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Smart Personal Safety Band for Children Using GPS–GSM Technology and SOS Alert System

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ABSTRACT

Personal safety has become a major concern for school-going children in light of the heightened rates of missing children, travel dangers, and communication barriers in case of emergencies. This paper has designed and developed a Smart Personal Safety Band, a wearable, independent personal safety device utilizing GPS-GSM that offers real-time emergency alerts. The proposed system is implemented with Arduino Nano, NEO-6M GPS module, SIM800L GSM module, and an SOS button, which instantly sends the location of the child to predefined contacts through SMS. This has been implemented on a compact, low-cost, user-friendly device that does not require a smartphone or internet. Testing shows accurate GPS tracking, robust GSM communication, and quick response times for sending alerts. The system is thus suitable for the safety of school children and other vulnerable groups. The future work will include IoT incorporation, geofencing, fall detection, and mobile app support.

Keywords: Child Safety, GPS Tracking, GSM Alert System, Arduino Nano, Wearable Device, SOS Button, SIM800L, Real-Time Location.

1. INTRODUCTION

One major concern faced all over the world is ensuring the safety of children during school travel and outdoors. The situation of getting lost, panicking, or being unable to contact parents in emergencies is very common among kids. Although one of the most common devices for communication is a smartphone, it is not practical for small kids due to limitations like battery, complexity, and inability to operate it under stress. Wearable electronics are quite practical since they would always stay attached to the child and require minimal interaction by the user. This paper proposes a Smart Personal Safety Band, which is a standalone device enabling children to send an emergency alert with one button press. The system incorporates GPS for real-time location detection and GSM technology for instant SMS-based communication, hence making the device useful even in a non-internet environment.

The design, implementation, working mechanism, testing results, and possible applications of the wearable Personal Safety Band are discussed in this paper.

2. BODY OF PAPER

The Personal Safety Smart Band is developed with the growing concern for child safety in mind, particularly in situations where children may be threatened, lost, or unable to reach out for help to guardians. Traditional means of safety devices, like smartphones, often prove unreliable for small children due to the potential to forget to carry them, inability to use them during panic situations, or because of low batteries or impaired internet connectivity. The proposed smart band eliminates these limitations with a simple, wearable, and immediately accessible emergency alert system. With a single press on the SOS button, the device automatically captures a child's real-time GPS coordinates and sends them via SMS to pre-set contacts, providing quick, reliable assistance sans internet access.

The device is built using an Arduino Nano microcontroller integrated with a NEO-6M GPS module and a SIM800L GSM module, all powered by a lithium-ion battery regulated through an LM2596 buck converter. This combination ensures the precise tracking of position, steady SMS transmission, and low power consumption suitable for everyday use. In designing the system, great importance is attached to compactness, comfort, and reliability-the crucial qualities of a smart band intended to be worn by children in different age groups. During tests, the smart band demonstrated quick responses of GPS, stable work of GSM, and the capability to deliver messages successfully in various environments, which confirms its suitability for urban and rural regions.

The Personal Safety Smart Band has much practical importance and value due to its low cost, independence, and effectiveness in ensuring the safety of an individual. This project can be modified to suit those who are aged, trekkers, patients, or people with special needs who may need emergency service. Still, regarding the fact that this is a base model and operates when GPS and GSM networks are available and sends SOS only manually, this gadget will provide further scope for enhancement. Possible enhancements could include IoT-based tracking in real time, more sensors for automatic detection of

emergencies, water-resistant design, and integration of mobile apps. Overall, this project showcased how simple embedded systems create a potential impact on personal safety and contribute towards real emergency preparedness. communication, and quick response times for sending alerts. The system is thus suitable for the safety of school children and other vulnerable groups. The future work will include IoT incorporation, geofencing, fall detection, and mobile app support.

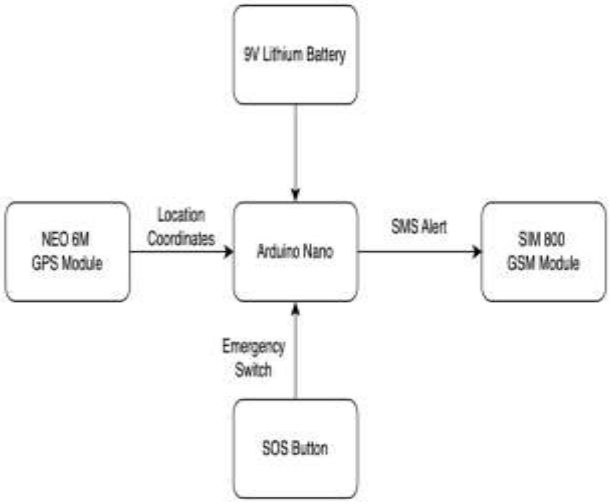

Fig: Block Diagram of Personal Safety

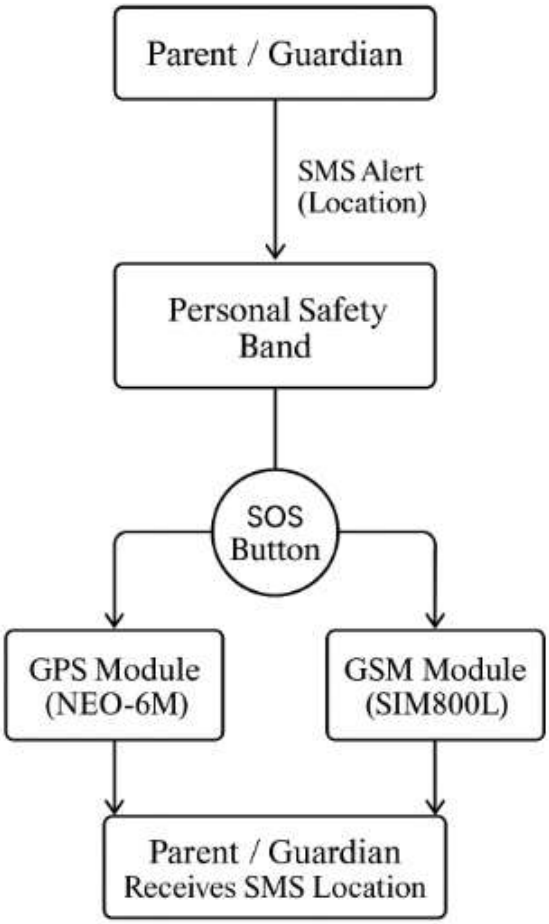

Fig: DFD Diagram of Personal Safety

3. CONCLUSIONS

The Personal Safety Smart Band offers a simple and reliable way to protect children during emergencies. The device uses Arduino, GPS, and GSM, along with an SOS button to send one's location instantly to parents. No smartphones or internet are required to make it operate; thus, it is very helpful in rural and low-network areas. Tests revealed fast SMS notifications, precise tracking in varied surroundings. The wearable design ensures that the device stays with the child at all times.
This system will become an even stronger safety tool with upgrades like IoT and the addition of sensors.

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