record of all plastic materials. Our Project pipes materials are acrylic, so this is a transparent plastic material with outstanding strength, stiffness, and optical clarity. Our project pipe diameter is 25mm.

Result: - This project climbs the obstacles or ride on the abnormal surface with the help of such a rocker-bogie mechanism serves our objective because of its nature of allowing flexibility in linkages when wheel climb ogres fromthe abnormal road surface. Hence this mechanism does not need an extra suspension arrangement. Also, the wireless Wi-Fi mini camera which is connected to the free mini camera app configured. The AV recording of the camera can be seen in that app. The camera also has motion detectionand night vision. Also, this project is budget-friendly.

5.37 PAPER 11

Author :- Md. Nahidul Alam1, Md. Saiam2, Abdullah Al Mamun3, Md. Musfiqur Rahman4, andUmma Hany5

Topic Name: - A Prototype of Multi-Functional Rescue Robot Using Wireless Communication

Introduction: - The main issue of a disaster place is that the delay to rescue the victims. In a disaster place, it became impossible to find the victim as soon as possible. the major reasons are the small number of technical rescuer teams. It ‘s also difficult for the rescuers to go inside the rubble because of toxic gas, hazardous material, high temperature. Rescue mechanical technology has been recognized by the National Research Council's ponder "Making the Nation More secure.

Method: - A. Mapping and Detecting Human B. Rover System & Workflow Mechanism C. Nanobot Workflow Operation

Result: - The main aim achieved from this design is that all sensors are providing data accurately. Nanobot is also giving proper thermal imagining. While any sensors got logic ‗1‘then all sensors start providing data. In this paper, we have divided the robot into three parts, which collect data from three perspective points & provide data to the rescuer team.

5.12 PAPER 12

Author:- Dinesh G, Mohammed Haneef , Mohammed Junaid, Naveen Kumar, Kanaiya VK.

Topic Name: - Camouflage Surveillance Robot.

Introduction: - Robot is an electro mechanical device which is controlled by program. The arm robot is designed for dangerous job, commercial job, home based job and many other purposes. We are designing Camouflage Surveillance Robot army robot which is surrounded by multiple functionality which include sensors, audio, video recording, wireless connectivity and the main objective of camouflage is to change its colors using color sensor concept when the robot move according tithe surface color. We are using ZigBee technology for strong connectivity it reaches workstation. Instead of humanarmy, we can send Arm robots to the dangerous place to complete the task.Like, hijack environment. The sensors are used to sense the body temperature,metal detection, gas detection, RGB colors. If Arm robots is not only used forthe defense purpose it can also be for wild photography to capture the wildanimals. However, the robot is containing the sensors and camera which sensethe body and capture the image. Further implementation is about Arm copterto spy and cover the intruder's area.

Method: - We are using multiple Arm robots with ZigBee module to overcome connectivity issue along with camouflage Robocat and PIR sensor with raspberry pi 3 controller. Wallowed multiple Arm robots to go

to the intruder area one robot passes the information to the other and vice-versa only when one or another robot goes out of range, Once the information reached/ received to arm robot which is within the range share the information to the workstation. In this way cover the broad area, If the intruder found the Arm robot it will automatically set to ―SELF DESTRUCTION‖.

Result: - The picture shows the actual design and activity in war field obstacle, and through transmitter receiver we can detect the obstacle coming in path. Gas sensor are used for sensing the toxic gases and metal detector are used for sensing metal weapons, land mines, etc. In this system we used camera to transmit the data from border to the official area or headquarters even when the Arm robot is out of network coverage area using multi-connectivity. In the scanning path if any obstacle or enemy is detected and found the Arm robot then Self destruction is programmed. Thus, in defiance application it is possible to provide 24-hour monitoring with camouflage surveillance.

5.13 PAPER 13

Author:- Hou-Tsan Lee Wei-Chuan Lin and Ching-Hsiang Huang

Topic Name:- Indoor Surveillance Security Robot with a Self-Propelled Patrolling Vehicle

Introduction:- As the incidents of theft grew more frequent, the applications of security systems are more popular than ever to prevent the damages

caused by theft whether at home or elsewhere. The traditional security system gives some protection to the situation but still has some dead zone that cannot be monitored. Therefore, this paper proposes mobile security monitoring system to improve the security of traditional one. The comparison diagram between the proposed and traditional security system is shown as Figures 1 and 2. A self-propelled patrolling vehicle acts as a security patroller in the security system, which can monitor those dead zonesof the traditional fixed surveillance system. The remote monitoringcapabilities can also be enhanced by using the wireless network. And theface detection system is adapted to record and analyze the invaders. No matter where the user is, he can monitor the indoor status by using network. There are also many literatures concerning about surveillance issue.

