IoT Based Women Safety Night Patrolling Robot

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KEYWORDS	ABSTRACT
Internet of Things, Night Surveillance, Robot, Women Safety, Security.	*This project we suggest a robot patrolling security that uses night vision camera to protect any premises. The robotic vehicle is traveling at different intervals and is fitted with camera and sound sensors for the night vision. It uses a predefined route. It stops at different points and if sound is heard it travels to next points. To patrol the allocated field, system uses the following IOT-based system. It monitors every area using HD camera to detect any intrusion. It has the capability of tracking sound at the premises. Any sound after the firm is closed and on its predefined course it begins to capture the images. It automatically captures the image whenever the sound detected and captured image will be sent to telegram along with the gps coordinates. This is where we use IOT Local Area Network (LAN) to receive transmitted images and display them with warning sounds to the user. We are therefore proposing a fully autonomous security robot that works constantly and patrols wide areas alone to protect the facility*

1. INTRODUCTION

Recent technology advancements have allowed for the development of women safety robots. These robots are designed to provide an extra layer of security and safety for women in areas with high levels of crime and violence. The robots are equipped with cameras and sensors that can detect any suspicious activity and send an alert to the nearest police station. Additionally, the robots can also be used for surveillance during public events, such as rallies and marches, allowing for a greater sense of security for women. Effects on aquatic ecosystems and human health if not properly treated.

Women safety has been a longstanding issue in many parts of the world and has only been further highlighted during the pandemic. In order to address these concerns, a new solution is being developed – a night robot. This robot will be able to patrol the streets at night in order to keep women safe The implementation of an IoT-based smart night patrolling robot is presented in this paper, utilizing an Arduino Uno, camera module, sound sensor, ultrasonic sensor, motor driver, motors, Nodemcu, and

buzzer. The proposed robot is designed to and provide a sense of security and comfort. This robot would be equipped with advanced sensors that can detect any potential threats and alert authorities accordingly.

The proposed system is developed at a low cost, making it accessible to a wider range of users. The implementation of the proposed system has been tested, and the results indicate that the system is efficient and effective in detecting and responding to environmental stimuli. The system is controlled using a web- based interace, and the users can monitor and control the system remotely.

II. RELATED WORKS

There will be apps expressly designed for the welfare of women on the IPhone or android marketplace, which all have advanced advantages [4]. This will help save a lifetime of possible dangers, such as VithUApp, which enables to transmit SOS warnings to a given contact by double-clicking the device's keys. Any time the main switch is pushed, it also transfers the GPS location [5]. This programmed, the Life 360 Kin Locator Application, helps to create a network of friends & family & allows on a responsive chart to see the positions of each other [6]. Even if it gets destroyed or lost on phone, the application also offers monitoring [7].

It built an evacuation watch that uses the Arduino microcontroller & has a Global Positioning System device for tracking & showing the position of the handset, as well as a speech recognition system that stores the voice on a sim card & shares it to the local police station, that can also be used as evidence [8].

Society Harnessing Equipment set up with the help of a synthetic, has covered the inner layer in contact with the surface [9]. The circle is positioned around the bosom as in the event of eve- teasing or assault on females [10]. The app, Intelligent Belt, is built for a compact device that appears like a regular belt. It contains the Atmega Plate, which shouts sensors of alarm & pressure [11]. The device will switch on automatically when the pressure sensor level is reached [12]. The screaming alarm system is switched on and sends sirens calling for assistance The microcontroller activates the device's buzzer so that anyone in the area can hear the serious situation and provide assistance. The microcontroller also sends an SMS with the current position and pulse reading to the registered mobile number of the family member and the

police with the aid of a GSM module. Since the GSM communicates the current location and new information every 10 seconds, authorities can efficiently follow a victim even if their present location changes often. This GSM module also contacts the family member and the police station. If the pulse reading is inaccurate as well, the microcontroller prompts the GSM module to contact an ambulance and send an SMS with the reading so that prompt medical attention can be given.

