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Women Self Defence Device using ESP32 CAM

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ABSTRACT: Every girl's top concern in today's society is how to stay safe from harassment. The world is become considerably more dangerous for women. In many nations, nefarious practices including molestations, dowries, crimes against women, and—worst of all—rape are on the rise. According to WHO and NCRB social government organisation estimates, 35% of women worldwide experience abnormal health suffering in public settings. Every girl's only persistent thought is the day when they would be able to walk freely around the streets at all times without having to worry about their safety. The right to be free from violence, harassment, and discrimination applies to women. Women can be helped by removing the barriers they encounter in this dangerous atmosphere. Women can achieve their full potential as people and contributors to the workforce if the barriers they confront in this hazardous atmosphere are removed. The advanced women safety system presented in this article, called "WOMEN SELF DEFENCE DEVICE USING ESP32 CAM" will contact and send alert messages to neighbouring police stations and family members when a woman is in danger. The location information is delivered as an SMS alert to numbers that have been saved in terms of latitude and longitude when a woman presses the button or it is automatically enabled when she is in distress. The protection and safety of women and children are the main goals of this project.

KEYWORDS: ESP32-CAM, Women Safety, IoT, GPS Tracking, Emergency Alert, Biometric Sensors

I. INTRODUCTION

Women safety has always been an issue even in these modern times with so much advancement in technology. Women are not safe anywhere and are most vulnerable when traveling alone into lonely roads and deserted places. Existing handheld devices that are available for women safety require women intervention to activate them such as pressing the button or shake the device after sensing the danger. However, for some reason if a woman has no time to activate it when she is in danger, the purpose of the safety device is not solved. In country like India where the growth rate of crime is considered to be more than the growth rate of population, which includes burglary, murders, rapes, and many more women's safety is believed to be one of the most important issues. According to a report by Thomson Reuters Foundation, India is ranked as a highly dangerous place for women worldwide, India has the greatest number of child brides as well. In Today's World the safety of women is in danger especially in India. The rate of crimes against women is not decreasing but in fact increasing at an alarming rate especially harassment, molestation, eve-teasing, rape, kidnapping and domestic violence. Many preventive measures have been taken by the government to stop these misbehaving activities but still has not affected the growing rate of these crimes and has remained unaffected. Students face incidents like child trafficking and kidnapping, when they are waiting to embark or disembark a school bus. Loaded with security apps for women, smart phone can help to send emergency alerts to the chosen people and also let people know if anything goes wrong. Sometimes there might be a situation that when women had an accident in the late night and there are no one to help them, in such situations the person will not be able to tell the situation that he/she facing. And they do not know the basic first-aid details and to know the person where the incident has happened. Now a days though there are many apps and devices evolved for women safety via smart phone which can be activated only by a touch or one click or shake the mobile. 1 Women continue to experience crisis and harassment, which persists as a never-ending issue in today's society when technology has advanced to new heights and every issue has a contemporary answer. Because they are constantly concerned for their daughters' safety, parents won't let their girls travel alone. Every time they go outside, they wanted to feel secure and safe. A challenge to achieving their goals and fulfilling their responsibilities is the rise in crimes and abuse against women. Women workers are concerned about their safety and security when they have to travel at odd hours, go far away, or go to remote regions for work. Also, the growth and development of women may be threatened by this insecurity. The goal of the research is to develop a portable safety gadget for women that uses IoT to constantly monitor the user using a variety of sensors interfaced an Arduino. And suggested a portable gadget in the form of a belt that automatically activates when the pressure difference exceeds a threshold in a dangerous circumstance. IoT was a technology we employed to offer safety. This system includes a

number of sensors, including temperature, moisture, pressure, heartbeat, vibration, GPS, and GSM sensors. This gadget was created with women's safety in mind. So she won't be afraid to go out alone. Also, it is portable and easy to use, allowing them to carry it with them wherever

they go. Delivering our prototype to all working women, kids, college students, and seniors is our main goal.