Method:- The proposed self-propelled monitoring and surveillance vehicle can be divided into the following parts: wireless IPCAM video capturesystem, face detection system, remote monitor and alarm transmitter system, RFID position detection systems, and cell phone monitoring and control system. The diagram of system architecture. The self-propelled vehicle uses RFID technology to control the moving direction. RFID tag is installed inthe right-hand side of the self-propelled vehicle. When the self-propelled vehicle moves to a predefined routing path installed with RFID reader, the RFID reader would detect the RFID tag and send the signals back to the server to show the detected position on the map to indicate the status of the self-propelled vehicle. Smartphone (Android) can also send control command through server to control the direction of self-propelled vehicle. Face detection subsystem uses the Intel‘s OpenCV library to detect face of the monitored place. There are two wireless IPCAMs mounted on the self- propelled vehicle to monitor the front and back of the vehicle for face

detection. If a face was detected in the image file, the server would trigger the MSN robot to send warning message to the user. Users can use the PC, notebook, or smart phone to monitor the situation or drive the self-propelled vehicle to the spots where the users want it to be.

Result: - The wireless IPCAM mounted on the self-propelled vehicle should be specified IP by log in the account and password provided by the manufacturer. When the self-propelled vehicle is patrolling, the picture would be captured and stored in the image files in the temporary memory of the IPCAM, respectively. The server then gets the image files via WIFI system and shows them on the display.

5.14 PAPER 14

Authord:-AnshDudeja, Anshul Yadav, Anveshak Parashar, ArnayKabtiyal, Shaveta Arora

Topic Name:- IoT Based Autonomous MultiPurpose Surveillance and Rescue
Robot.

Introduction: - In 1954, humans were introduced to the world ‘s first fully functioning industrial robot–The Unimate” and after that, scientists and engineers have come together to create dynamic and diverse changes in the field of automation and robotics to make the daily humane tasks easier and faster. The use of robots in development and automation fields is increasing day by day and there is no doubt about the future being largely controlled by robots and artificial intelligence. The Surveillance System closely observes and analyzes the surrounding and get instant information about the conditions. It is mainly required in areas of high risk,

borders, public places, and prison or in industries which is mainly used for monitoring behavior and activities of a group or any individual. The need of surveillance robots arises when the life risk is too high and the user wants the information to be highly accurate. Robots are nothing but fully automated electronic and internet-controlled devices that are capable of performing various tasks that a normal human might not be able to do. Thus, use of robots for surveillance is one of the greatest advancements in the fieldof automation [2]. These multifunctional robots are able to perform tasks in dangerous situations like collapsing buildings or radioactive zones. One of itsbest uses is in the protection and rescue works after unexpected tragedy or unwanted invasions like Ukraine-Russia Cold war or tragedies like Chernobyl/Bhopal Gas Plant. There are many obstacles faced by the rescue forces during inspection of such sudden and unexpected events like narrow spacing, collapsing of damaged structures. It becomes difficult for an ordinary human to deal with such risky tasks to enter areas without knowing the present information. These robots being autonomous in nature are designed to perform efficiently without human interference and have high mobility.

Methods: - The system consists of two major sections – one is the user control section and the other one is the mobility section. The robot has an Arduino microcontroller which acts as the brain of system as it is used for controlling the motors and movement of the robot. In the user section, with the help of a mobile or a laptop user control is much better as compared tothe old versions where a big control instructed panel was required to make the robot move and perform tasks. The communication from the user end to the robotic mobile section can be performed in various ways, using a Zigbee device or any Bluetooth controlled technology, but in these the range

of communication is limited. So, in order to make the robot remotely controlled from a far distance, user Section can be connected with the internet using the IoT technology. For connecting the user with the robot from far distance, Thing Speak, an IoT based technology is used. For receiving the live video visuals and the data from the sensors, Thing Speak channel plays a vital role. The sensors and ESP32 Camera Wi-Fi Module are connected to the Arduino Board that further provides the Wi-Fi facility to the Robot. After the full connection, the robot can send the data collected from the sensors using the Wi-Bimodules and the IoT platform to the users. In mobility part, the robot consists of wheels, motors, battery, ESP32 Wi-Fi Module and various different sensors. The Arduino board is placed on the body of robot which gives input supplies to the DC Motors and the motors are further connected to the wheels which move according to the user instructions. The Arduino microcontroller is coded through its IDE software where the code is defined for appropriate movement. Parallel tithe movement of the robot, various sensors such as Gas sensor, Ultrasonic sensor, PIR sensor are also mounted on the robot interfaced with the microcontroller.

Result: - In this paper, an IoT-based autonomous multi-purpose surveillance and rescue robotics proposed which can solved the problems regarding inspection of difficult areas and unexpected situations. This autonomous robot is fully capable of replacing humans and providing extremely accurate data to the user. It overcomes the problem of short ranged communication with the help of Thing speak IoT platform and broadcasts the live videos to theuser. The robot is small in size and is capable of maneuvering hard terrains, also it rotate in all directions. There are many applications to this robot suchas surveillance while being steady or in motion, analyzing the surrounding areas, displaying land mines, spying and other militarized operations.

