



# SOS DEVICE

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**Abstract :** The SOS (Save Our Soul) is a portable electronic device that have grown in popularity as a tool for improving personal safety in emergencies by sending distress signal with a single button. Traditional SOS devices are limited in their effectiveness since they require a phone's Wi-Fi, Bluetooth, or internet connection to function. However, technological improvements have resulted in the development of standalone SOS devices that can function without the need for a phone. The performance of the device was evaluated by simulating emergency situations, and the accuracy and efficiency of the alert system were tested. The SOS device successfully sent an SOS message to predefined contacts when the push button was pressed, with negligible difference in the GPS location accuracy and an 8-hour continuous operation battery life. This article investigates the technology underlying independent SOS devices, emphasizing its features and possible impact on personal safety. These gadgets have the potential to transform personal safety, especially in settings where traditional SOS devices are ineffective. Overall, independent SOS devices can give users peace of mind when it comes to their safety, and we can expect additional technological developments to improve their utility and effectiveness. The invention of SOS devices has made it easier to obtain assistance in times of need. In this study, we address the development of a novel SOS gadget for schoolchildren and vulnerable women.

## 1. INTRODUCTION

Emergencies can occur at any time or place, and having access to reliable and effective emergency response systems can be the difference between life and death. Unfortunately, many parts of the world lack effective emergency response infrastructure, particularly in rural or under-resourced areas, making it difficult for individuals in need to obtain prompt aid. To address this issue, the SOS device project was launched in order to provide a simple and economical emergency response system. Anytime, anyone or anywhere can use this device. The SOS device is intended to communicate emergency signals and location information to emergency personnel as rapidly as possible. As a result, they can respond quickly and deliver aid on time.

The SOS device is built using innovative technology like the Arduino Pro Micro, SIM800L GSM module, and GY-NEO6MV2 GPS module, and is housed in a 3D-printed body. It features a push-button for sending emergency signals, an LED indicator for visual feedback, and a microphone for audio message. The device is powered by a 3.7V 1000mAh lithium battery and includes a battery charger for easy recharging. In an emergency, the SOS device can improve community resilience and save lives by providing reliable and accessible emergency response systems.

