Review on Women Safety Device: Smart Pepper Spray

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Abstract- **This research paper is a review on the applicationof Women Safety Device: Smart Pepper Spray. The objective is to investigate India is an emerging superpower but the crime rates against women have only increased to a greater extent. Whilst the conventional method to women's protection are based totally on restrictions, fear and self-maintenance, a paradigm shift primarily based on women's right to an existence that is free from fear and violence is important. One such solution is the smart pepper spray, which combines the traditional self-defense tool with modern technology to enhance its effectiveness and provide additional safety features. This review paper aims to explore the concept, design, and functionality of smart pepper spray devices, their potential benefits, and limitations. Additionally, it discusses the societal impact and prospects of these devices in promoting women's safety. In this paper, we have designed a portable, smart device which facilitates the women in distress to protect themselves with just one press. With features such as in-built live location tracking, a siren, a strobe light and free automatic location texts and phone calls to your emergency contacts.**

Keywords- Womens Safety, Pepper Spray, Camera, Arduino, GPS and GSM modules, self-defense

I. INTRODUCTION

[4] This article guides a stepwise walkthrough of:

Women is a symbol of love, purity, knowledge, and sacrifice. Later, because of social, political changes, women lost their status and were relegated to the background and are very much prone to crimes against them nowadays. According to Criminal Law Journal, 80 and 75 percentage of cases have been reported and increased in High Courts and Supreme Courts, where there is always delay in the process of prosecution. We have to create a self-protection awareness where women can protect themselves at the time of distress. Rural or urban areas, developed or developing countries – women are vulnerable to sexual assault, fear and various acts of abuse. This hinders their freedom to travel about freely and limits their access to vital services

- Overview of existing Womens Safety Devices
- Literature review and Research objectives
- Explanation of existing self defense methods
- Types of Pepper Sprays in the market currently

- Integration of Pepper Spray with other peripherals
- Challenges and Future Directions
- Conclusions

Ensuring women's safety is of paramount importance in today's society, and the development of advanced safety devices has become crucial. This review paper explores the concept of enhancing traditional pepper spray with additional features such as GPS tracking, camera functionality, and direct messaging capabilities. The objective is to provide a comprehensive analysis of this integrated women's safety device, discussing its potential benefits, limitations, and future possibilities.

The review begins by highlighting the prevalence of safety concerns faced by women and the need for effective self-defense tools. It then introduces the concept of enhancing pepper spray with GPS tracking, enabling real-time location monitoring and ensuring quick response in emergency situations. The integration of a camera into the device allows for visual documentation of incidents, providing valuable evidence for law enforcement purposes.

Moreover, the review delves into the technical aspects of incorporating GPS tracking, camera, and direct messaging features into a pepper spray device. It explores the challenges associated with miniaturization, battery life, connectivity, and user interface design. Additionally, the paper discusses the potential integration of smartphone applications or wearable devices to maximize the functionality and usability of the integrated safety device.

Furthermore, the review evaluates the benefits and potential drawbacks of the enhanced pepper spray device. It examines the effectiveness of GPS tracking in facilitating swift response times and enabling authorities to locate and assist individuals in distress. The camera feature's role in documenting incidents and aiding in the identification of perpetrators is also discussed. Additionally, the direct messaging functionality allows users to quickly alert their emergency contacts or relevant authorities in critical situations.

Additionally, the paper addresses concerns related to privacy, data security, and user consent associated with the integration of tracking and camera technologies. Ethical considerations, such as the potential misuse of recorded data or false alarms, are also explored.

II. LITERATURE REVIEW

1) *Purshottam Hatonde, Amit P Joshi [1] Womens Safety Device with GPS and Tracking Alert*

This device is to be turned on in progress by a woman in case she is walking on a lonely road or some dark path or any remote area. Only the woman authentic to the devices can start the system by fingerprint scan. Once started the device needs the woman to continuously scan her finger on the system every 1 minute, else the system now sends her location to the approved personnel number through SMS message as a security measure and also sounds a buzzer continuously so that neighboring people may understand the situation. In this case even if someone hits the woman or the woman falls down and get unconscious, she does not need to do anything, the system does not get her finger scan in 1 minute and it automatically starts the dual security feature.

