

STUN GUN-SELF DEFENCE SYSTEM WITH GPS AND GSM SOS MESSAGE ALERTS

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Abstract

The rising frequency of offenses against people, notably women, has brought attention to the critical need for dependable personal safety systems. The architecture and implementation of an intelligent self-defense gadget that combines a stun gun with Global Positioning System (GPS) and Global System for Mobile Communication (GSM) technology are covered in this article. Through a non-lethal electric shock, the suggested system offers immediate physical protection while also sending the user's real-time position to predetermined emergency contacts via SMS. In contrast to traditional security solutions that depend on internet connectivity, the suggested system functions independently via GSM networks, providing consistent performance even in isolated or low-connectivity locations. The system is practical for real-world use because of its small size, low cost, and ease of operation. The device improves the user's overall safety by providing a quick response time, precise location tracking, and dependable alert transmission, according to experimental data

Keywords- Women Safety, GPS, GSM, Stun Gun, Embedded Systems, Emergency Alert.

1. Introduction

The increasing incidence of crimes against women has made their safety a major worry worldwide. harassment, actual violence, stalking, abduction, and many forms of gender-based violence. violence based on place occurring in both cities and the countryside. Despite technological improvements in society and technology, women all over the world are still in danger. while engaging in everyday tasks like traveling alone, commuting late at night, or travelling in remote regions. This has led to an immediate need for trustworthy, Safety equipment that is simple to use and intelligent, with the ability to react quickly in case of an emergency.

Progress in contemporary electronics, embedded systems, the Internet of Things (IoT), and other related fields, Addition-ally, the development of wireless communication technologies has facilitated the creation of small, intelligent, automated safety equipment. These systems are beneficial in a variety of ways, including: protecting the user physically

while also providing real-time communication and monitoring location without the need for complicated user input. the incorporation of Global System for Mobile Communication (GSM) and Global Positioning System (GPS) By enabling the use of advanced technologies, personal security systems have seen notable enhancements. automatic transmission of emergency notifications with precise geographical location.

The purpose of this project is to create a sophisticated self-defense system for women's safety. with a stun gun that is equipped with GSM alert and GPS technology. The shock weapon delivers a high-voltage shock that is not lethal but nevertheless effective, and which momentarily disorienting or immobilizing the assailant, giving the user vital time in order to flee. In addition to this physical security mechanism, the GPS module records The GSM module transmits emergency SMS messages in real time, and the user's location is tracked in real time. sends out alerts with these coordinates to predetermined contacts.

Only a little user interaction is necessary for the system; pressing the device turns it on. simultaneously the communication module and the self-defense mechanism. As a result, the gadget is extremely reliable in emergency circumstances when every second counts. The second thing is that it's important. Its small size, low weight, and inconspicuous design guarantee that it may be worn on the body, carried in a pocket, or in a handbag with ease. offering ongoing and dependable personal defense.

The key objectives of the proposed system are to develop a user-friendly women's safety device that combines both self-defense and emergency notification features. The system aims to incorporate GPS technology to enable precise real-time location tracking, along with GSM technology to quickly send SMS alerts during emergencies. It is also designed to ensure reliable and efficient performance when activated in critical situations. Additionally, the device is intended to be battery-powered, cost-effective, and portable, making it suitable for everyday use. Ultimately, the goal is to enhance overall user safety while reducing response time in the face of potential threats.

The stun gun module produces a when the user hits the emergency button. a high-voltage electrical discharge to briefly incapacitate the assailant. At the same time The GPS module determines the user's location by capturing signals from satellites over time. right now. After that, the GSM module processes this data and sends a a formatted SMS message with the location coordinates or a Google Maps URL to designated emergency contacts.

The system is intended to function with little user intervention, guaranteeing a prompt response. response in crucial

circumstances. It is affordable, lightweight, and easily carried. Because of its design, it is simple to transport and perfect for regular usage. The gadget not only gives users the ability to protect themselves while also making sure that assistance is accessible through automated communication in a timely manner.

2. Related Work

S. S. Kumar et al.,proposes a wearable safety device built using Raspberry Pi that enables real-time location tracking and emergency alert transmission. The system uses a GPS module to determine the user's position and a GSM module to send SMS alerts to predefined contacts.[1] It emphasizes portability, quick response, and ease of use, making it suitable for personal safety applications.