II. OBJECTIVES OF OUR PROJECT WORK

1. To provide safety to women from precarious situation.
2. To help the parents to ensure their daughter's safety.
3. To rise a confident among working woman, child, women in rural areas on travelling alone.
4. To provide physiological parameters to the user for their health concern.

III. LITERATURE SURVEY HISTORY

Dr. Paithankar Prasad Rajendra et al., (2017) proposed the vehicle tracking system uses GPS and GSM to track and provide complete location information to user over mobile phone is a total security and fleet management solution. It is the technology used to determine the location of a vehicle using different methods like GPS and other navigation system operating via satellite and ground based stations. Modern vehicle tracking system use GPS technology to monitor and locate the vehicle anywhere on earth, but sometimes different types of automatic vehicle location technology are also used. The vehicle tracking system is fitted inside the vehicle that provides effective real time location and the data can even be stored and downloaded to a computer which can be used for analysis in future. This system is an essential device for tracking car any time the owner wants to monitor it and today it is extremely popular among people having expensive cars, used as theft prevention and recovery of the stolen car. The data collected can be viewed on electronic maps through internet and webpage. In this project Arduino Uno is used because earlier vehicle tracking system was based on very complicated and high cost microcontroller like 8051 with programming kit, ARM, etc. The main advantage of Arduino is low cost and easy to program it is also compatible with all the three operating system (Windows, Mac, Linux). This message contains the coordinates of vehicle location.

J. SriRam Pavan et al., (2018) proposed this project which presents a women safety device with GPS tracking and alerts using ARDUINO. The system can be interconnected with the alarm system and alert the neighbors. This detection and messaging system is composed of a GPS receiver, ARDUINO and a GSM Modem. GPS Receiver gets the location information from satellites in the form of latitude and longitude. The ARDUINO processes this information and this processed information is sent to the user using GSM modem A GSM modem is interfaced to the ARDUINO. The GSM modem sends an SMS to the predefined mobile number. When a woman is in danger and in need of self-defence then she can press the switch which is allotted to her. By pressing the switch, the entire system will be activated then immediately a SMS will be sent to concern the person with location using GSM and GPS.

IV. METHODOLOGY

The paper proposes an automated, highly reliable women's security device that consists of advanced sensors embedded in a wearable device. It consists of advanced sensors and an ATMEGA8 microcontroller with an Arduino tool that keep the user under observation at all times. It monitors the heartbeat rate, temperature, and vibration in the body through sensors to check for uneasy situations. In this work, equipment for alerting the system is designed. The Arduino controller is used for controlling the whole process of the system. The GSM is used to send SMS regarding GPS locations. Switch is pressed when the person is in danger. Here a buzzer laser diode is added, which will activate when the women press the switch.