IoT refers to objects that are linked to the internet and reachable from anywhere. The system keeps an eye on the house with the help of attached sensors and feeds data to the owner's phone over the internet connection in the home. It is similar to how the owner may manage and check on their household appliances using a Smartphone application. This gadget will relieve some of the owners' duties by keeping them informed at all t imes about their home [13]. Elderly and physically challenged people can operate appliances using the mobile phone that serves as the device's remote control. This technology will substantially aid in the simultaneous diagnosis and improvement of each animal's health. The technology might be able to prevent theft or disappearance of the animals. The temperature, heart rate, ruminance, and location of the animal within the farm can all be obtained by the owner using a Smartphone application that acts as the user interface. A prototype of this idea has been made and is provided for testing. As the health of the animals can be checked using a mobile app from anywhere in the world, the technology will make it easier for the farm owner and the employees to conduct their jobs [14].

The award, on the other hand, is a s mall print study of an IoT- enabled safety device that is available online and can use GPS tools to track the victim's location, as well as talk to colleagues, family and police about incident episodes. The creators came up with a framework closely related to the problem of lighting in girls. Devices used to deter the girls' provocations [15].

Only the woman who has been verified by the devices can use the fingerprint scan to start the system. The woman must continuously scan her finger on the system once every minute once the device is turned on. If she doesn't, as a safety precaution, the system will notify her location to the authorized staff number through SMS and continuously sound a buzzer so that those nearby can hear what's happening. In this case, the woman is not

required to take any action even if she is attacked or falls and loses consciousness because the system would automatically activate the dual security feature and collect her finger scan after one minute. This technology will be e xtre mely helpful in both stopping crimes against women and saving lives. The device carries out this framework using a GPS sensor, a GSM modem, an LCD display, LEDs, and a microcontroller- based circuit.

III. PROPOSED MODEL

Robotics is being used in the women safety night patrolling programme to increase the safety of women. It will represent a major improvement in automation and security. The female security night patrolling robot effectively utilizes its ability to run without a hitch. The main reason for this is that they are terrified of becoming the victim of violence or of being physically or sexually mistreated. Women and girls still have difficulties, despite the 21st century's rapid technological advancement and new technologies. They routinely bridge racial, religious, political, and cultural differences to advance liberty. Women's safety is important to our society, but it is also the duty of each individual to make sure they are sufficiently protected. The best method to lower your chance of becoming a victim of violent crime is to recognize, protect, and find services that can help you when you're in peril. Technology has revolutionized the way society operates, from communication to personal safety. The Internet of Things (IoT) is a perfect e xa mple. IoT is quickly becoming a critical component of women's safety. By leveraging sensors, communication technologies, and artificial intelligence, it is possible to build networks of support and early warning systems for vulnerable people.

With the rise of the internet of things (IoT) and the increasing accessibility of devices with computing power, there has been a surge in the development of technology- based solutions to address safety concerns in the public sphere. On the forefront of such solutions are those used to promote women's safety. By leveraging the reach of IoT, the risk of harm to women due to physical or verbal aggression can be greatly reduced. IoT- based solutions can be used to provide access to help when needed and ensure that women have the necessary resources to stay safe.

Recently, security robots have been offered for purchase. Security is provided by Knightscope's cutting-edge physical security robots, which are present in buildings, parking lots, and even the open air. A feature of emerging social robots like

Buddy, Personal Robot, Riley, and Aido is home security monitoring. There are other security robot research and development choices, however they are more expensive because to the technology they use. In order to solve this problem, the study suggests a multisensory system-base low-cost, user friendly, and fairly priced autonomous mobile security robot. The intelligent security patrol robot is implemented using the mobile application. The robot can patrol a designated region entirely on its own and is transportable.

It contains a multimodal monitoring system with six sensors. As a result, depending on the user's preferences, the robot can be utilised for both patrolling and alerting. While many of the devices have a single purpose, it additionally offers four various warning mechanisms for notifying users of security breaches. The most recent advancement for women safety robots is the utilization of night patrol robots. These robots can go out at night and patrol the streets, keeping an eye out for any possible danger. The night patrol robots are also equipped with cameras and sensors, allowing them to detect any signs of danger and alert the police. By providing an extra layer of security and safety during the night, these robots can help make public spaces safer for women.

Furthermore, the robots are also designed to patrol the streets during night time hours, providing an extra layer of protection for female pedestrians. This allows women to feel more secure when traversing the streets late at night, knowing that their safety is being monitored by a robot.