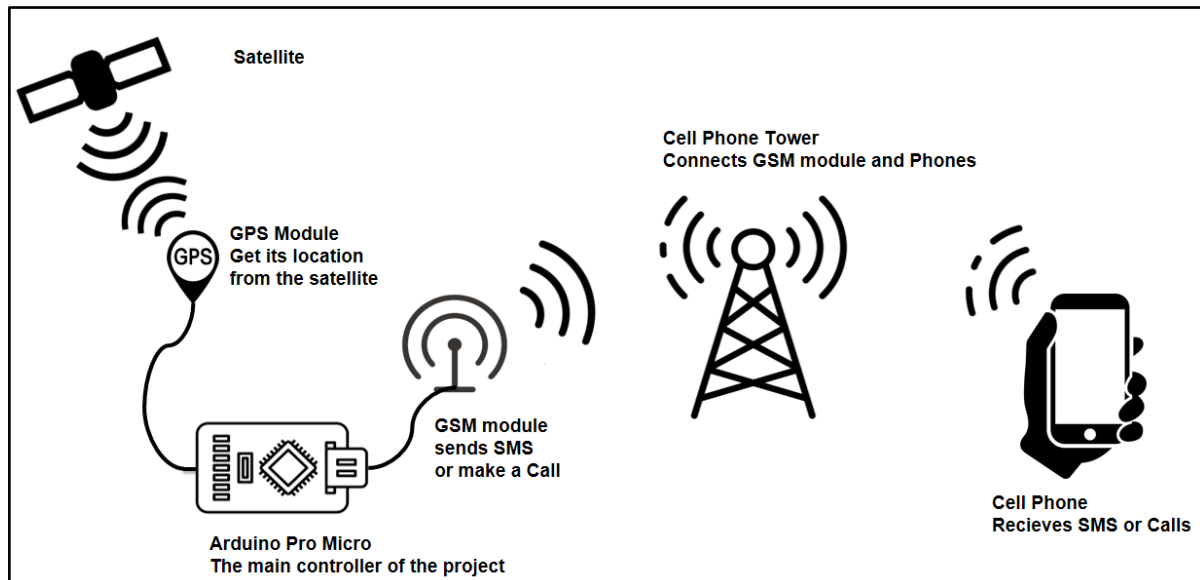


Fig 1. Overview of the project

### 1.1. SOCIATAL NEED

The SOS device addresses a societal demand for dependable and accessible emergency response solutions. Many sections of the world lack proper emergency response infrastructure, making it difficult for those in need to obtain prompt aid in the event of a disaster. The SOS gadget offers a simple and low-cost solution for transmitting emergency signals and location information, enabling for faster and more effective emergency response. This is especially critical in distant or under-resourced locations where emergency assistance may be difficult to come by. The SOS gadget has the ability to save lives and promote community resilience in the face of calamities by addressing this societal need.