5.15 PAPER 15

Author:- Elvin Yano, Louise Sebastian Reyes, Paul Randell Castro,Joseph Joshua Tarroza, Anthony JamesBautista

Topic Name:- Prototype of a Compact Assistant Surveillance Robot forSearch and Rescue Operation.

Introduction:- The Philippines is located on the Pacific Ring of Fire, which is a path that spans along the Pacific Ocean where majority of the Earth‘s volcanic activity and earthquakes take place. Its location and the tropical climate make it prone to disasters like earthquakes and typhoons. These disasters are hard to predict and could potentially cause destruction and casualties.This makes the Philippines one of the most vulnerable countries in the world. Poorly built and outdated infrastructures increase the chances of urban catastrophes. Once natural disasters hit, there are numerous disasters that would follow it. A recent example is when a 6.5 magnitude earthquake stuck Davao City, Philippines, last October 2019. The quake resulted to numerous people dead, missing, and injured, on top of that, over 2,000 houses and buildings have been damaged. Aftermaths like these will require Urban Search and Rescue,USAR units to be deployed to look for victimsthat are possibly trapped under rumbles and ruins of damaged buildings. Search and surveillance is a dangerous operation and greatly involves risk for both the rescuers and victims.

Method:- The field test area and geometric limitations were considered because of different terrains that the robot will encounter. The robot is expected to go through structural collapses such as rubble, sand, and

concrete, hence a high torque, geared DC motor was considered. Tracked wheels were selected because it can offer good traction and maneuverability in various terrain such as in uneven surfaces with rocks and debris. The CASROS robot was designed to be small and compact to allow it to navigate through narrow spaces. A First Person View, FPV camera is the primary component installed in the robot. Its purpose is to stream real-time video recordings of the area. This information serves as a valuable resource to the rescuers. The live updates recorded by the FPV are transmitted to a laptop computer via a receiver. Servo motors were used to vertically tilt the FPV.The overall construction of the CASROS robot was designed to be economical, considering that during search and surveillance operations the chances of damaging the components or even losing the whole robot from accidental collapse of the structure would likely to occur. These factors were also considered without sacrificing the basic functions of the robot. Table 1 shows the overall design specifications of the CASROS robot.

Result:- The CASROS robot navigation capabilities were also tested indifferent conditions. It was observed that the robot was able to maintain its overall stability while continuously streaming real-time video updates to a laptop computer. Ultrasonicsensor sends signal to stop the robot when an obstacle is detected 20 centimeters away. This allows the operator to look for other paths to navigate. An imaginary search and rescue operation map was used to test the performance of the CASROS robot. An operator was asked to operate the robot by driving it from behind and following the robot from the initial position going to the goal position using a Remote Controller.

5.16 PAPER 16

Author:-Dr.RambabuBusi, B., Sai SreeValli, K. Vijaychandana, N.RamaKrishna Rao, R. Leela Lavanya

Topic Name:- Surveillance Patrolling ROBOT Using Arduino Nano.

Introduction: - Surveillance in the security is the close observation among the people and their activities to prevent crimes or criminal activities and also itis used to provide the evidence of the cases that are happened in the dark to the public service officers. Surveillance using CCTV footage for a wide range area would become an expansible process where the camera could not capture the images and the scene in all directions and stationary cameras are complicated for the security patrolling purposes. To avoid this disadvantage, introducing the security robot on a patrol that which patrols the whole instructed area and collects the pictures of entire area. These patrolling robots are of programmed automated supervision. Robot moves along the black path using the help of IR line follower and also changing its route using the Ultrasonic sensor. These robots are equipped with the 360 degrees rotating camera with the high resolution which scans the whole location and provide the recordings or direct video to the control stationwhere the whole monitoring is done. These supervised robots also consist of the siren to indicate an alerting sign to the near people for the rescue purpose.

Method: - Working of the surveillance patrolling robot starts when the DC motor of the robot get their respective triggering voltage. These rotatory motors run at the speed of 30rpm on the predefined black path. In the movement of the black path sensor which is fixed at the starting of the robot

comes in to existence. These sensors sense the black color path and gives conditions tithe robot based on the route turnings of the path.

Result: - By using IOT, the location and photographs are shared from the situation successfully through this project. Hence with the help of this robot, we can save the victim in time and catch the accused. Thus, surveillance and the security of the society is provided in an efficient manner.

5.17 PAPER 17

Author:- Nurul Ayni Mat Pauzi, Seri MasturaMustaza and Iskandar Yahya.

Topic Name:- Low-cost environmental monitoring mini rover based on IoT technology.