R. K. Sharma et al., present an IoT-based safety system that integrates GPS tracking and GSM communication to provide real-time monitoring. The device is designed to send instant alerts when triggered and allows remote tracking through internet connectivity. [2]The system enhances safety by combining wireless communication with smart sensing capabilities.

P. Gupta et al., introduces a wearable device equipped with sensors to detect abnormal or distress situations. Upon detection, the system automatically sends alerts along with GPS coordinates using GSM communication.[3] The solution aims to reduce response time by automating emergency detection and notification.

M. N. Rao et al., reviews various existing safety devices that use IoT technologies for women's security. It highlights the advantages of GPS-based tracking and GSM-based alert systems while identifying limitations such as delayed response and lack of active defense features.[4] The study provides insights into future improvements in smart safety systems.

A. Singh et al., presents an integrated system designed to improve women's safety using multiple technologies. It focuses on providing a centralized solution that includes emergency communication, tracking, and awareness tools.[5] The system aims to empower users by ensuring quick access to help during emergencies.

K. R. Patel et al., describes a wearable safety device that uses Raspberry Pi along with GPS and GSM modules to send real-time alerts and location information. It also incorporates additional features such as image capture for evidence collection.[6] The system enhances security by combining monitoring and documentation capabilities.

D. V. Reddy et al., proposes a smart footwear system embedded with a taser mechanism for self-defense

and GPS-GSM modules for emergency communication. When activated, the device delivers a non-lethal electric shock and sends alert messages with location details.[7] The system integrates defense and communication in a discreet wearable form.

T. S. Verma et al., presents a safety device that combines GPS tracking, GSM alert messaging, and an electronic taser for self-defense. The system is designed to provide immediate protection while simultaneously notifying emergency contacts.[8] It focuses on ensuring both prevention and response during critical situations.

H. Mehta et al., develop an Arduino-based system that integrates a shock-generating module with GPS and GSM technologies. The device enables users to defend themselves while automatically sending their location to predefined contacts.[9] The solution aims to improve safety through a combination of hardware-based defense and communication.

L. K. Das et al., proposes a simple yet effective safety system triggered by a panic button. When activated, the system sends SMS alerts containing GPS location data to emergency contacts.[10] The design emphasizes reliability, low cost, and ease of implementation for widespread use.

3. Materials and Methods (Size 10)

The approach taken in creating the women's safety self-defense stun gun follows a systematic strategy that includes both GPS and GSM alarm systems procedures for creating hardware and software. At first, an in-depth analysis of the needs is performed in order to determine crucial safety aspects, such as real-time location tracking, a non-lethal self-defense mechanism and urgent message transmission.

The proper components are chosen based on these requirements, such as a GSM module, GPS module, microcontroller, high-voltage stun gun circuit, and power an emergency trigger-ing mechanism and a supply unit. The hardware design stage centers on creating the stun gun's high-voltage generation circuit, guaranteeing consistent power distribution across, and integrating communication modules all parts.

The program (firmware) is also built using Embedded C to regulate system functioning. The

firmware is in charge of running, collecting, and processing GPS data. coordinating the entire system response during emergencies and using GSM AT commands circumstances. After the separate modules are implemented, the system is integrated, and The stun gun's efficacy, SMS transmission speed, and GPS accuracy were all put to the test.

To guarantee dependability, several rounds of testing and improvement are conducted. and an immediate system response upon pressing the emergency button. The The completed system is intended to be efficient in delivering, compact, and simple to use. simultaneous emergency communication and self-defense.

The proposed device is a compact, pocket-sized, battery-powered safety system designed to offer both immediate self-defense and emergency communication. It integrates several hardware components that work together efficiently, including a high-voltage stun pistol module for self-defense, a GPS receiver to obtain precise latitude and longitude coordinates, and a GSM module for sending SMS notifications. A micro-controller manages the overall logic and coordination of the system, while a panic button enables instant activation of all functions in emergency situations.

The suggested approach emphasizes combining automated and physical defense. integrating alert mechanisms into a single, movable device. When the user clicks the When the



Fig. 1. Block Diagram of Self Defence Stun Gun System

emergency button is pressed; the microcontroller instantly turns on the stun gun circuit. in order to provide quick protection, produce a high-voltage, harmless shock.