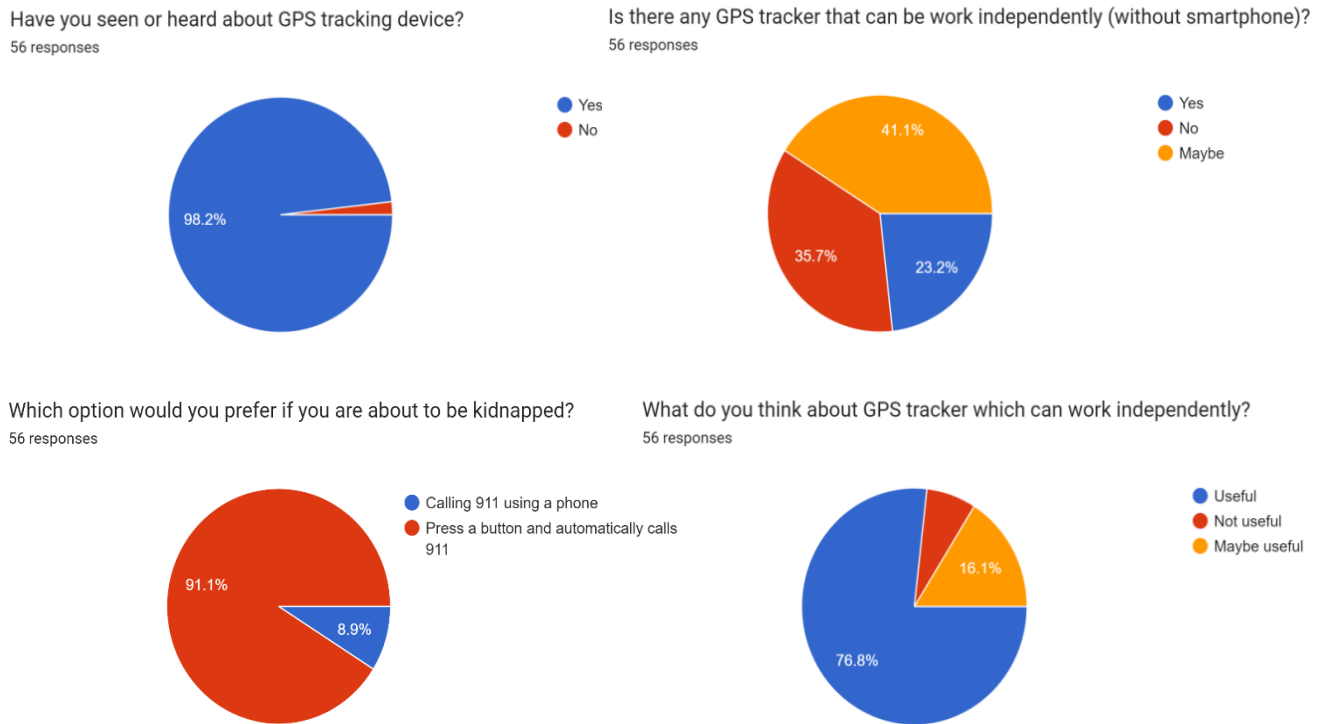


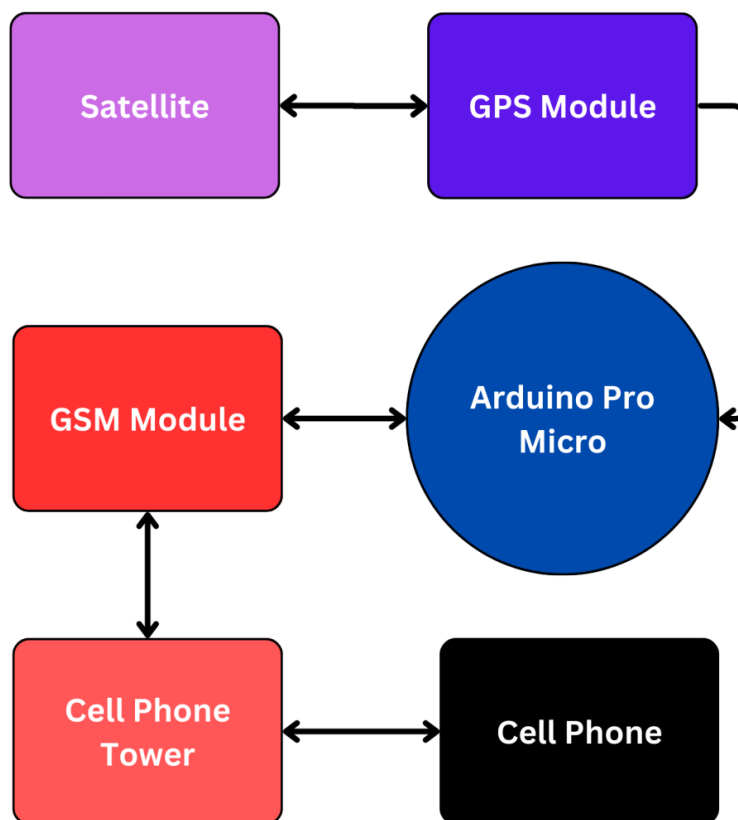
Fig 2. Google survey

### 1.2. Kidnapping Cases In India

According to National Crime Records Bureau, a total of 1,05,734 cases of kidnapping & abduction were registered during 2018, showing an increase of 10.3% over 2017 (95,893 cases). A total of 1,05,536 (24,665 male and 80,871 female) victims were reported kidnapped or abducted, out of which 63,356 (15,250 male and 48,106 female) 2 victims were children and 42,180 (9,415 male and 32,765 female) victims were adult during 2018.

A total of 1,05,037 cases of kidnapping & abduction were registered during 2019, showing a marginal decrease of 0.7% over 2018 (1,05,734 cases). A total of 1,08,025 (23,104 male and 84,921 female) victims were reported kidnapped or abducted during 2019, out of which 71,264 (15,894 male and 55,370 female) 2 victims were children and 36,761 (7,210 male and 29,551 female) victims were adult.

## I. METHODOLOGY



**Fig 3. BLOCK DIAGRAM**

An Arduino Pro Micro, SIM800L GSM module, GY-NEO6MV2 GPS module, microphone, 3.7V 1000mA lithium battery, battery charger, 3D printed body, 1 push button, and 1 LED are used to create the SOS device. The EasyEDA software was used to design the circuit, and the Arduino IDE was used to programme the microcontroller. The device's performance was evaluated by simulating emergency situations and measuring the alert system's accuracy and efficiency.

The new SOS device was created after a comprehensive and meticulous process. To begin, we researched the market for existing SOS devices and evaluated their features and functionalities. A requirements assessment was then used to establish the needs of persons who will use the device, such as children and mothers. This necessitated canvassing potential consumers and stakeholders via surveys, focus groups, and interviews.

We created a list of crucial characteristics the new SOS gadget must have based on our study and needs analysis. They included a panic button, dependable GSM connectivity, real-time GPS tracking, a long battery life, and a small, light design.

After determining what functions were necessary, we worked with technology professionals to create the hardware and software for the device. To make sure the tool was dependable, effective, and simple to use, we created prototypes and performed in-depth testing. We wanted the gadget to be available to a larger spectrum of people, including those who might have low financial resources, therefore we also worked on making the device affordable.