Introduction: - In this era, monitoring system has become very important not just for security purposes but can serve as an input for smart system development. Ineffective monitoring system not only capable in continuous monitoring of the surrounding but can also give an early warning in case of emergency or occurrence of undesired event, as well as providing accurate environmental condition at area of interest at any time. Conventional monitoring system such as the use of CCTV and personnel with detection dog or hand-carried sensor devices, have become increasingly outdated and is unsuitable for monitoring large areas, confined or tight spaces such as ventilation ducts [1] and in dangerous or harsh environment such as facilities with high radiation exposure (e.g.: nuclear plant), toxic gas leak orsewerswhere bacteria and diseases are rampant. This method of monitoring may pose risks of danger, pollution, diseases and other negative effects

towards the human and animals involved. Furthermore, the hand-carried devices used can ‘t be deployed over extended period of time for continuous monitoring. The use of CCTVs also has its limitations, where it is inflexible as it cannot monitor large areas, cannot be installed in all areas such as air ventilation system, and when installed in a room, it cannot be moved unless dismantled. Furthermore, CCTV is known to have blind spots. Large number of CCTVs are needed to cover a wide and large area, which increases the investment cost. The cost for installation, purchase and CCTV maintenance also contributes in the high investment cost of this system.

Method: - The development of the rover is accomplished in four phases. The first phase in the concept design. To identify the specifications of the environmental monitoring mini rover, literature studies have been conducted to identify the weaknesses of conventional surveillance systems and current state-of the-art of environmental monitoring. Focus will be given to the development of a compact sized mobile based rover for accessing spaces that are difficult to access (e.g.: ventilation, air duct, etc.) at a low cost, capable to perform and gather data for a basic monitoring of the environmental surrounding. Cost constraint was also set as the main aim is to produce a low-cost rover. The second phase is the hardware selection and development based on the specification set in the first phase and the third phase is the software development. The software development involved programming of the individual hardware as well as development of the mobile applicationfor maneuvering the rover and environmental data monitoring. Final phase ofthe study is the testing phase, whereby the rover is deployed to gather information of its surrounding.

Result: - the prototype of the proposed rover with and without the enclosed cover, the 3D design of the protection covers of the rover and to secure the camera position of the rover. The 3D design software used for the drawing is Blender. The chassis of this prototype was used to gather data and conduct the monitoring of several environmental surroundings. All the sensors onboard were calibrated before the rover was assembled.

5.18 PAPER 18

Author: - B. R. V. Pradeep, G. Krishna Reddy, G. Ravi Raju1.

Topic Name:- RASPBERRY PI BASED SURVEILLANCE ROBOT.

Introduction: - Our work aims to provide a robotic vehicle equipped with a wireless camera having night vision capability for remote monitoring/spying purposes. The night vision camera allows for transmitting real time night vision video even in dark environments. Whatever is recorded by the camera can be viewed in PC for reference. This system is to be useful in war,terrorism and sensitive areas. It can also be used to operate in jungles and other environments humans cannot possibly enter during the night. The vehicle can be controlled remotely by an android device for easy operation.
It uses android
application commands to move in front, back and left right directions. The vehicle consists of receivers interfaced to an 8051 microcontroller. On receiving command from the receiver. The 8051microcontrollers now operates the movement motor through a driver IC. The robotic vehicle can be

easily operated from any android device. It provides a good user interface for handling the vehicle. The android device can operate the vehicle at a good Bluetooth communication range. The Bluetooth receiver at the vehicle is used to transmit control movement data from app to vehicle. The night vision camera mounted on robot allows for efficient spying even in darkest areas using infrared lighting. Cloud robotics is an emerging field that is centered on the benefits of converged infrastructure and shared services of a cloud computing environment. In this paper, a system is designed with an autonomous robot to sense environmental data such as temperature, humidity, and air quality, along with GPS coordinates and store them on the cloud. The mobile robot is controlled using an Arduino microcontroller and communicates with the cloud via a Raspberry Pi.

Method: - Our work aims to provide a robotic vehicle equipped with a wireless camera having night vision capability for remote monitoring/spying purposes. The night vision camera allows for transmitting real time night vision video even in dark environments. Whatever is recorded by the camera can be viewed in PC for reference. The block diagram of iota based firefighting robot is shown by fig.1, which consists of plurality of sensors, Arduino uno, dc motor and Bluetooth module. Power offer could be a regard to supply of electricity. A device which provides electricity or different kindsof power to drive an output load or various number of installed components. The supply is mostly ordinarily injected to voltage consuming component, less typically to mechanical parts, and barely other parts. In this device a 12VDC power is offer to all electronics related component. For this purpose, there is a requirement to step down electrical device, rectifier, transformer, and filter circuit for smoothing generated 12V DC power The Attention commands are transferred to the electronic devices. In reverse, the electronic

device transfers the stored messages from the wireless module. The micro controller checks the Bluetooth command and after validating the command it performs further certain task on the robot or device. The micro controller used here in this project is ATMEGA 328 incorporated in an Arduino UNO board.

Result: - This article designed a low-cost Microcontroller Based Android controlled Robot. The robot will move forward, backward, left and right direction by following the instructions given from the mobile with audio, video surveillance system using night vision camera. This robot is controlled by Bluetooth module with left, right, forward and backwards positions through android phone. This system can be helpful for various purposes. In this paper, we have proposed a design of a smart cloud robot to monitor the environmental condition of a remote place. A prototype has been developed and tested in our campus to illustrate the effectiveness of the proposed. Future scope, in future studies this system integrates with GPS get the exact location of fire and gas detection detected. Module it utilizes an interface GPS sensor to transmit area of the leakage over to the Autologin system, here we use IOT to check, get and show the gas leakage caution and location overIOT.