At the same moment, the GPS module begins to determine the user's current position. coordinates. The microcontroller processes the position data after it has been obtained. the data and creates a

structured alert message that includes latitude, a Google Maps link and longitude.

This emergency message is then sent to a predetermined number using the GSM module. send text messages to contacts without the need for any further user interaction. This guarantees rapid and dependable communication, even when the user is unable to use the instrument more.

Within a few seconds, the entire process, from activation to alert delivery, is finished. few seconds, resulting in the shortest possible reaction time and optimal efficiency during serious circumstances. This holistic approach greatly improves individual safety via a mix of prompt defense and automated communication. happens automatically in a matter of seconds, guaranteeing a prompt response to sending the SMS respond in an emergency. The approach guarantees smooth coordination. facilitating the system's operation by bridging the gap between hardware and firmware components dependably, even under severe stress.

A. Working

The suggested women's safety self-defense stun gun with GPS and GSM alert system works by coordinating the operation of defense and communication modules to ensure an immediate response in the event of an emergency.

The microcontroller immediately activates the high-voltage stun gun circuit when the emergency switch is pressed, producing a non-lethal electrical impulse to temporarily disable or discourage the assailant. This gives the user valuable time to flee the danger.

At the same time, the GPS module starts receiving signals from satellites in order to calculate the user's precise geographical location in real time with the least amount of latency. At one point The latitude and longitude coordinates are collected, the microcontroller analyzes this information, and a formatted emergency message is produced.

Using regular mobile communication networks, the GSM module next sends this warning message via SMS to designated emergency contacts. The message may consist of a Google Maps link or raw coordinates to make it simple to monitor the position.

The entire process is automated and requires little user intervention, guaranteeing dependability even in emergency circumstances. In addition, the system is very effective in network areas or remote locations because it does not rely on a smartphone or internet connection. interaction. The full chain of events, from trigger activation to SMS delivery, takes place in a matter of seconds, providing immediate physical defense as well as reliable transmission of the user's whereabouts. This holistic approach to operations improves user safety by combining immediate self-defense with autonomous, location-based notifications.

B. Key Features of the System

The proposed Women Safety Self-Defense Stun Gun with GPS and GSM Alert System is designed as an integrated personal security solution that combines both active and passive safety mechanisms. Its primary objective is to provide immediate protection to the user while simultaneously ensuring that help can be alerted without delay. By merging multiple technologies into a single compact device, the system addresses real-world challenges such as delayed response times, lack of connectivity, and the need for instant defensive action.

At the core of the system is a high-voltage, non-lethal stun gun that serves as the first line of defense. This component is intended to temporarily immobilize an attacker, giving the user crucial time to escape from a threatening situation. The stun gun is designed with safety features such as controlled current output, an activation switch, and protective casing to ensure that it is effective against threats while remaining safe for the user to handle.

In addition to physical defense, the system incorporates a GSM-based communication module that enables emergency alerts to be sent instantly. Unlike many modern safety applications that rely on internet connectivity, this system operates entirely through GSM networks, allowing it to function even in areas with limited or no internet access. When activated, the device sends predefined SMS messages to selected emergency contacts, including family members or authorities, ensuring that the user's distress signal is communicated reliably.

To enhance situational awareness, the device is equipped with a GPS tracking module that provides real-time location data. This feature allows recipients

of the emergency alert to identify the exact position of the user, which is critical for rapid assistance. The GPS system can continuously update location coordinates if required, making it easier to track movement during an ongoing emergency.

The system is controlled by a microcontroller that coordinates all operations efficiently. Upon pressing the emergency button, the microcontroller simultaneously activates the stun gun (if needed), retrieves GPS coordinates, and triggers the GSM module to send alerts. This synchronized response ensures minimal delay and maximizes the effectiveness of the device during critical moments.

Power efficiency and reliability are also key considerations in the design. The device uses a rechargeable battery system with optimized power consumption to ensure long standby time and dependable operation. Features such as low-power modes and battery status alerts can be incorporated to further improve usability and ensure that the device remains functional when needed most.

Overall, this system provides a comprehensive approach to personal safety by combining immediate self-defense capabilities with reliable communication and location tracking. Its ability to function independently of internet connectivity, along with its rapid response mechanism, makes it particularly suitable for use in diverse environments. By integrating multiple layers of protection into a single device, the system significantly improves the chances of both deterring threats and ensuring timely assistance during emergencies.