Women's safety has become a serious worry all around the world as the incidence of violence against them rises. They are used to being hurt emotionally or physically. Because of harassment at work and in public places, people are giving up on their hobbies and objectives. Despite the numerous anti-harassment regulations that the government has passed, the frequency of female harassment has not lessened. Giving them moral support is the most effective strategy to lessen violence against them, such as robbery, sexual assault, domestic abuse, and other types of violence. As a result, the Women Safety Patrolling Robot will seek to ensure the safety of women. While the current systems

use CCTV cameras to record occurrences, the proposed patrolling robot will roam its designated area and look for any instances of anonymous conduct. This, however, does not constitute a prophylactic measure for the safety of women. The women's community will consequently gain more from the night patrolling robot. If the lady is in distress, gets lost while out with friends or family, or needs help getting home, this gadget will safeguard her and offer support when she needs it by texting or calling her friends and the control centre to let them know where she is and how she is feeling.

With the goal of giving women security, this is done. Any abnormal behaviour or slight sound interaction is reported to the appropriate authority. The robot then visits the desired location on its own, snaps a picture of it, and sends it to the user. It follows both static and dynamic lines while patrolling, as well as lines that are formed dynamically.

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A. Robot Unit

The block diagram of the robot unit is seen in Figure 1 above, in which Arduino controller, ultrasonic sensor, sound sensor, motor driver and dc motors are used. For smooth movement of robot, ultrasonic sensor is used to detect for any obstacles in the path of the robot kit. High-performance ultrasonic range finders are what this sensor is. It is small and has an astonishingly broad measurement range of 2 cm to 4 m in an operating voltage of 5V.In case of ant incidents occur, the women will sound for help so sound sensor is used to detect for any high pitch sound from the streets so that an image can be taken of the accused and forwarded to the concerned peoples. This sensor is used to detect sound and to detect sound strength in an operating voltage of 3.3 v to 5v.

B. ARDUINO

Arduino is open source physical processing which is base on a microcontroller board and an incorporated development environment for the board to be programmed. Arduino gains a few inputs, for example, switches or sensors and control a few multiple outputs, for example, lights, engine and others. Arduino program can run on Windows, Macintosh and Linux operating systems (OS) opposite to most microcontrollers' frameworks which run only on Windows. Arduino programming is easy to learn and apply to beginners and amateurs. Arduino is an instrument used to build a better version of a computer which can control, interact and sense more than a normal desktop computer.
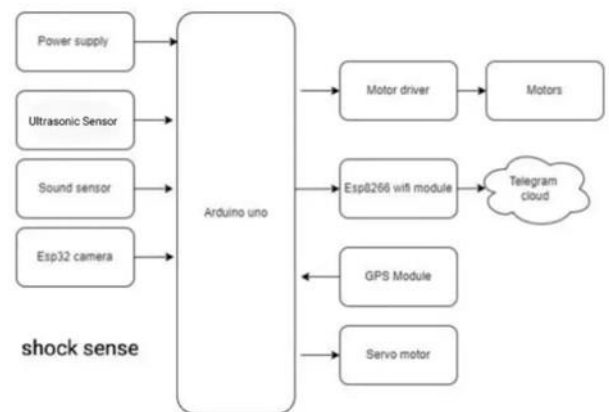
III. PROPOSED SYSTEM

Fig.1.Block diagram

Programs for the board. Arduino can be utilized to create interactive items, taking inputs from a diverse collection of switches or sensors, and controlling an assortment of lights, engines, and other physical outputs. Arduino activities can be remaining solitary, or they can be associated with programs running on your machine (e.g. Flash, Processing and Maxmsp.) The board can be amassed by hand or bought preassembled; the open source IDE can be downloaded free of charge. Focused around the Processing media programming environment, the Arduino programming language is an execution of Wiring, a comparative physical computing platform.

Fig. 2. Clear diagram of the Arduino IDE

IV. RESULTS AND DISCUSSION

The advancement of the Internet of Things (IoT) is bringing new opportunities to improve the lives of individuals, including women's safety. By using sensors and other devices that are connected to a network, IoT can create a smarter environment with automated processes and improved security to protect women at home, in the workplace, and in public areas. For exa mple, a sensor- enabled smart home can be used to detect intruders and alert authorities when danger is detected. Additionally, wearable technologies integrated with GP S can be used to track individuals and provide real-time location information.The specifications are shown in Table 1 and Figure 3 shows the workflow of the system.

