WOMEN SAFETY SYSTEM WITH PORTABLE VISVUAL MONITORING SYSTEM

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ABSTRACT:

Women’s safety has become a critical concern for the Indian government, driven by the alarming rise in crimes against women. This urgent situation demands decisive action to combat these offenses. In today's digital age, the widespread use of smartphones presents an opportunity to leverage technology for security purposes. This application is designed with a unique feature that sends immediate alerts to pre-registered contacts upon activation. Once triggered, it continuously tracks the user's location, providing real-time updates to those alerted. Additionally, analysing crime data can help uncover significant patterns and hidden connections, enabling a more strategic approach to crime prevention.

INTRODUCTION OF PROJECT

A woman embodies love, purity, knowledge, and sacrifice [1]. The strength of any society lies in the happiness and respect afforded to its women. Yet, the same homes that honour goddesses often become the place where the real goddesses—the women—suffer abuse [2]. Today, while women are standing shoulder to shoulder with men, they do so at the expense of enduring relentless harassment, abuse, and violence, both in public and within their own homes [3]. Their freedom is stripped away—they are unable to step out at will, wear clothes as they choose, or pursue their careers without fear. This not only robs them of their liberty but also shatters their confidence and crushes their dreams [4].

Given these harsh realities, the need for women’s security has become paramount [5]. In the past, women were largely confined to their homes, which, though limiting, offered a degree of safety. Today, as more women seek employment and independence, the lack of safety has become glaringly evident [6]. One in three women may face violence in her lifetime, a grim statistic that has become even more common in recent years [7]. Although numerous safety systems have been developed to address this, they often fall short. A police officer cannot always be by a woman’s side, but proactive security measures can empower them to protect themselves [8].

This paper seeks to leverage the latest advancements in technology, specifically the Internet of Things (IoT), to address this issue. IoT, an interconnected ecosystem of devices accessible through the web, offers real-time solutions for safety. With the rise in crimes against women, as reported by the National Crime Records Bureau [9], there is a pressing need for technology to play a central role in crime prevention. We propose a system capable of detecting and responding to threats in real time, pinpointing the user’s location to offer immediate security measures based on where they stand [10]. By blending technology with social development, we can take meaningful steps toward preventing crime and ensuring women’s safety.

II. LITERATURE SURVEY

In recent years, the issue of women's safety has garnered significant attention worldwide due to the increasing prevalence of violence, harassment, and abuse against women. Traditional safety mechanisms, while somewhat effective, have been criticized for their lack of immediate intervention capabilities and failure to provide real-time assistance. This gap has catalysed the development of advanced technological solutions aimed at enhancing personal security, specifically through portable monitoring systems [11]. These systems, leveraging cutting-edge technologies such as the Internet of Things (IoT), computer vision, and real-time video surveillance, offer a robust solution to ensuring women’s safety by enabling instantaneous response and preventive measures. Several innovations in personal security systems have emerged in recent years. Portable devices equipped with GPS tracking and real-time communication features have been integrated into women’s safety mechanisms to provide immediate alerts to authorities in case of an emergency [12]. Research by Patel et al. (2019) highlights the development of IoT-based smart wearable devices that can continuously monitor a woman’s surroundings, detect abnormal situations using machine learning algorithms, and automatically send distress signals. Such devices are linked to mobile applications, allowing users to trigger an alert with minimal physical interaction, which is critical in high-risk situations.

Moreover, advancements in video surveillance have bolstered the reliability and effectiveness of monitoring systems. Studies indicate that integrating video monitoring into personal safety devices can provide vital visual evidence in the event of an incident, increasing the probability of apprehending offenders [13]. The deployment of portable cameras, as noted by Singh et al. (2021), allows real-time video feeds to be transmitted to law enforcement agencies, enabling swift action. Additionally, these cameras often use artificial intelligence (AI)-driven analytics to detect unusual behaviour patterns, further enhancing the system's proactivity in ensuring women's safety. Wearable technology plays a crucial role in the development of women's safety systems. Devices such as smart bracelets, pendants, and other wearables embedded with cameras and GPS tracking are increasingly being used as a first line of defines. According to Verma and colleagues (2020), wearable devices equipped with visual monitoring systems offer an integrated approach where location tracking, video surveillance, and communication are seamlessly combined to ensure safety. These devices, operating on IoT platforms, enable constant connectivity, allowing users to remain linked with a centralized safety network.