5.19 PAPER 19

Author:- A. Aashraya , P. Munaswamy

Topic Name:- IoT BASED MILITARY ROBOT USING RASPBERRY Pi3.

Introduction:- In today‘s world the monitoring of military areas is essential due to increased attacks of theenemies but the quality of that monitoring i.e.

surveillance is not that much satisfactory; this results in the increasing ratio of lives of the soldier in danger. Because of that it is necessary to improve the quality of surveillance through effective surveillance. This is done more effectively by high quality video transmission. In this project the quality of video is improved using Closed Circuit Cameras. For all this there is a need of the ground Robot which is able to move on the hills, muddy areas. By using Closed Circuit Cameras various technical advancements are took placed in surveillance [1]. Lots of crime scenes have been solved by using this technology but still, the crime rate has not reduced because of immobility of the surveillance equipment ‘s. In this project design and development of the robot is done which will move from one place to another, it has capability of capturing real-time images and videos required for the surveillance. The main constraint in surveillance is mobility of the robot. Thisrobot is also capable of doing housekeeping. And also, the water sprinkler made under this project and we can operate a robot there is no need forhuman to go even near the area on fire. We have used the light dependent resistors for detection of fire. It is the highly sensitive device and is capable for detecting very small fires too. The robot accommodates a water tank and sprinkler on itself to extinguish fire.

Method: - The raspberry pi has the ability to interact with the outside world, and has been used in a wide array of digital maker projects, from music machines and parent detectors to weather stations and tweeting birdhouses with infra-red cameras. We want to see the raspberry pieing used by kids all over the world to learn to program and understand how computers work. Several generations of raspberry pi have been released. All models feature a Broadcom system on a chip (soc) with an integrated ARM- compatible central processing unit (CPU) Andon-chip graphics processing

unit (GPU).Processor speed ranges from 700 MHz to 1.4GHz for the pi3 model B+ or 1.5GHz for pi 4; onboard memory ranges from 256 MiB to 1 Gi Brandom-access memory (RAM), with up to 8 Gi available on the pi 4. Secure digital (SD)cards in microSD from factor (SDHC on early models) areused to store the operating system and program memory. The boards have one to five USB ports for video output, HDMI and composite video are supported, with a standard 3.5mm tip-ring-sleeve jack for audio output. Lower-level output is provided by a number of GPIO pins, which support common protocols like I2C. the B-models have an 8P8C Ethernet port and the pi 3, pi 4 and Piero W have on board Wi-Fi 802.11n and Bluetooth. The first generation (Raspberry model B) was released in February 2012, followed by simpler and cheaper model A. in 2014, the foundation released a board with an improved design, raspberry model B+. these boards are appropriately credit-card sized and represent the standard mainline formfactor. Improved A+ and B+ models were released a year later.A‒compute module‖ was released in April 2014 for embedded applications. The raspberry pi 2, which featured a 900 MHz Quadra-core ARM cortex-A7 processor and1GiBRAM, was released in February 2015A raspberry pi zero with smaller size and reduced input/output (I/o) and general-purpose (GPIO) capabilities was released in November 2015.On 28 February 2017, the raspberry pi zero W was launched, a version of the zero with Wi-Fiend Bluetooth capabilities, on 12 January 2018, the raspberry pi zero WH was launched. Aversion of the zero W with pre-soldered GPIO headers. Raspberry pi 3 model B was released in February 2016 with a 1.2GHz 64-bit Quadra core processor, on-board 802.11n WIFI, Bluetooth and USB boot capabilities. On pi day 2018, theraspberry 3 model B+ was launched with a faster 1.4GHz processor and a three-times faster gigabit Ethernet (throughput limited to ca. 300 Mbit/s by the internal USB 2.0

connections) or 2.4/5 GHzdualband802.11ac Wi-Fi (100 Mbit/s). Other features are power over Ethernet (PoE) (with the add-on Poe HAT), USB boot and network boot (as SD card is no longer required).Raspberry pi 4 model B was released in June 2019 with a 1.5 GHz 64-bit Quadra coreARMcortex-A72 processor, on-board 802.11ac Wi-Fi, Bluetooth 5, full gigabit Ethernet(throughput not limited), two USB 2.0 ports, two USB 3.0 ports, and dual-monitor support via pair of micro HDMI(HDMI type D) ports for up to 4K resolution. The pi 4 is also powered

via a USB-C port, enabling additional power to be provided to downstream peripherals, when used with an appropriate PSU. The initial raspberry pi 4 board has a design flaw where third-party e-marked USB cables, such as those used on apple MacBook ‘s, incorrectly identify it and refuse to provide power. Tom ‘s hardware tested 14different cables and founded that 11 of themturned on and powered the pi without issue. The design flaw was fixed in revision 1.2 of the board, released in late 2019.