TABLE 1 :- SENSOR SP ECIFICATION

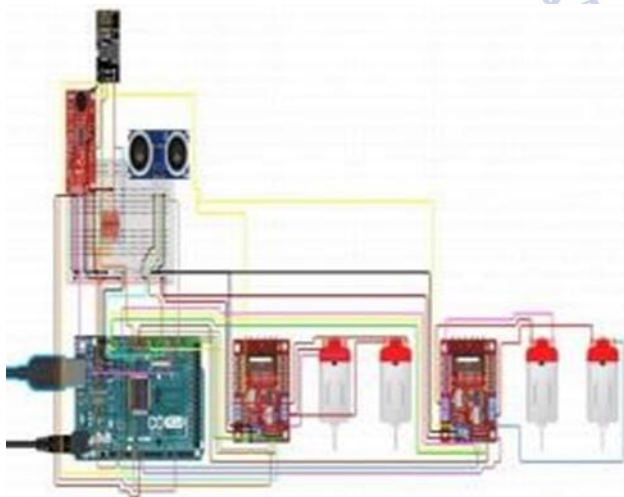| SI.NO	Components	Specifications
1	Arduino	Input: 5V,Analog pins: 6 Digital pins: 14 ,2KB SRAM, 32KB FLASH, 1KB EEPROM
2	Ultrasonic sensor	Operating voltage: 5V Pins: 4 ,Range: 2-400 cm Operating current 15mA
3	Sound sensor	Operating voltage: 3.3-5V
4	PIR sensor	Λ: $1.9*10^{13}$ to $1.2*10^{14}$ Hz Medium Emission Angle, 40°
5	Camera	Pixels: 1.4 μm × 1.4 μm Sensor: OmniVision OV5647

Fig.3. Hardware implementation of Arduino Circuit

Furthermore, these robots can be used for night patrols in areas where the presence of security guards is not feasible. This technology provides an extra layer of protection and safety for women in areas considered to be dangerous or unsafe. The robots are also designed to be highly maneuverable and able to traverse small spaces, making them invaluable for providing security in tight urban environments.
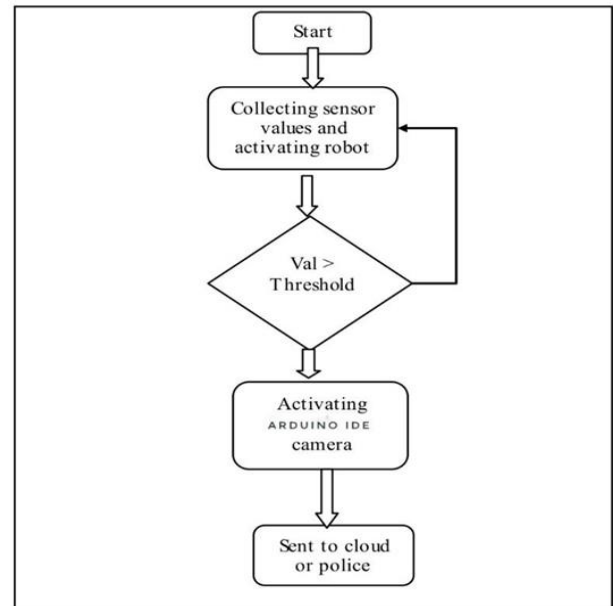

Fig. 4. Flow of the proposed system

Figure 4 shows the Arduino circuit diagram. The device records all sports and maintains an event log and history when motion is detected. The activity's description and the date it happened are recorded in the event log. Utilize traffic signs in difficult- to-reach regions to reduce false alarms.
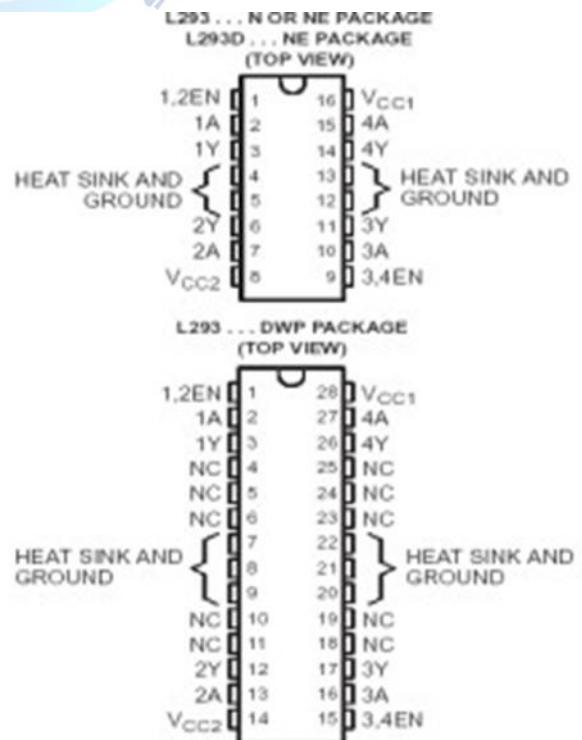