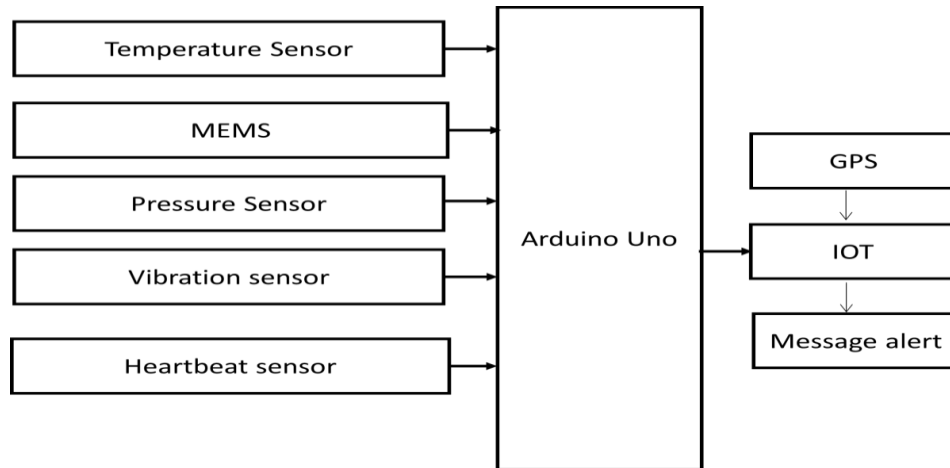


FIG 1:BLOCK DIAGRAM

V. WORKING PRINCIPLE

- Our proposed system consists of sensors, Arduino with sensors tool which keep user under observation at all the times using IoT.
- We proposed a portable device as a belt that is automatically activated when the pressure difference crosses over the threshold in an unsafe situation.
- In this project, we use Heartbeat, vibration, MEMS and temperature sensor to detect the abnormalities.
- The safety wrist band can assist the person automatically and manually.
- This is possible because of the sensors, namely stress sensor, heart rate sensor and accelerometer in the wrist band.
- The continuous measured physiological parameters can be stored on the chip, which may be further useful for the person.
- Here, an Arduino UNO is used to handle the entire mechanism.
- The GPS is used to identify location.
- The device can send the victim's current location to the nearest police control room or registered mobile numbers to rescue the victim.

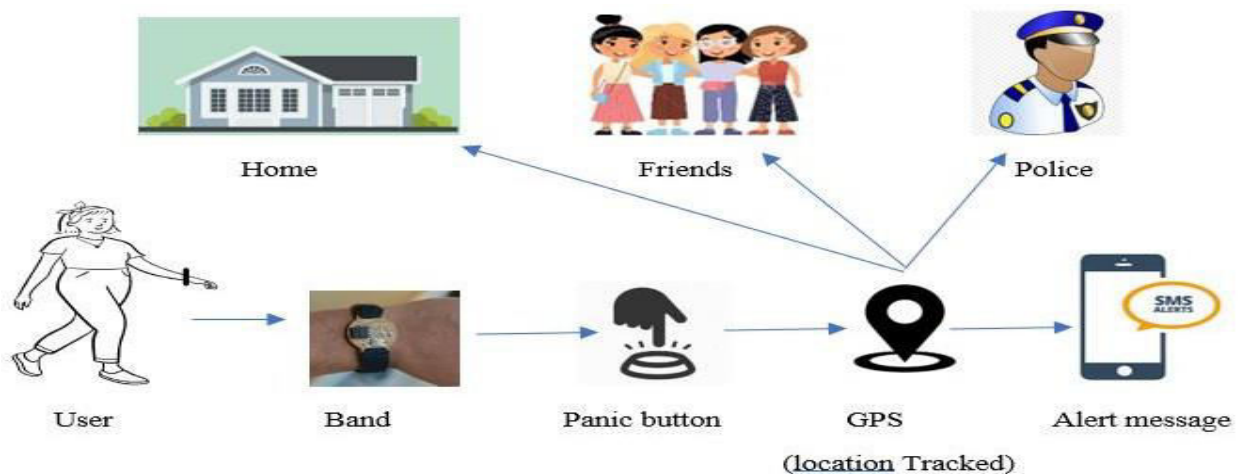


FIG 2: Pictorial Representation of the proposed system.

- The sensors on the input side include temperature, MEMS, pressure, vibration, and heartbeat sensors.
- The data from these sensors will be sent to the microcontroller after they have detected the specified values coming from the intended person.
- The Arduino is connected to a microcontroller, which receives data from an input sensor.
- The embedded C language will be used to programme the Arduino so that the output will respond in accordance with the predetermined threshold value.
- Because the output is connected to the Internet of Things, we can monitor real-time values using any of the effective IOT servers.
- The entire mechanism is controlled in this case by an Arduino Uno.
- To pinpoint a place, utilise GPS.
- The tool can provide the attacker with the victim's present location.