Result: - The Robot is kept on a platform which is connected to aluminum chassis the platform is kept straight with help of 8 Servo Motors and pro Mini. Here the pro Mini is connected to a gyro sensor which gives that the knowledge of its orientation. That's robot is built on a hard Aluminum chassis which neighbors it to roll on ref trains and keep it balanced. The upper half of the robots body is paid to imitate human body it has to films through which it can interact and show some basic gestures. It is implemented using PVC pipes and hence cost is low.

5.20PAPER 20

Author:- S.S. Pansare, Prajakta Bhagwat, Trupti Burud, Sushil Mulange.

Topic Name:- Arduino Based War Field Spying Robot Using Wireless Camera.

Introduction: - Now a Day ‘s the innovations in technology completely changes the domain of robotics and automations which helps in allfields from household to defiance. In this project, we are developing a robot based on Arduino using android applications. Also, we are using Bluetooth technology for serial communication. Data can be shared between two devices using Bluetooth technology. We are using two DC motors for the movement of the robot. To handle the situations internet protocol camera is mountedon the robot.

Method: - It moves according to commands delivered from android remote-control app via Bluetooth. Remote control app has four buttons for the relevance forward, left, right and back movements as well as
stop buttons. The remote control app also uses a web viewer component,which is used as recipient of the WIFI video stream from the android phone mounted on the robot this video is streamed by a IP webcam Ipswich is installed on the android phone The robot can transmit video via Bluetooth through IP web cam app which is installed on the phone directly to the remote control app. Robot can detect the presence of an object or obstacles along the path and send signals to the receiver with the help of IR sensor and proximity sensor as metal detector. The command given by the receiver to the robot are displayed on the LCD which is mounted on the robot. Software: ARDUINOIDE – Arduino works good in terms of prototyping. It is easy to program and programming can be done using Clanguage.Hardware: The master and the slave are the devices ofthe Bluetooth module. The connection

of the Bluetooth module with Arduino can be done in opposite manner. The device will ask to enter the password once the pairing is over between the two devices. The password can be anything that we set. For the connection between two devices entering password is must.

Result: - In this project, the spying robot is built with IP camera ruby remote control via Bluetooth in order to handle the robot wirelessly. The motive behind developing a spy robot is to make it user friendly. The spy robot can easily move, capture images and wirelessly transmit them thus giving the soldiers an indication about the dangers and situations in Warfield.

5.21 PAPER 21

Author:- Shrikant V. Sonekar, Bhargav J. Ditani, Jay P. Patel Computer Science & Engineering JDCOEM, Nagpur.

Topic:- Design and Development of IoT controlled Smart Surveillance cum Waste Cleaning Rover.

Introduction: - aim of our project is to make a framework which is capable to handle the task of garbage collection efficiently. For this we have designed the rover inane very efficient manner this rover not only collects the garbage but also helps in disposing it at a particular place, if it gets filled up to itsbrim it signals dustbin full to the user and then the user controlling the rover can take to its land fill site and dump it there. As we know that if the dustbin gets

fulfilled the concerned authority don ‘t take action until it starts to smell in the nearby surrounding, so to abolish such type of mistakes we have added the feature of garbage overflow detection, The use of such IoT based Garbage Overflow Detection and Management System makes it Avery useful thing for the society and nature. The Ultrasonic Sensors inside the Trash Can will help us to give an indication of the amount of garbage which is been collected inside the dustbin. These will not only help to keep the nearby surrounding clean but it will also help in preventing the citizens from getting infected from diseases. The utmost important feature of this rover is that it is accessible from any part of the globe and it involves wireless connectivity for the transmission of instruction.

Method: - Steps to Convert RGB Frames to Gray-scale using
OPENCV:

1. Start
2. Capture Video Feed
3. Check Frame available
4. If True, pass Frame and COLOR_BGR2GRAYargument to cvt Colorfunction of OPENCV
5. Else, step 2 is being repeated, till it not becomes true.

Result:- The mobile robot was developed with use of extensive IoT concept. The rover can be accessible remotely and camera mounted on it live streams the video and sends it to the web application. It included various sensors like infrared and ultrasonic sensors. The Web application is created so the rover can be controlled using direction button. The real time trash bin status was displayed on the webpage, with refresh period of 20 second; so that we can.

CHAPTER 6

6.1 HARDWARE COMPONENTS

Raspberry Pi: Model is the third generation Raspberry Pi. This powerful credit-card sized single board computer can be used for many applications and supersedes the original Raspberry Pi Model B+ Model B. Whilst maintaining the popular board format the Raspberry Pi 3 Model B brings you a more powerful processer, 10x faster than the first-generation Raspberry Pi. Additionally, it adds wireless LAN & Bluetooth connectivity making it the ideal solution for powerful connected designs.

Node MCU / UNO: NodeMCU is a low-cost open source IoT platform. It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which was based on the ESP-12 and Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP headerand 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.

Sonic echo sensors x2:sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object‘s proximity.