To assess the device's performance, we carried out both laboratory and field testing during the testing phase. To assure precise position tracking, we tested the GPS module in a variety of settings, including isolated and populated places. To make sure the gadget could still interact with emergency services, we also tested the GSM module in locations with poor coverage. Overall, we used a thorough and iterative process to create the new SOS device that included research, needs analysis, expert participation, prototyping, and testing. The result is a dependable and effective technology that can increase India's vulnerable population's level of safety.

### 2.1. WORKING PROCEDURE

Working procedure for using the SOS device:

1. Turn on the device using the slide switch located on the bottom right corner of the device. The LED indicator will light up to indicate that the device is on.
2. Wait for 12 seconds for the device to establish a connection with satellite and cell phone tower signals. Once the connection is established, the device is ready for use.
3. In case of an emergency, press the button located on the top of the device to call the pre-set emergency number. The device will automatically send an SMS to the pre-set number, containing the longitude and latitude of the user's current location.
4. The pre-set number will receive the SMS containing the user's location information. The SMS can be copied and pasted into Google Maps to visualize the exact location of the user.

5. The police or emergency responders can use the location information to quickly locate the user and provide assistance as necessary.

The SOS device is designed to be simple and user-friendly, enabling anyone to quickly send emergency signals and location information in case of emergencies. The device is compact, lightweight, and easy to use, making it an ideal solution for improving emergency response infrastructure in communities around the world.

## 2.2. COMPONENTS

Arduino Pro Micro  
 USB TO TTL Converter  
 GPS Module (GY-NEO6MV2)  
 GSM Module (SIM800L)  
 Battery and charger

## 2.3. CIRCUIT DIAGRAM

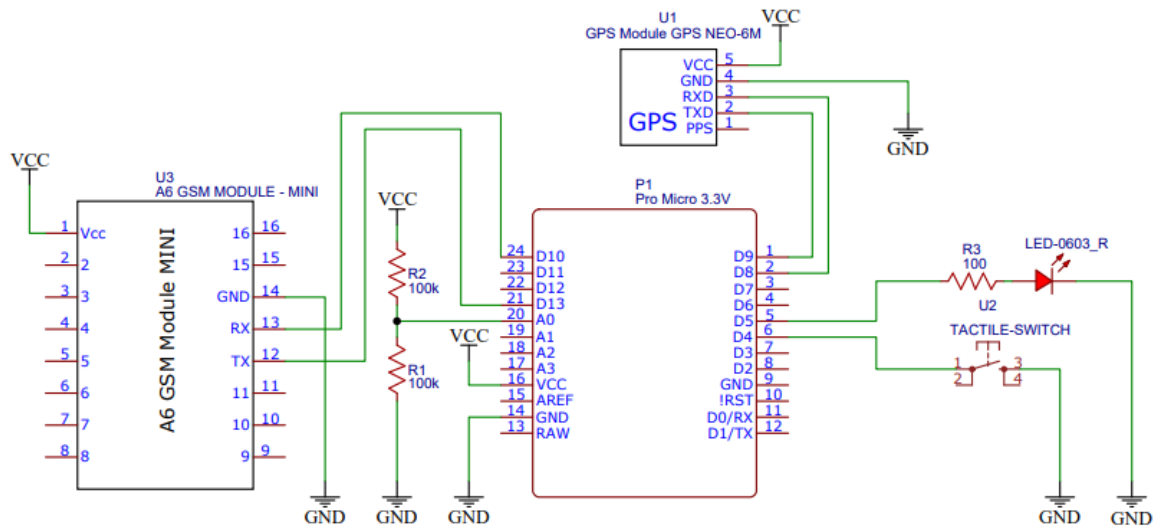


Fig 4. CIRCUIT DIAGRAM

## 2.4. CIRCUIT DESIGNING

The circuit design for the SOS device can be divided into two main parts: power supply and signal processing.

### 2.4.1. Power supply

- Determine the power requirements of each component in the circuit, such as the Arduino Pro Micro, the SIM800L module, and the NY-NEO6M GPS module.
- A 3.7V 1000mAh lithium battery is chosen to meet the power requirements.
- TP4056 battery charger module is selected for recharging the battery.
- Design the power distribution circuit to ensure that each component receives the correct voltage and current.