VI. HARDWARE DISCUSSION

1. ARDUINO UNO:

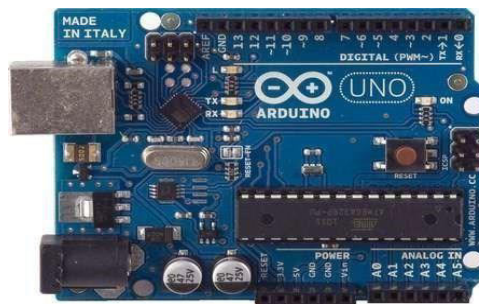


Fig -3:Arduino UNO

The Arduino microcontroller is an easy-to-use yet powerful single-board computer that has gained considerable traction in the hobby and professional markets. The Arduino is open-source, which means hardware is reasonably priced and development software is free. This guide is for students in ME 2011, or students anywhere, who are confronting the Arduino for the first time. For advanced Arduino users, prowl the web; there are lots of resources.

This guide covers the Arduino Uno board (SparkFun DEV-09950, \$29.95), a good choice for students and educators. With the Arduino board, you can write programmes and create interface circuits to read switches and other sensors and to control motors and lights with very little effort.

This is what the Arduino board looks like.

2. PRESSURE SENSOR



Fig -4 PRESSURE SENSOR

A pressure sensor measures pressure, typically of gases or liquids. Pressure is an expression of the force required to stop a fluid from expanding, and is usually stated in terms of force per unit area. A pressure sensor usually acts as a transducer; it generates a signal as a function of the pressure imposed. For the purposes of this article, such a signal is electrical.

Pressure sensors are used for control and monitoring in thousands of everyday applications. Pressure sensors can also be used to indirectly measure other variables such as fluid/gas flow, speed, water level, and altitude. Pressure sensors can alternatively be called pressure transducers, pressure transmitters, pressure senders, pressure indicators, piezometers and manometers, among other names.

Pressure sensors can vary drastically in technology, design, performance, application suitability and cost. A conservative estimate would be that there may be over 50 technologies and at least 300 companies making pressure sensors worldwide.

There is also a category of pressure sensors that are designed to measure in a dynamic mode for capturing very high-speed changes in pressure. Example applications for this type of sensor would be in the measuring of combustion pressure in an engine cylinder or in a gas turbine. These sensors are commonly manufactured out of piezoelectric materials such as quartz.

3. MEMS

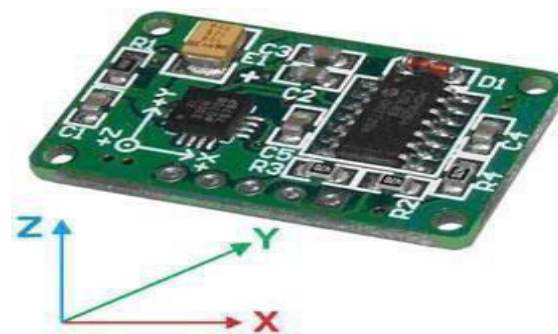


Fig -5 Visual Diagram of MEMS SENSOR

Micro-electromechanical systems (MEMS) is a technology that combines computers with tiny mechanical devices such as sensors, valves, gears, mirrors, and actuators embedded in semiconductor chips. MEMS or what he calls analogue computing will be "the foundational technology of the next decade." MEMS is also sometimes called smart matter.

MEMS are already used as accelerometers in automobile air-bags. They've replaced a less reliable device at lower cost and show promise of being able to inflate a bag not only on the basis of sensed deceleration but also on the basis of the size of the person they are protecting. Basically, a MEMS device contains micro-circuitry on a tiny silicon chip into which some mechanical device such as a mirror or a sensor has been manufactured. Potentially, such chips can be built in large quantities at low cost, making them cost-effective for many uses.