Smoke detection sensor:smoke detector is a device that senses smoke, typically as an indicator of fire. Smoke detectors are usually housed inplastic enclosures, typically shaped like a disk about 150 millimeter (6 in) in diameter and 25 millimeter (1 in) thick, but shape and size vary. Smoke can be detected either optically (photoelectric) or by physical process (ionization). Detectors may use one or both sensing methods.

IR sensor: An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment. Infrared radiation was accidentally discovered by an astronomer named William Herchel in 1800.

Rover Chassis: Hard Structure

RFID reader:A radio frequency identification reader (RFID reader) is a device used to gather information from an RFID tag, which is used to track individual objects. Radio waves are used to transfer data from the tag to a reader.

DC motor:DC motor is any of a class of rotary electrical motors that converts direct current (DC) electrical energy into mechanical energy. The most common types rely on the forces produced by induced magnetic fields due to flowing current in the coil. Nearly all types of DC motors have some internalmechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor.

Servo Motor:A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration.[1] It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, oftena dedicated module designed specifically for use with servomotors.

Metal detector:A metal detector is an instrument that detects the nearby presence of metal. Metal detectors are useful for finding metal objects on the surface, underground, and under water. The unit itself, consist of a control box, and an adjustable shaft, which holds a pickup coil, which can vary in shape and size.

Vision Sensor: Vision Sensors/Machine Vision Systems analyze images to perform appearance inspections, character inspections, positioning, and defect inspections.

PIR: The passive infrared sensor

sensor that measures infrared light radiating from objects. PIR sensors mostly used in PIR-based motion detectors.PIR sensor can detect animal/human movement in a requirement range. PIR is made of a pyroelectric sensor, which is able to detect different levels of infrared radiation.

Camera: Arducam Cameras

Battery: ESP8266

6.2 SOFTWARE COMPONENTS

ARDUINO IDE: Contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

RASPBERRY PI OS(C++ & PYTHON):

Geany is a powerful and lightweight development environment for Raspberry Pi. It's essentially a text editor coupled with GTK+ plugin and Scintilla library support that you can use to write code

BlueJ is a popular IDE for those just starting out with Java. It has a simple interface that is easy to use, which makes it ideal for SBCs like Raspberry Pi. Besides, BlueJ also supports the Stride programming language that combines the best of both block-based and text-based systems.

Thonny is the perfect IDE for Pi if you want to code in Python. It's easy to use and comes with Python 3.7 built-in. If you're new to Python and want to create a basic program with it, Thonny offers a clean, vanilla interface. This helps to ensure that you don't get bogged down with all the fancy features — like the ones found on most IDEs — and focus on getting your code right.