Fig. 5. Motor driver pin diagram

The Internet of Things (IoT) is revolutionizing the way that women are protected and empowered. Smartphones and wearables, connected to the internet, are enabling women to take control of their safety and well-being, like never before. Through geo-location services, low-powered sensors, and analytics, women can now access support and assistance in real- time, no matter where they are. This influx of data- driven solutions promises a new era of safety for women, as well as opportunities for further innovation. From figure 5

For one factor, the collector consists of sweep and gradient scripts while receiving the SOS package. A specific location is displayed on the course graph. The hardware implementation of the Robot Device is seen in Figure 6 below, in which ultrasonic sensor is placed at the front of the robot which is used to detect any obstacle in its path and dc motors are placed at the bottom of the robot kit which drives the robot unit and whole robot is powered by 12v battery which is placed above the kit. ESP8266 Wi-Fi module provides data for the prototype module so that it can trigger a mail.
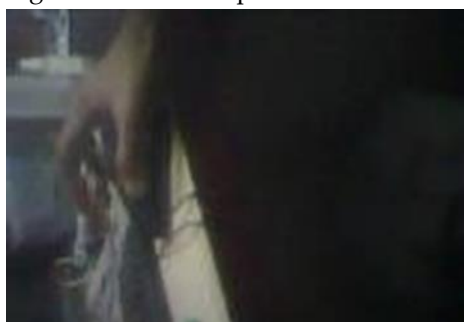

Fig.6. Hardware implementation

Fig. 7. Live images from ArduinoIDE (OUTPUT)

Above Figure 7 shows the live images captured from Raspberry pi unit. This raspberry pi will be placed over the robot unit to lively monitor the e xterna l situations around the streets. And as discussed above sound sensor

and buzzer units are placed on the robot unit. All its functions have been checked successfully.EMERGENCYALERT:http://maps.google.com/?q

=16.5109,80.6606

DC motors are an important part of robotics, as they provide the power necessary for robots to move and manoeuvre. These motors are especially useful in small or lightweight robots that require precise control over the speed and position of the robot. DC motors are preferred for these types of robots because they can be easily adjusted to provide the desired speed and torque.

TABLE II. MOTOR VALUES

Motor input 1	Motor input 2	Output
0	0	Off condition
1	0	Moves frontward
0	1	Moves backward
1	1	No function

Table 3.comparission table for motors used in the hardware

| Feature	Brushed DC Motor	Brushless DC Motor	Coreless DC Motor
Efficiency	75-80%	85-90%	High (varies)
Maintenance	High (brush wear)	Low (no brushes)	Moderate (cooling needed)
Speed Control	Good	Excellent	Excellent
Torque	High starting torque	High torque per watt	Rapid acceleration
Applications	Industrial, automotive, home appliances	Robotics, EVs, cooling fans	Medical, robotics, high-speed systems
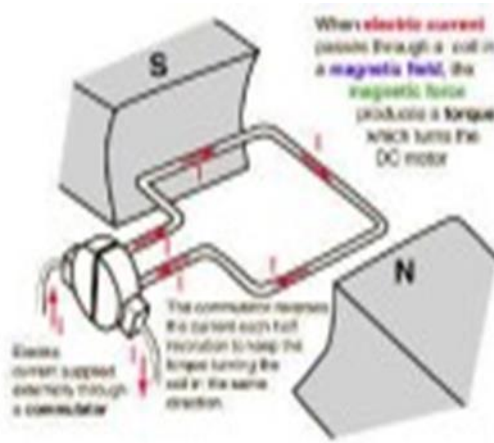
Fig.8. dc motor

4.1. GPS MODULE

The Global Positioning System (GPS) is the only fully functional Global Navigation Satellite System (GNSS). The GPS uses a constellation of between 24 and 32 Medium Earth Orbit satellites that transmit precise microwave signals, which enable GPS receivers to determine their location, speed. GPS was developed by the United States Department of defense. Its official name is NAVSTAR-GPS. Although NAVSTAR-GPS is not an acronym, a few backronyms have been created for it. The GPS satellite constellation is managed by the United States Air Force 50th Space Wing.