4. VIBRATION SENSORS:

The piezoelectric sensor is used for flex, touch, vibration and shock measurement. Its basic principle, at the risk of oversimplification, is as follows: whenever a structure moves, it experiences acceleration. A piezoelectric shock sensor, in turn, can generate a charge when physically accelerated. This combination of properties is then used to modify response or reduce noise and vibration.

It is important because vibration and shock can shorten the life of any electronic and electromechanical system. Delicate leads and bond wires can be stressed, especially after exposure to long term vibration. Solder joints can break free and PCB traces can ever so slightly tear from impact and impulse shock, creating the hardest type of system failure to

debug; an intermittent failure.

This article discusses piezoelectric shock and vibration sensors and sensor technology, focusing on available products (all parts mentioned here can be found on the Digi-Key website — links are provided), as well as design issues and design techniques.

5. GPS

- The Global Positioning System (GPS) is a space-based radio navigation system that
- provides reliable positioning, navigation, and timing services to users on a continuous worldwide basis -- freely available to all.
- Satellite Navigation is based on a global network of satellites that transmit radio signals from medium earth orbit. Users of Satellite Navigation are most familiar with the 31 Global Positioning System (GPS) satellites developed and operated by the United States.
- Three other constellations also provide similar services. Collectively, these constellations and their augmentations are called Global Navigation Satellite

6. Circuit Design

Power supply Vcc

It is necessary to provide a clean and stable power supply for our GPS module in order to obtain good performances (Ex: TTFF). Unstable power source will have a significant negative impact on the GPS performance. To achieve this, the Vcc ripple must be controlled under 50mVpp.

In addition, there are also some important suggestions for main power circuit design:

Add ferrite bead, power choke or low pass filter for power noise reduction

Use linear regulator for voltage regulation

Use enough decoupling capacitors for stable voltage due to current variation.

7. UART 0 (RX/TX) –Serial Interface

UART is the default interface, and it supports transfer baud rate ranging from 4800 bps to 115200 bps. The logic is TTL level. If the RS232 logic-level is needed for application, then the use of level shifters is necessary. Please leave RX open if it is not used, there is an internal pull-up to VCC. Please don't use an external pull-up for unexpected current draw.

8. Antenna Design, ANTENNA_IN

GPS antenna is a receiving device to acquire weak GPS signal from sky. Popular solution would be ceramic patch antenna due to its small form factor with low cost. There are two types of antennas, passive and active. Passive antenna is with solely antenna itself. Active antenna is with LNA to have high gain with the cost of current supply.