Recent studies emphasize the potential of IoT in making such systems more efficient and reliable. By leveraging a cloud-based infrastructure, data from wearable safety devices can be stored and processed in real time. This provides not only immediate alerts but also long-term insights into unsafe zones and incident patterns. The work of Rao et al. (2020) underscores the necessity of ensuring that such systems are low-cost and highly accessible, especially in regions where women's safety remains a critical concern. The role of artificial intelligence (AI) and machine learning (ML) in safety monitoring systems cannot be overstated. AI-driven safety systems can autonomously identify threats based on predefined parameters and learned behaviours from real-world data. Computer vision, a subset of AI, is particularly valuable in processing video footage from portable monitoring devices, as it enables real-time object recognition, facial identification, and activity analysis. The application of deep learning models to detect anomalous behaviours, such as aggression or stalking, has shown significant promise. For instance, Zhang et al. (2021) developed a portable visual monitoring system using convolutional neural networks (CNNs) that could predict potential threats based on body language and facial expressions captured in real time, leading to pre-emptive safety alerts. Moreover, natural language processing (NLP) models are being used in conjunction with visual monitoring systems to interpret verbal cues from the surroundings. This dual-mode monitoring (audio and visual) allows systems to respond more intelligently to complex situations, providing women with a higher degree of protection in environments that may not appear overtly dangerous but pose hidden threats.

Despite the rapid advancement of portable visual monitoring systems, several challenges remain in their widespread adoption and effectiveness. Privacy concerns are paramount, as constant video surveillance raises issues regarding the potential misuse of data. Ensuring secure data transmission and storage is critical in preventing unauthorized access to sensitive video feeds, a challenge addressed by Roy et al. (2022) through the implementation of encrypted cloud-based architectures. Another challenge is ensuring that such systems are user-friendly and accessible, particularly in regions with limited technological infrastructure. Developing low-cost, energy-efficient monitoring devices remains a pressing concern, as pointed out by Gupta et al. (2021). The next generation of women's safety systems must prioritize affordability without sacrificing functionality, ensuring that they are accessible to a broader demographic. In summary, the integration of portable visual monitoring systems into women's safety devices represents a transformative approach to enhancing personal security. The convergence of IoT, AI, and wearable technologies holds the potential to provide real-time protection and proactive intervention. However, as the technology evolves, it will be critical to address the challenges of privacy, accessibility, and cost to ensure that these systems can be effectively implemented on a global scale.

DESIGN OF HARDWARE

This chapter briefly explains about the Hardware. It discusses the circuit diagram of each module in detail.

ARDUINO UNO

The Arduino Uno is a microcontroller board based on the ATmega328 (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, 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 an AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode. Arduino board has the following new features:

- pin out: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible both with the board that use the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin, that is reserved for future purposes.
- Stronger RESET circuit.
- At mega 16U2 replace the 8U2.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

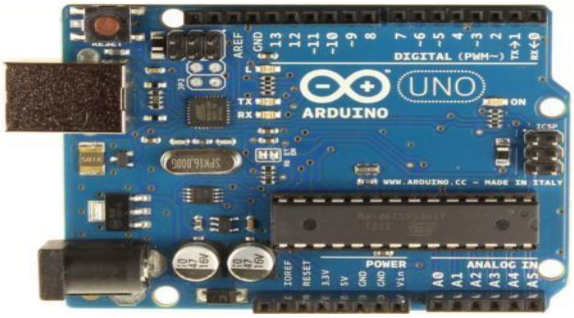

Fig 1: ARDUINO UNO

POWER SUPPLY:

The power supplies are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can by broken down into a series of blocks, each of which performs a particular function. A d.c power supply which maintains the output voltage constant irrespective of a.c mains fluctuations or load variations is known as “Regulated D.C Power Supply”.