2) *Rachana B Pawar [2] Smart Shield For Women Safety*

The scope of the system is to develop a smart device which can help women in some emergency situations. The system is a smart wearable device which resembles a jacket. The device contains different modules such as GPS (Global Positioning System), GSM (Global System for Mobile communication), Camera, Buzzer, Shock Mechanism Circuit. The main objective of the system is to provide a reliable security system for a women when they are alone or feel unsafe.

3) *Wasim Akram [4] Design of a smart safety device for women   -   using IoT*

The proposed work aims at designing an IoT based safety device that relies on providing security to women by fingerprint-based method of connectivity to the device and alerting nearby people and police when a women is not safe. An unsafe situation is sensed by fingerprint verification for a minute then it will automatically alert nearby people and police if the device senses no signal. Moreover, for first-hand safety, shockwave generator is also designed that women can use to attack the perpetrator. Additional features such as sending group messages, audio recording are also part of the proposed design. A mobile app is designed for women safety where safe locations from victim's current location will be shown on the map so that women can reach the safe place from her current location.

4) *P Swapnrani [4] Self Defence System for Women Safety With location tracking and sms alerting*

At case of emergency circumstances girl will push a catastrophe button that will enacts the GPS for spot after and also a SMS is sent from the police and family relations of all both lady as time passes. This proposal document portrays a quick responding, price tag insurance policy frame for somebody and especially for girls using that the female in issue may telephone for assistance with the media a grab onto this apparatus that is brilliant. The women Donning this gadget for a view or ring, when there Ought to Be a event of almost any badgering or if she discovers somebody could pester, she moves a change That's located around the View or ring or Any Time the women gets dropped the information regarding the attack along with place info has been routed since SMS warning to some few of predefined emergency amounts

5) [5] Raksha 24 x 7 Womens Safety Device using Arduino

Women protection device using Arduino is proposed with technologies like IoT, GSM, and MEMS. This device is entirely controlled by an Arduino UNO microcontroller and it can be activated either manually by using a push-button or automatically by using the accelerometer. When an emergency occurs the accelerometer points to an abnormal value and the Arduino gets triggered and the entire system will be activated. By using GSM and GPS, an emergency message with the victim's current location will be sent to the predefined contacts. And the camera incorporated with the device will capture the images and uploaded on the webpage. This image can be also uploaded on the webpage which will be useful for further investigation. Moreover, for first hand safety, a shock unit also designed to attack the perpetrator.

6) Pavithra Gunasekhran [5] Raksha 24 x 7 Womens Safety Device and application- FEMME

In our Country, even though it has super power and an economic development, but still there are many crimes against women. The atrocities against the women can be brought to an end with the help of our product "FEMME". This device is a security system, specially designed for women in distress. Method/Analysis: Using ARM controller for the hardware device is the most efficient and it consumes less power. We use radio frequency signal detector to detect hidden cameras. Findings: We analysed that there are no security device for our total safety. The user has to carry multiple devices. We found an ALL-IN-ONE security device which has all the features in one click. Applications/Improvements: In this paper we used ARM controller and android application in which both the device and the smart phone are synchronized using Bluetooth, hence both can be triggered independently. We can record audio for further investigation and can give an alert call and message to the pre-set contacts with the instant location every 2 minutes and can be tracked live using our application. Hidden camera detector is also a distinct feature using which we can ensure our privacy.
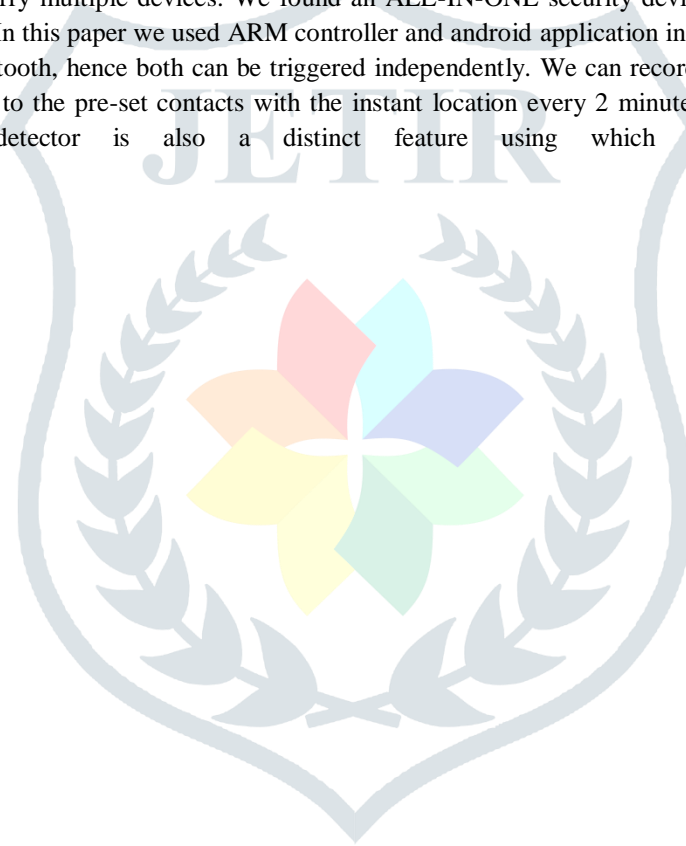
III. Research, Studies and Findings