Global Positioning System is an earth-orbiting-satellite based system that provides signals available anywhere on or above the earth, twenty-four hours a day, which can be used to determine precise time and the position of a GPS receiver in three dimensions. GPS is increasingly used as an input for Geographic Information Systems particularly for precise positioning of geospatial data and the collection of data in the field. Precise positioning is possible using GPS receivers at reference locations providing corrections and relative positioning data for remote receivers.

Time and frequency dissemination, based on the precise clocks on board the SVs and controlled by the monitor stations, is another, use for GPS. Astronomical observatories telecommunications facilities and laboratory standards can be set to precise time signals or controlled to accurate frequencies by special purpose GPS receivers. Similar satellite navigation systems include the Russian GLONASS (incomplete as of 2008), the upcoming European Galileo positioning system, the proposed COMPASS navigation system of China, and IRNSS of India.
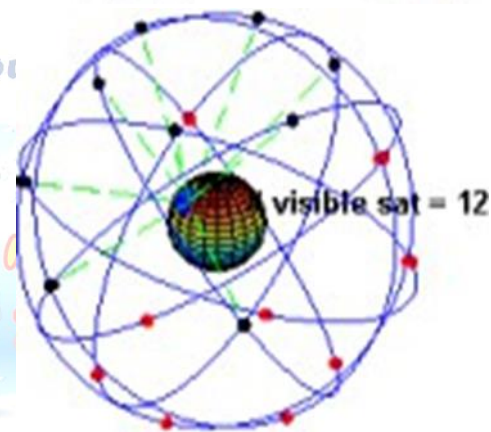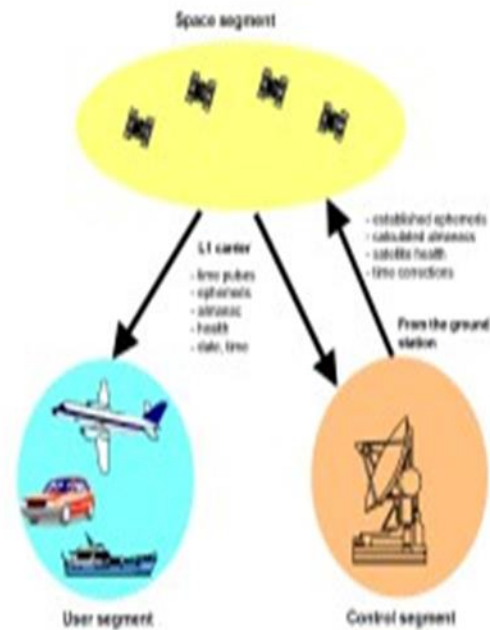

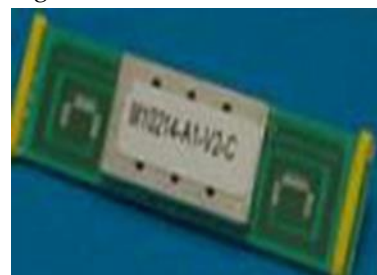Fig.9. space segment

Fig.10. A GPS satellite
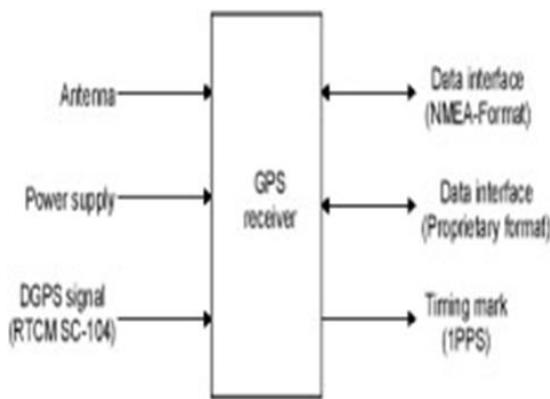

Fig.11.A GPS receiver with integrated antenna.