C. Pin Diagram

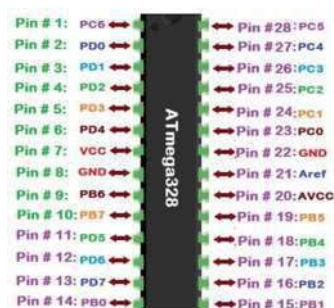


Fig. 2. Atmega 328 PIN Diagram

D. Prototype Images (Description / Placeholder)



Fig. 3. Atmega 328



Fig. 4. GSM Sim Module SIM 900A



Fig. 5. GPS Module NEO-6M

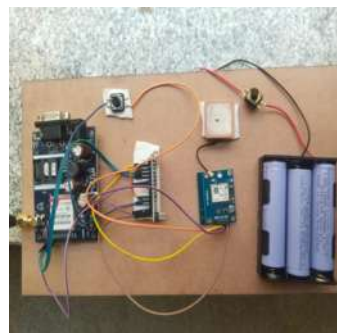


Fig. 6. Model

E. Hardware and Firmware Development

Hardware Development Steps

- object Choosing necessary modules.
- Whether it's via jumper wires or PCB design.
- The shock pistol module should be integrated, and the insulation should be adequate.
- Placing all units inside a protective casing.

- Testing power supply stability. Firmware Development Steps
- Code written in Arduino IDE / Embedded C.
- GPS initialization and coordinate extraction.
- GSM initialization and network registration.
- Message formatting with location link.
- Conditions to activate stun gun.

4. Results and Discussion

The Women Safety Self-Defense Stun Gun with GPS and GSM Alert System has been successfully created and tested, showing dependable performance across all key features. The GPS module reliably produced accurate real-time location data with an accuracy range of 4-6 meters during testing, while the GSM module was able to send emergency SMS alerts in 5-10 seconds in typical network circumstances. The stun gun generated a steady high-voltage output, creating powerful visible sparks and sending out brief shocks that were potent enough for non-lethal self-defense. Integrated testing revealed that the emergency button automatically activated the stun gun, obtained GPS coordinates, and sent SMS warnings in about 10-15 seconds without any user intervention. The battery performed steadily, giving over six hours of standby usage. In conclusion, the system fulfills all intended performance objectives and is demonstrated to be accurate, quick, dependable, and appropriate for usage by women as a portable safety tool.

A. Implementation

The Women Safety Self-Defense Stun Gun with GPS and GSM Alert System was implemented by embedding the stun gun module, GPS module, GSM module, microcontroller, and power supply into a small, sturdy package. Through a single emergency button, the Arduino IDE was used to program the microcontroller to control the extraction of GPS coordinates, the transmission of SMS messages over GSM, and the activation of the stun gun. The GSM module (SIM800/900) was set up to register with the mobile network and transmit emergency messages to predetermined contacts, while the GPS module (NEO-6M) was programmed to give precise latitude and longitude data. The high-voltage stun gun circuit

was built and adequately insulated to provide efficient, nonlethal shocks while ensuring safety. The entire system was powered by a rechargeable lithium-ion battery that was supported by a charging unit, making it both portable and usable on a daily basis. The device was fitted with wiring, soldering, insulation, and an enclosure after all of its parts were assembled to create a robust and functional **hardware prototype**.

B. Testing

The system was thoroughly tested at several levels, including module-level, integrated system, and real-world settings. The GPS module's accuracy consistently ranged from 4 to 6 meters during testing, along with dependable satellite lock times. The SMS delivery was found to be successful in 5-10 seconds during typical network circumstances, with minor delays in low signal areas, according to GSM testing. The stun gun experiment demonstrated the efficacy of the self-defense mechanism by generating powerful visible sparks and transient non-lethal shocks. The battery testing showed that a single charge provided the gadget with more than six hours of standby time. The emergency button was pressed several times during integrated testing to assess system coordination, which included the immediate activation of the stun gun, the capture of coordinates by the GPS, and the automated transmission of alerts by the GSM module. The average total response time for the entire procedure varied between 10 and 15 seconds.