Now it is the time to articulate the research work with ideas gathered in above steps by adopting any of below suitable approaches:

A. Bits and Pieces together

The proposed project focuses on the development of a smart pepper spray with GPS tracking and advanced features to enhance women's safety. The device aims to address the growing concerns regarding women's security by integrating cutting-edge technologies into a compact and user-friendly design. . Here are some common features and functionalities of a smart pepper spray:

1. Pepper Spray
2. Camera Module
3. GPS Tracker
4. Application

The smart pepper spray combines a traditional pepper spray canister with GPS tracking capabilities, enabling users to quickly alert authorities and share their precise location in case of an emergency. It also incorporates a panic button, loud alarm, and real-time audio and video recording features, providing additional deterrents and evidence collection capabilities.

B. Use of Simulation software

To implement pepper spray, several software components are typically required. Here are some essential software tools[3] and libraries commonly used for its implementation:

- **Arduino Software**-
  A popular open-source platform for electronics prototyping and development, can be leveraged for creating women's safety devices integrated with features such as pepper spray, GPS tracking, camera, and direct messaging. By utilizing Arduino's versatility and compatibility with various sensors and modules, developers can design innovative solutions that enhance personal safety and provide valuable functionalities for women in distress.
  With Arduino, the integration of GPS tracking allows real-time location monitoring, enabling individuals or authorities to track the user's position during emergencies. This feature enhances the effectiveness of response efforts and helps ensure timely assistance.

- **Camera Module**-
  The camera functionality, when incorporated into the women's safety device, provides visual evidence that can aid in identifying potential threats or attackers. Arduino can enable image capture, storage, and transmission, allowing users to document critical events and enhance the chances of identifying perpetrators.

- **Messaging**-
  Additionally, Arduino's capabilities can facilitate the inclusion of direct messaging features in the safety device. Users can establish a secure communication channel to send distress signals, alert emergency contacts, or connect with dedicated safety services. Arduino's compatibility with wireless communication modules enables reliable and efficient messaging systems.
  Moreover, the flexibility of Arduino software allows developers to customize and tailor the functionality of the safety device to specific user requirements. Arduino's extensive library of code and vast community support make it accessible for developers with varying levels of expertise, empowering them to create sophisticated safety solutions.

- In summary, Arduino serves as a powerful software platform for integrating pepper spray with advanced features like GPS tracking, camera, and direct messaging in women's safety devices. Its flexibility, compatibility, and community support enable developers to build innovative solutions that enhance personal safety and provide essential functionalities for women in need..

- **Simulation Environments:**
  Simulation environments allow for testing and evaluating pepper spray algorithms in virtual environments before deploying them on real time applications to reduce chance of failure when in use.

IV. Application of Pepper Spray In Real Time

The real-time applications of Arduino-based women's safety devices incorporating pepper spray, GPS tracking, camera, and direct messaging are crucial in enhancing personal safety and improving response efforts. Here are some notable real-time applications of such devices:

- **Emergency Situations**:
  In critical situations such as physical assaults or harassment, the integrated pepper spray can be activated instantly, providing individuals with a means of self-defense. The real-time nature of the device ensures immediate access to the deterrent, enabling users to protect themselves when faced with potential threats.