VII. RESULT AND DISCUSSION

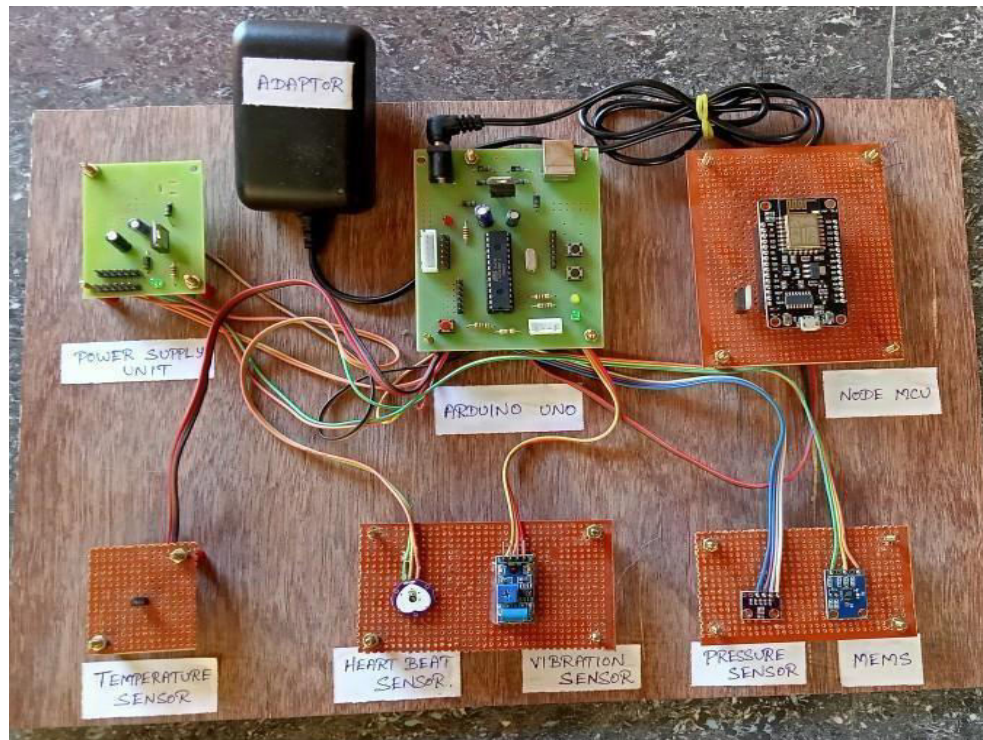


Fig 10: final project output

The integration The figure shows the hardware layout of the proposed system which suggests a wearable device with integrated high-tech sensors for automatic, extremely dependable women security. It has cutting-edge sensors, an ATMEGA8 microcontroller, and an Arduino tool that constantly monitor the user. Through sensors, it keeps an eye on the body's temperature, vibration, and cardiac rate to look for uncomfortable circumstances. The design of equipment to alert the system is done in this task. The entire system's operation is controlled by an Arduino controller. GPS location-related SMS are sent over GSM. When someone is in danger, the switch is pressed. A buzzer laser diode has been installed in this place, and it will turn on when a woman presses the switch.

VIII. CONCLUSION

In conclusion, The project will solve the critical issues faced by women and will help to solve them with technologically sound equipment and ideas. The intention of this project is not only provide safety and it also provides security by means of self-defence mechanism. The crime against the women can be now brought to an end with the help of real system implementation of the proposed model.

The suggested design will address important problems and contribute to their resolution using cutting-edge tools and concepts. The strength of this approach is that it offers security through a self-defence mechanism in addition to safety. With true system implementation of the suggested paradigm, the crime against women can now be put an end. In this paper, we suggest and present an Internet of Things-based safety gadget. The purpose of this safety feature is to protect women and children from harassment at all times. The tool can immediately alert law enforcement to take legal action against the offenders. In order to save the victim, the device can also send the victim's location to the closest police station. The tool is very user-friendly, and it can be used easily and affordably by users of various skill levels.

IX. FUTURE SCOPE

The proposed IoT-based women safety system has significant potential for future enhancements to improve its effectiveness, accessibility, and usability. Here are some key areas for future development:

1. **Integration with AI and Machine Learning:** Incorporating AI algorithms can enhance threat detection by analyzing patterns in sensor data, such as abnormal heart rates or sudden movements, to differentiate between false alarms and genuine emergencies. Predictive analytics could also identify high-risk areas based on historical crime data.
2. **Wearable Design Improvements:** The device can be miniaturized and integrated into everyday accessories like jewelry, watches, or clothing to ensure discreet usage and comfort. Flexible and waterproof materials could make it more durable and adaptable to various environments.
3. **Enhanced Connectivity:** Utilizing 5G technology can ensure faster and more reliable data transmission, reducing latency in emergency alerts. Integration with smart city infrastructure could enable real-time tracking and quicker response from authorities.
4. **Additional Sensors:** Incorporating environmental sensors (e.g., air quality, noise levels) and biometric sensors (e.g., stress levels) can provide a more comprehensive safety net. Voice recognition or gesture-based activation could offer alternative ways to trigger alerts.
5. **Community and Crowdsourcing Features:** A companion app could allow users to share their location with trusted networks or alert nearby volunteers in emergencies, creating a community-based safety network.

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