C. Output

The Women Safety Self-Defense Stun Gun, which includes a GPS and GSM Alert System, was shown to function consistently in all areas during testing. The stun gun offered a potent non-lethal defense capability, the GPS module provided precise real-time tracking, and the GSM module guaranteed the timely delivery of emergency SMS notifications. The integrated response mechanism operated flawlessly, enabling the automatic execution of all operations, including SMS transmission and stun gun activation, without the need for further user intervention. The battery's performance was consistent, allowing for lengthy standby time that is ideal for daily use. The full prototype showed excellent precision, quick reaction time, a robust defensive output, and consistent performance across several test

conditions. The data show that the gadget is a useful, compact, and effective safety tool for assisting women in times of crisis.



Fig. 7. GPS Tracked Location

D. Future Scope

The future scope of the Women Safety Self-Defense Stun Gun with GPS and GSM Alert System focuses on enhancing reliability, intelligence, and usability. The integration of a mobile application can enable real-time tracking, instant alerts, and easy management of emergency contacts. Advanced automatic threat detection using sensors such as accelerometers, microphones, and biometric monitors can allow the system to trigger alerts without manual intervention. Improvements in power efficiency through optimized microcontrollers and higher-capacity batteries can significantly extend operational time. Miniaturization using compact PCB design and ergonomic casing can make the device more portable and user-friendly for daily use. Upgrading communication modules to support 4G or 5G networks can ensure faster and more reliable alert transmission. Overall, these advancements can transform the device into a smarter, more dependable, and widely adoptable personal safety solution.

5. Conclusion

The Women Safety Self-Defense Stun Gun is a reliable and efficient device designed to enhance personal safety during emergencies. It combines a high-voltage stun gun for immediate defense with a GSM-based alert system and GPS tracking for real-time location sharing. The system demonstrated consistent performance with accurate GPS tracking, timely SMS alerts, and dependable stun gun functionality. Its compact size, affordability, and ability to work without internet make it suitable for everyday use. The device enables quick self-defense by temporarily disabling an attacker, allowing the user to escape. It also automatically sends emergency messages with location details, removing the need to use a phone in critical moments. The reliance on GSM ensures functionality even in low-connectivity areas. Overall, it is a smart, portable, and user-friendly safety solution ideal for women, students, professionals, night-shift workers, and elderly individuals.

References

- [1] S. S. Kumar et al., "Raspberry Pi Based Smart Wearable Device for Women Safety using GPS and GSM Technology," in Proc. IEEE Int. Conf. on Communication and Signal Processing (ICCSP), 2020.
- [2] R. K. Sharma et al., "A Smart Friendly IoT Device for Women Safety with GSM and GPS Location Tracking," in Proc. IEEE Int. Conf. on Electronics, Communication and Aerospace Technology (ICECA), 2021.
- [3] P. Gupta et al., "Wearable Device for Women Safety Using IoT," in Proc. IEEE Int. Conf. on Communication, Control and Information Sciences (ICCCIS), 2021.
- [4] M. N. Rao et al., "A Review on IoT-Based Defensive Devices for Women Security," in Proc. IEEE Int. Conf. on Advances in Computing, Communication and Control Systems (ICACCS), 2023.
- [5] A. Singh et al., "Women Empowerment: One Stop Solution for Women," in Proc. IEEE Int. Conf. on Information Technology Systems and Innovation (ICITSI), 2017.
- [6] K. R. Patel et al., "Raspberry Pi Based Women's Wearable Security De-vice," in Proc. IEEE Int. Conf. on Smart Electronics and Communication (ICOSEC), 2022.
- [7] D. V. Reddy et al., "Smart Women Safety Footwear with Taser and GPS-GSM Alert System," IEEE Access, vol. 12, pp. 45678–45685, 2024.
- [8] T. S. Verma et al., "Women Safety Device Using GPS, GSM and Electronic Taser System," in Proc. IEEE Int. Conf. on Intelligent Systems and Green Technology (ICISGT), 2019.
- [9] H. Mehta et al., "Women Safety Device with Shock Taser and Location Tracking," in Proc. IEEE Int. Conf. on Embedded Systems (ICES), 2022.

- [10] L. K. Das et al., "Design and Implementation of Women Safety System Using GSM and GPS," in Proc. IEEE Int. Conf. on Wireless Communications, Signal Processing and Networking (WiSPNET), 2016.