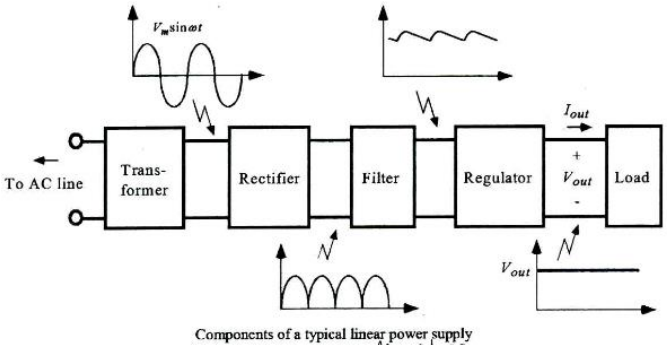

Fig 2: Block Diagram of Power Supply

LCD DISPLAY

A model described here is for its low price and great possibilities most frequently used in practice. It is based on the HD44780 microcontroller (Hitachi) and can display messages in two lines with 16 characters each. It displays all the alphabets, Greek letters, punctuation marks, mathematical symbols etc. In addition, it is possible to display symbols that user makes up on its own. Automatic shifting message on display (shift left and right), appearance of the pointer, backlight etc. are considered as useful characteristics.

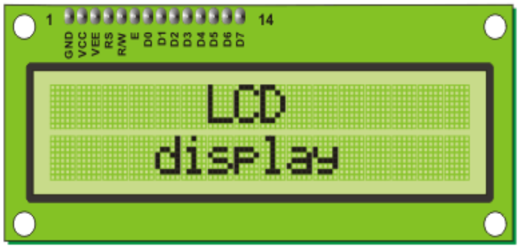

Fig 3: LCD

BUZZER

Digital systems and microcontroller pins lack sufficient current to drive the circuits like relays, buzzer circuits etc. While these circuits require around 10milli amps to be operated, the microcontroller's pin can provide a maximum of 1-2milli amps current. For this reason, a driver such as a power transistor is placed in between the microcontroller and the buzzer circuit.

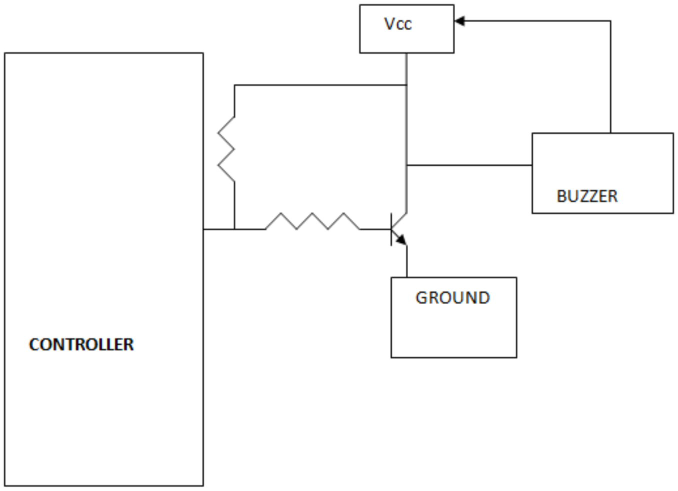

Fig 4. Buzzer

WIFI MODULE:

The **ESP8266** is a low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability produced by Shanghai-based Chinese manufacturer, Espressif Systems.[1]

The chip first came to the attention of western makers in August 2014 with the **ESP-01** module, made by a third-party manufacturer, Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at the time there was almost no English-language documentation on the chip and the commands it accepted.[2] The very low price and the fact that there were very few external components on the module which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, chip, and the software on it, as well as to translate the Chinese documentation.[3]

The **ESP8285** is an ESP8266 with 1 MiB of built-in flash, allowing for single-chip devices capable of connecting to Wi-Fi.[4]

The successor to these microcontroller chips is the ESP32.

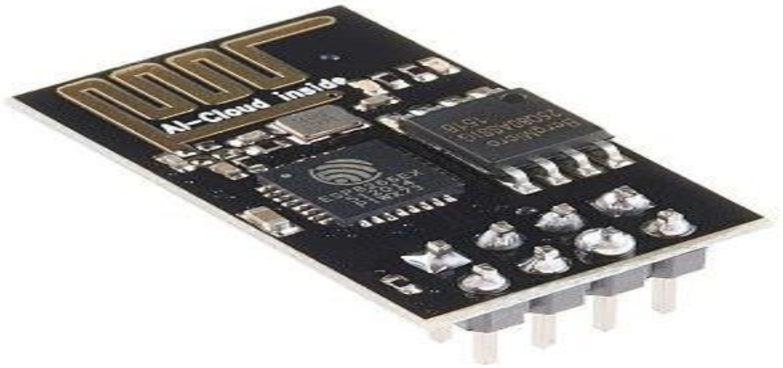

Fig 5. WIFI MODULE

PUSH BUTTON:

A switch is an electrical component that can break an electrical circuit, interrupting the current or diverting it from one conductor to another. The most familiar form of switch is a manually operated electromechanical device with one or more sets of electrical contacts. Each set of contacts can be in one of two states: either 'closed' meaning the contacts are touching and electricity can flow between them, or 'open', meaning the contacts are separated and non-conducting.