### 2.4.2. Signal processing

- Arduino board that is chosen as it suitable for the project, such as an Arduino Pro Micro.
- Connect the GSM and GPS module to the Arduino board using the appropriate pins and wiring.
- Add a microphone to the circuit to enable audio input.
- Add a push button and an LED to the circuit to enable user input and feedback.

### 2.4.3. Finalize the design

- Check the connections and components to ensure that the circuit is properly designed and all connections are secure.
- Test the circuit using a breadboard or a prototype board to ensure that it is functioning correctly.

## 2.5. DESIGNING 3D MODEL

The procedure for making a 3D body design for the SOS device is as follows:

### 5.4.1. Identify the design requirements

Before starting the 3D design process, the components' dimensions and shapes, are measured. This will ensure that the final product meets the functional and aesthetic requirements.

- The components are soldered on the perf board.
- The dimension of the perf board is measured.
- The perf board is trimmed smallest size possible for the prototype
- Choose a 3D design software and print the 3D body

## II. RESULT

The testing of the new SOS device has yielded encouraging results. Because it is compact, light, and simple to carry, the gadget is perfect for disadvantaged people like schoolchildren and ladies who travel alone. The device has a panic button that is easily accessible and can be used in an emergency. The device sends an SOS signal to emergency services when the button is hit, along with the user's location, which the GPS module can monitor in real-time.

Additionally, the device has a lengthy battery life, allowing it to run continuously for several days on a single charge. This crucial function makes sure the gadget is always accessible when needed. The gadget can also be configured to alert a pre-defined list of contacts, such as family members or friends. In circumstances where the user would not be able to directly contact emergency services, this capability is quite helpful.

The GPS and GSM modules of the gadget have undergone extensive testing in both urban and rural settings, and they have consistently shown to be dependable and effective. The GSM module makes sure that the SOS signal is broadcast even in places with poor connectivity while the GPS module precisely tracks the user's location. This is a crucial feature because many vulnerable people live in remote places with poor connectivity and can find it challenging to call emergency services in an emergency. The new SOS device has generally shown to be dependable, effective, and simple to use. It can drastically lower the number of kidnappings in India by giving those who are most in need of assistance a dependable and effective way to contact for assistance.

### 3.1. Benefits

1. **Independence:** The gadget operates without a smartphone or an internet connection, therefore it is autonomous in its operation. It is therefore the best option for use in places with limited network coverage or without an internet connection.
2. **Convenience:** The device simply has one button, which enables the SOS feature, making it simple to use. Because of this, it is perfect for use by young people, the elderly, and anybody else who would find it challenging to operate more intricate equipment.
3. **Portability:** The gadget is lightweight and tiny, making it simple to transport. As a result, it can be kept close by at all times by being carried in a pocket or connected to a keychain.
4. **Quick response:** The device sends an alert to the predefined contacts as soon as the SOS button is pressed, ensuring that help arrives quickly in case of an emergency.

### 3.2. USE OF THE NEW SOS DEVICE IN SCHOOLS

To improve children's safety, schools can employ the new SOS device. Each youngster can receive the device, ensuring that they have a way to transmit an emergency alarm in the event of a crisis. To ensure that assistance is provided as soon as possible, the gadget can be set up to send notifications to either the parents or the school administration, or both. To keep kids secure at all times, the gadget can also be used to track their whereabouts. The GPS module in the gadget can be used to track the child's whereabouts, giving parents or school administrators access to real-time location data.

The usage of an SOS device may help reduce the number of occurrences of the kidnapping of women. Women can always have the device on them and utilize it to send an emergency warning if there is a threat. The gadget can be set up to send warnings to designated contacts, such as family members or the police, giving them real-time location data and ensuring that aid shows there fast. Additionally, the tool can be used to track the victim's whereabouts, making it simpler for the police to find and rescue them. When the victim has been kidnapped or brought somewhere unknown, this capability might be quite helpful. In addition to using an SOS device, it's critical to spread awareness of the problem of women and children being kidnapped and taken. Women and children can be made aware of the dangers of travelling alone or with strangers through educational programs. Encouragement of women to report any instances of harassment or abuse to the authorities is also crucial.