FIG.12.Gps Reciever Block Diagram

4.2. POWER SUPPLY AND CONSUMPTION

Being a wifi soc,This chip requires a fair amount of power to operate its transceiver. it has incorporated some impressive power management features, including highly integrated components that allow for greater optimization and increased efficiency. all this makes sp8266 one of the least power-hungry chips in the wifi ic industry! unfortunately its levels of demand are still higher than of those based on wireless technologies such as bluetooth, or zigbee. the official esp8266 datasheet states this regarding current draw. However, this is just the power consumption of the esp8266ex chip, the entire module, featuring additional hardware such as leds, crystals, capacitors and registers revealed that actual consumption of the mod-wifi-esp8266-dev varied greatly from this table. the approximate idle (while ready to receive packets) current of the module was measured to be 70ma, with somewhat higher when receiving packets in 802.11n mode. transmission drew 80ma current.

Table 4.ESP8266EX current draw at 3.3V as listed in the official documentation from Espressif

Mode	Typ	Unit
Transmit 802.11b, CCK 11Mbps, P_{OUT}=+17dBm	170	mA
Transmit 802.11g, OFDM 54Mbps, P_{OUT}=+15dBm	140	mA
Transmit 802.11n, MCS7, P_{OUT}=+13dBm	120	mA
Receive 802.11b, packet length=1024byte, -80dBm	50	mA
Receive 802.11g, packet length=1024byte, -70dBm	56	mA
Receive 802.11n, packet length=1024byte, -65dBm	56	mA
Deep sleep	10	uA
Power save mode DTIM 1	1.2	mA
Power save mode DTIM 3	0.9	mA
Total shutdown	0.5	uA

V. CONCLUSION AND FUTURE SCOPE

Conclusion:

The project ends with a definition of patrolling safety robot, which uses night vision camera to secure its premises. The robot runs in the same direction, at different intervals. It also features a camera with night vision and sound sensors. It is employed by a predefined route to patrolling movement given by the controller. It collects and sends out the pictures directly to the show room for further action. According to this device, the whole area monitoring is conducted using the night vision camera and even automated system when the sound is detected by the robot will automatically send the notification that it can capture the live image of the area where the data can be stored in telegram.

The future scope :

The future scope of a women safety night patrolling robot using Arduino is promising, with opportunities for advancements in technology and social impact. Here are some potential future developments:

Artificial Intelligence (AI) Integration:

Implementing advanced AI algorithms can enhance the robot's ability to understand and respond to different situations intelligently, making it more adaptive and efficient.

Facial Recognition Technology:

Integrating facial recognition technology can help identify potential threats or persons of interest, adding an extra layer of security.

Machine Learning for Behavior Analysis:

machine learning algorithms to analyze patterns in public spaces can help the robot identify suspicious activities and respond accordingly.

Biometric Authentication:

Implementing biometric authentication features can add an extra layer of security, ensuring that the robot can be accessed and controlled only by authorized personnel.

Swarm Robotics:

Exploring the concept of swarm robotics, where multiple robots collaborate and coordinate their actions, can

enhance the effectiveness of night patrolling and coverage in larger areas. Drone Integration:

Integrating drones for aerial surveillance can provide a broader perspective and help cover areas that are challenging for ground- based robots to navigate.

5G Connectivity:

Leveraging 5G connectivity can enhance the real-time communication capabilities of the robot, allowing for faster data transfer and more responsive control.

Energy Efficiency:

Research and development efforts could focus on improving the energy efficiency of the robot, possibly incorporating renewable energy sources or more efficient battery technologies for extended patrol durations.

Global Collaboration:

Collaborating with international organizations, researchers, and technology developers can lead to the exchange of ideas and best practices, promoting the global adoption and improvement of such safety robots.

Human-Robot Interaction:

Improving the human-robot interaction through natural language processing, gesture recognition, or other intuitive interfaces can make the robot more user-friendly and accessible.

Customization for Cultural Sensitivity:

Customizing the robot's features and behaviors to be culturally sensitive can enhance its acceptance and effectiveness in diverse communities.

Emergency Response Features:

Enhancing the robot's capabilities to assist in emergency situations, such as providing first aid or calling for medical assistance, can make it a more versatile tool for public safety.

Public Awareness and Education:

Initiatives to educate the public about the role and capabilities of women safety robots can contribute to increased awareness, acceptance, and cooperation.

Regulatory Framework:

Development of regulatory frameworks and ethical guidelines for the deployment and operation of such robots can ensure responsible use and adherence to privacy and security standards.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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