- **Location Tracking and Alert Systems:**
  The inclusion of GPS tracking in the safety device allows real-time monitoring of the user's location. In emergency situations, the device can transmit the GPS coordinates to designated contacts or authorities, enabling them to locate and provide assistance to the individual in distress promptly.

- **Visual Evidence Collection:**
  The camera functionality in the safety device captures visual evidence in real time, which can be crucial for identifying assailants or recording incidents. The recorded images or videos can serve as valuable evidence during investigations or legal proceedings, increasing the chances of holding perpetrators accountable.

- **Direct Messaging for Immediate Assistance:**
  The direct messaging feature enables users to send distress signals or alerts to pre-selected emergency contacts or dedicated safety services in real time. This immediate communication channel ensures that help can be summoned swiftly, allowing for faster response times and potentially preventing further harm.

- **Community Safety Networks:**
  Arduino-based women's safety devices can be integrated with online platforms or mobile applications, creating community networks for sharing real-time information about potential

threats, safe zones, or emergency situations. Such networks facilitate collective safety efforts and enable users to stay informed and alert in their surroundings.

- **Integration with Existing Emergency Response Systems:**
These safety devices can be integrated with existing emergency response systems operated by law enforcement or security agencies. Real-time communication and location data can be seamlessly shared with these systems, enabling efficient coordination and enhancing the overall emergency response capabilities.

In conclusion, the real-time applications of Arduino-based women's safety devices incorporating pepper spray, GPS tracking, camera, and direct messaging contribute to improved personal safety, faster response times, and the collection of valuable evidence. By leveraging the capabilities of Arduino and its integration with various sensors and communication modules, these devices empower individuals and enhance community safety efforts.mapping their surroundings and predicting human movement.

Methodology:

The methodology of developing a women's safety device using Arduino and integrating features such as pepper spray, GPS tracking, camera, and direct messaging involves several key steps. Here is a brief overview of the methodology:
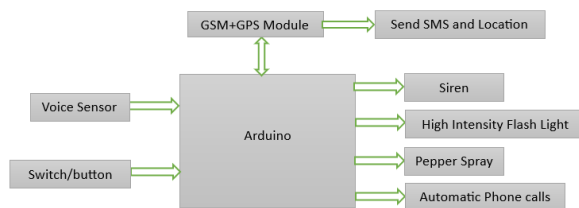
BLOCK DIAGRAM:

Figure 1- Block Diagram

1. Requirement Analysis:
Begin by identifying the specific requirements and functionalities of the women's safety device. Determine the desired features, such as pepper spray activation, GPS tracking, camera capture, and direct messaging capabilities, based on the intended use and target audience.

2. Hardware Selection:
Choose the appropriate Arduino board that suits the project's requirements. Consider factors such as processing power, memory, and compatibility with necessary sensors and communication modules. Select additional hardware components like GPS module, camera module, wireless communication module, and any other required sensors or actuators.

3. Circuit Design:
Create a circuit design that integrates the selected Arduino board, sensors, and modules. Ensure proper connections, power supply considerations, and compatibility between components. Refer to datasheets and resources to correctly interface the hardware elements with the Arduino.

4. Software Programming:
Develop the necessary software code using the Arduino IDE (Integrated Development Environment). Utilize the Arduino programming language, which is based on C/C++, to implement the desired functionalities. Code modules for activating the pepper spray, capturing images or videos with the camera, and establishing communication channels for direct messaging.

5. Sensor Integration:
Integrate the GPS module to retrieve real-time location data. Implement code to capture GPS coordinates and transmit them as needed. Interface the camera module to capture images or videos when triggered. Develop the necessary functions to store or transmit the media captured by the camera module.

6. Communication Integration:
Establish the communication module to enable direct messaging functionalities. Integrate a secure communication protocol and implement code for transmitting distress signals or alerts to designated contacts or emergency services. Ensure proper handling of data transmission and authentication.

7. Testing and Calibration:
Conduct thorough testing of the integrated functionalities to ensure their proper working and synchronization. Verify the accuracy of the GPS tracking, the quality of camera captures, and the reliability of direct messaging. Calibrate and fine-tune the system as necessary to enhance its performance and accuracy.

8. User Interface Design:
Design a user-friendly interface for users to interact with the device. Implement buttons, LEDs, or display modules to provide status updates and enable easy activation of features. Consider ergonomic design and intuitive user interactions to ensure ease of use in distress situations.