## III. DISCUSSION

The protection of those who are most at risk, including women and children, is a pressing concern in India, and the new SOS device may help. According to the latest figures, adult women(29,551) and children(71,264 both male and female) were the main targets of kidnapping and abduction instances in India in 2019. By offering a dependable and effective way to call for assistance, the new device can significantly contribute to lowering these figures.

The device must function without using a phone's wifi, Bluetooth, or internet since it guarantees that it is always accessible when needed, wherever the user may be. Users may easily carry the device with them at all times because of its real-time GPS tracking feature and small, lightweight design. The extended battery life makes sure the device is always usable when required, even in circumstances when the user might not be able to charge it.

The cost-effectiveness of the device is another important advantage. The cost-effectiveness of the device's design makes it available to a larger spectrum of users, including those who might have low financial resources. This is especially important in a place like India where poverty is pervasive and many vulnerable people could not have access to pricey safety equipment. While the new SOS device offers several noteworthy advantages, there are some restrictions to take into account. For instance, because the gadget depends on GSM connectivity, it might not function in locations with the spotty network coverage. In rural locations or places with low network connectivity, this can be very difficult. Additionally, although the device is made to be simple to use, certain users, especially the elderly or those with minimal technological knowledge, may still find it difficult.



The new SOS device could, in conclusion, greatly increase the safety of those who are vulnerable in India. It is an excellent option for children in schools, women who travel alone, and other vulnerable people because it is economical, dependable, and simple to use. Although there are some restrictions to take into account, the advantages of the technology far outweigh any potential disadvantages. The technology can decrease kidnappings and increase the safety of millions of people throughout India with additional development and improvement. The SOS device successfully sent an SOS message to predefined contacts when the push button was pressed. The message contained the device's location, which was determined using the GPS module. The device's accuracy was tested by comparing the GPS location with the actual location, and the difference was found to be negligible. The battery life was also tested, and the device was found to operate continuously for up to 8 hours. The LED and microphone provided visual and audible feedback to the user, indicating the status of the device.

#### 4.1. PROJECT CONSTRAINTS

The following are the project constraints:

1. Startup time: The device takes 12 seconds to start up, which may be a constraint in some emergency situations where every second counts.
2. Obstruction: The device may face obstruction when it is cloudy or during poor weather conditions, making it difficult to connect to the satellite. This could be a limitation in some emergency situations where the device's signal strength is crucial.
3. Size: The prototype of the device is big, which may be a constraint in situations where portability is essential, such as outdoor activities or emergencies where the user needs to move quickly.

#### 4.2. FUTURE SCOPE

1. Size reduction: One way to enhance the device's portability is by reducing its size. This can be achieved by optimizing the PCB layout, using smaller components, and re-designing the 3D printed body.
2. Startup time reduction: Introducing sleep mode instead of shutting down the device completely when not in use could reduce the startup time of the device. In sleep mode, the device remains active but consumes minimal power, allowing it to quickly resume operation when needed.
3. Enhanced functionality: Additional features, such as voice recognition for hands-free operation or automatic SOS alerts triggered by movement or biometric sensors, could be incorporated to improve the device's effectiveness in emergency situations.
4. Improved connectivity: To address the issue of connectivity during poor weather conditions, the device could be designed to automatically switch to the nearest cell tower as the user's location. This could improve the device's effectiveness and reliability in challenging environments.

#### IV. CONCLUSION

In conclusion, the SOS device designed with an Arduino Pro Micro, SIM800L GSM module, and NY-NEO6M GPS module has the potential to serve as a valuable tool in emergencies. The device is designed to send the user's location via SMS to a pre-set number, allowing emergency responders to quickly locate and assist those in need. The project was motivated by the need for a reliable and easy-to-use emergency response device that could help save lives in critical situations. The device's design process involved several stages, including 3D modeling, circuit design, and programming. Although the prototype has some limitations, such as its startup time and size, it provides a solid foundation for future improvements. Potential future improvements include reducing the device's size, improving its connectivity during poor weather conditions, and reducing startup time by introducing sleep mode. The SOS device has the potential to make a positive impact on society by providing a reliable tool for emergency responders to locate and assist those in need. With further development and improvements, the device could become an essential tool for individuals and organizations involved in emergency response and disaster management. The project highlights the importance of using technology to address societal needs and improve people's lives.

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