CHAPTER7

7.1 ARCHITECTURE DIAGRAM

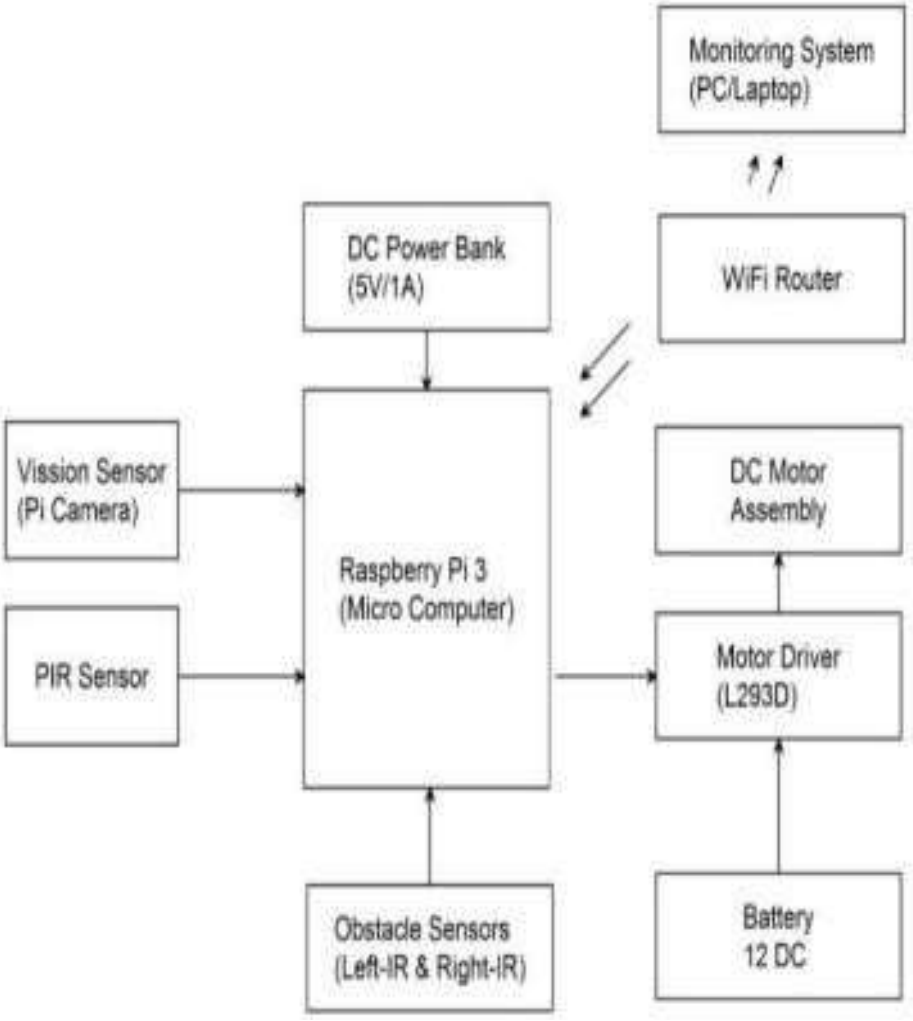

Figure 7.1: Architecture diagram

7.2 USE CASE DIAGRAM

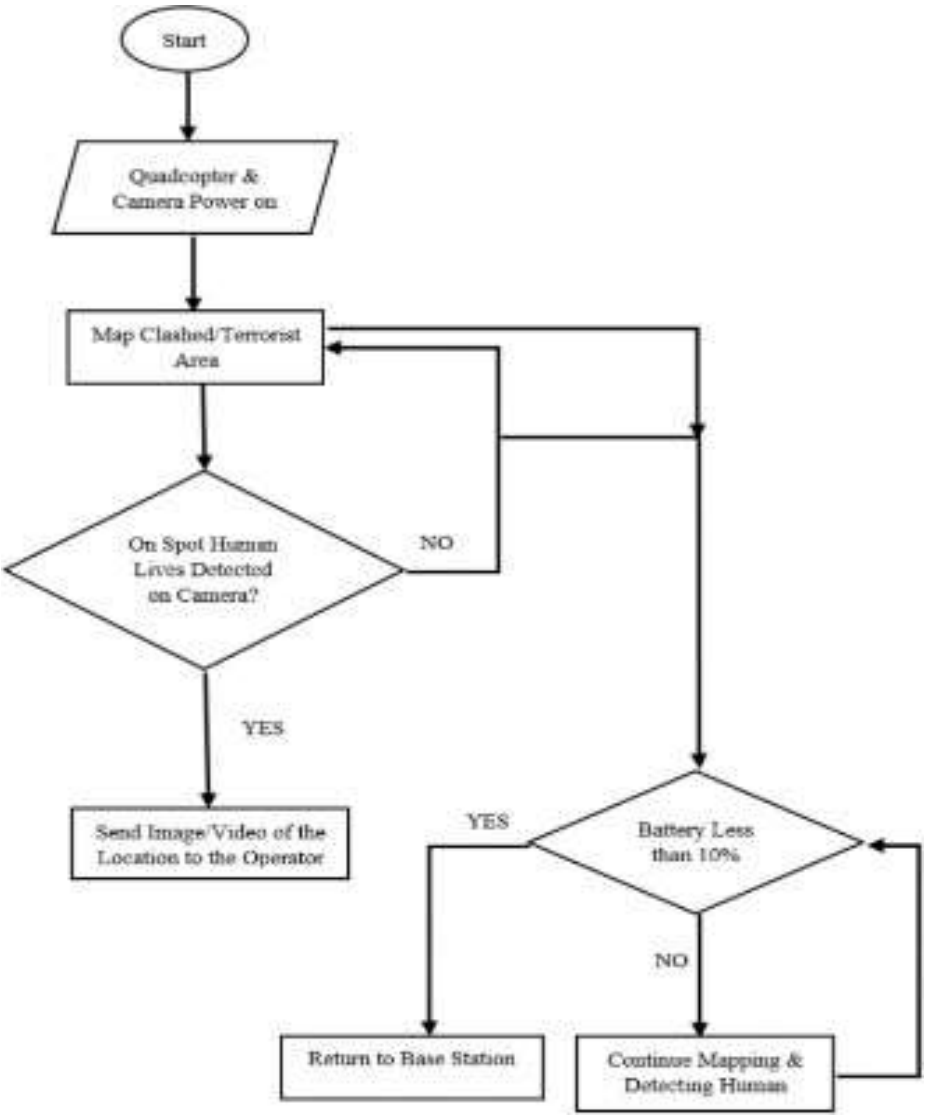

Figure 7.2: Use case diagram

7.3 EXISTING SYSTEM

- Existing System Frameworks which are already made use surveillance robots that have limited scope of correspondence as they depend on RF Innovation, ZigBee and Bluetooth.
- short range remote camera so they can't catch the pictures which are not secured by the locale of camera.

CHAPTER 8

8. CONCLUSION

- Capable of going places where neither humans nor normal rovers can go.
- Can be used in combat situation (not intense).
- Can perform actions in stealth.
- Self-operated by AI with a option of manual operation.
- Can be easily camouflaged.
- Has an multipurpose mount that can be used to mount cameras semi and fully automatic gas and tear gas ejectors.
- Is able to perform all the functions of CBRN mini UGB.

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