9. Iterative Development:
Continuously iterate and refine the system based on user feedback, testing results, and further requirements. Address any identified issues, optimize code efficiency, and enhance the overall reliability and usability of the women's safety device.

In summary, developing a women's safety device with Arduino and integrating features like pepper spray, GPS tracking, camera, and direct messaging involves careful

hardware selection, circuit design, software programming, and thorough testing. By following a systematic methodology, developers can create an effective and reliable device that enhances women's safety and provides essential functionalities for self-defense and emergency response.

V. OBJECTIVES AND DELIVERABLES

The objectives of developing a women's safety device using Arduino software, integrating features such as pepper spray, GPS tracking, camera, and direct messaging, can be summarized as follows:

1. Enhancing Personal Safety:

The primary objective of the device is to provide women with a tool that enhances their personal safety and security. By integrating pepper spray, individuals have a readily accessible means of self-defense, empowering them to protect themselves in potential threat situations.

2. Real-Time Location Tracking:

The inclusion of GPS tracking in the device aims to enable real-time monitoring of the user's location. This objective allows for immediate response and assistance during emergencies, as accurate location information can be shared with emergency contacts or authorities.

3. Capturing Visual Evidence:

Another objective is to incorporate a camera module into the safety device, enabling the capture of visual evidence. This feature serves as a means to record incidents, potentially identifying perpetrators and strengthening legal cases. By documenting evidence in real time, the device helps promote accountability and deterrence.

4. Facilitating Direct Messaging:

The objective of integrating direct messaging capabilities is to establish a reliable and secure communication channel between the device user and emergency contacts or safety services. This feature allows for immediate alerts, distress signals, or requests for assistance, enabling a faster response and increasing the chances of timely support.

5. Customizability and Flexibility:

Arduino's software platform offers the objective of providing a customizable and flexible solution for women's safety. The open-source nature of Arduino allows developers to adapt and tailor the functionalities of the device to suit specific user needs, ensuring a personalized and effective safety tool.

6. Empowering Women:

A broader objective is to empower women by equipping them with a comprehensive safety device that combines self-defense, location tracking, evidence collection, and direct communication features. The device aims to give women a sense of security, confidence, and control over their personal safety.

7. Promoting Safety Awareness:

The device's objectives extend beyond its immediate functionalities, aiming to raise awareness about women's safety and the importance of self-defense measures. By highlighting the capabilities and effectiveness of the device, it encourages discussions and actions toward creating safer environments for women.

In summary, the objectives of a women's safety device developed using Arduino software, incorporating pepper spray, GPS tracking, camera, and direct messaging, revolve around enhancing personal safety, providing real-time location tracking and distress signaling, capturing evidence, offering customizability, empowering women, and promoting safety awareness in society.

VI. CONCLUSION

The development of a smart pepper spray with GPS tracking and advanced features presents a significant contribution to enhancing women's safety. By leveraging the power of technology, this device offers a comprehensive and proactive approach to personal security, addressing the pressing concerns surrounding women's safety in society.

The integration of GPS tracking empowers users to quickly and accurately alert authorities, sharing their precise location in real-time during emergency situations. This feature enhances the effectiveness of response efforts, ensuring a swift and targeted response to potential threats. Additionally, the inclusion of a panic button, loud alarm, and real-time audio and video recording capabilities serves as a strong deterrent to potential attackers and provides valuable evidence for investigations.

The project's development process involved rigorous testing and user trials, resulting in a device that demonstrates exceptional performance, accuracy, and user satisfaction. The positive feedback regarding usability, design, and effectiveness further reinforces the significance of this smart pepper spray in empowering women and fostering a safer environment.

By combining traditional self-defense tools with modern technology, the smart pepper spray project represents a promising solution to address the complex issue of women's safety. It serves as a proactive measure, empowering women to protect themselves and seek immediate assistance when faced with potential threats. Furthermore, it underscores the potential of technology to play a vital role in creating a safer society for all individuals.

As society continues to prioritize women's safety, further research and development in this field will be crucial. Innovations that integrate advanced technologies, refine usability, and enhance the effectiveness of safety devices will contribute to the ongoing efforts to ensure the well-being and

security of women in all aspects of life

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