Fig 6: Push Buttons.

NODE MCU:

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 module.[6][7] Later, support for the ESP32 32-bit MCU was added

NodeMCU is an open source firmware for which open source prototyping board designs are available. The name "NodeMCU" combines "node" and "MCU" (micro-controller unit).[8]. The term "NodeMCU" strictly speaking refers to the firmware rather than the associated development kits.

Both the firmware and prototyping board designs are open source.

The firmware uses the Lua scripting language. The firmware is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson[10] and SPIFFS.[11] Due to resource constraints, users need to select the modules relevant for their project and build a firmware tailored to their needs. Support for the 32-bit ESP32 has also been implemented.

The prototyping hardware typically used is a circuit board functioning as a dual in-line package (DIP) which integrates a USB controller with a smaller surface-mounted board containing the MCU and antenna. The choice of the DIP format allows for easy prototyping on breadboards. The design was initially was based on the ESP-12 module of the ESP8266, which is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IoT applications

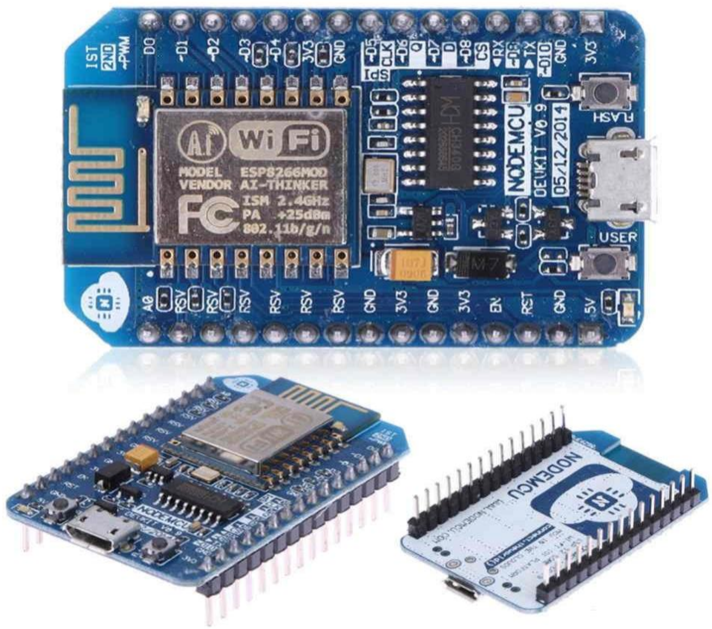

Fig 7. NodeMCU Development Board v0.9 (Version1)

IV.BLOCK DIAGRAM:

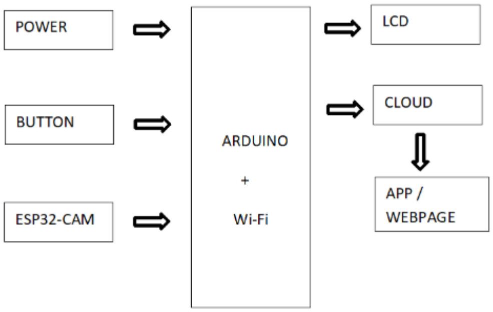

Fig 8. Block Diagram

V.CONCLUSION

The developed model will help to reduce crimes and will help the crime detection in many ways that is from arresting the criminals to reducing the crimes by caring out various necessary measures. Android system is developed for controlling the crimes in our society, we are using KNN algorithm for finding nearest location so any necessary action will be taken by user and police stations. The product is built as lab prototype to show how the real world can implement this into their day-to-day life to take any precautions. The main objectives are to provide security and taking proper precautions. The main objectives are to provide security and taking proper precautions to avoid the incident which can harm our society values.

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