Raspberry Pi Powered Communicatable Intelligent Life Jacket

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Abstract

Locating an accident victim in water is a difficult task, and 7% of all injury-related deaths due to drowning, which is one of the major causes of worldwide unintentional injury death, said WHO. Lifejacket helps them to float on water but finding their location is another important task to rescue them. This study intends to present a new smart lifejacket which senses the danger and to locate the victim place using Global Positioning System and Global System for Mobile Communication modules. The smart lifejacket works on the principle of push –pull, whose one end of the Push-Pull switch is attached to the travelling vessel and the other end is attached to the smart lifejacket. When the person wearing the jacket moves away from the vessel the connection of the switch with the lifejacket is removed which activates the system. Now the Raspberry Pi based system extracts the location information from the GPS Module and sends the location information to the rescue team using the GSM module.

Keywords 1

Lifejacket, Push-Pull Switch, Raspberry Pi, GPS, GSM.

1. Introduction

With the rapid improvement of living standards and income levels, there is a sharp increase in the number of individuals who are getting involved in water sports and other water entertainment activities [1]. As the number of individual spending time in marine increases there is also an increase in the accidents associated with it. When someone falls into the water without his own knowledge, they are in continuous motion due to the tides. During such a critical time they try to seek for help [2]. However, wearing the traditional life jacket only provides the buoyancy but exact location of the victim is not known. So, a continuous position tracking is required [3].

The mobile signals in the water are limited to 30 Kms from the coast [4]. Most of the marine events happened within this range. So, the distance is not a major challenge in this study but locating the victims becomes the major challenge. For this problem the implementation of Raspberry Pi based model comes handy [5]. Also, Raspberry Pi has the capability to interface even more modules for future advancement.

After the confirmation from the switch, the GSM module sends the GPS real time location. The information can help the rescue team to rush to the position of the victim.

2. Literature Survey

The improvement of the vehicle GPS equipment model, depicted by author Pham Hoang Oat [6], uses the GPS framework to get a vehicle's arrangement and send it utilizing GSM to the client's mobile through the versatile organization. The primary equipment parts of the framework are u-blox

WAC-2022: Workshop on Applied Computing, January 27 – 28, 2022, Chennai, India.
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NEO-6Q Global Positioning System collector module, u-blox LEON-GIOO Global System for Mobile Communication module and Arduino Uno microcontroller. The created vehicle GPS exhibits the possibility of close to continuous following of vehicles also, further developed adaptability, worldwide operability and cost when contrasted with existing arrangements.

Swapna et.al. in their work [7], a standard innovation is thought of, for following inland vessel with the goal that the mishaps in the ocean can be stayed away from. A framework is intended to distinguish and to continually screen the vessel and if the vessel is in peril an alarm notification can be shipped off, a salvage group by a base station where the vessel has been checked. Vibration sensor is utilized to recognize the vibrations inside the water and Ultrasonic sensor is utilized to distinguish the item which is close to the vessel to stay away from impact.

R.Divyadevi et.al. [8] presents an intelligent helmet that guarantees that a rider can't begin without wearing it. The working of the intelligent helmet is as follows; vibration sensors are set in places of the model where the likelihood of contact with the ground is more which are associated with the microcontroller board. So, when the user collides with an obstacle and the system hits the ground, these sensors sense and offers it to the microcontroller board, the regulator separates GPS information utilizing the GPS module that is interfaced to it.

The system reported by Arsheen Barnagarwala and aziz Buriwala [9] offers a moderate and smaller plan carried out for following and checking vehicle’s Instantaneous speed, top speed, distance, and latest area with the assistance of GPS and GSM. The system comprises of more than one section, first is mobile and the latter is joined in the objective vehicle which involves a GPS collector, a microcontroller and a GSM module with outskirts show and force units. When GSM gets initiated, it takes the last accepted vehicle's Instantaneous speed, top speed, and latest area esteems from the cushion and sends a SMS (short message Service) to the specific cell number or Personal Computer which is reclassified in the program.

The work presented by PratikshaBhuta et.al. [10] is pointing towards making vehicle driving more secure than earlier. This is carried out by using Arduino. The authors have inferred the driver's condition and they propose the identification of liquor utilizing liquor indicator linked with Arduino to an extent that when the degree of liquor is more than an admissible cut-off, the vehicle will turn off and the Global Positioning System module will capture the current area of the vehicle. Likewise, the Global System for Mobile Communication module will naturally send trouble notification to police or relatives.

The work performed by Anja et.al. [11] talks about the part of Position, Navigation and Timing (PNT) data for empowering inland stream route help capacities, for example, connect crash cautioning, securing supporting, and programmed direction. Since GSM doesn't as of now meet the accessibility and solidness correspondence prerequisites along inland streams, utilization of the programmed recognizable proof framework Automatic Identification System (AIS) for information transmission is investigated. Regardless of the further advancements needed for the AIS correspondence foundation, it is shown that their framework engineering can almost meet the trustworthiness and exactness prerequisites for driver-help capacities on inland streams.

By carrying out the idea proposed in [12] by the author Sadman Shahriar Alam et.al, with a cell phone application, the expense is diminished significantly, as the equipment is promptly accessible. This paper gives a portable based app that sends in arranges utilizing Global positioning System and other data from the cell phone to the electronic worker, which then, at that point returns profundity information. The versatile application then, at that point chooses whether the user is moving toward a protected or perilous region. This application was tried on Elgeseter Bridge in Trondheim, Norway. Precision trail run of the Global Positioning System modules on cell phones and an outside Global Positioning System module (Quectel L80) were completed.

As an essential method for subsea correspondences, Xiguo Ren et.al in [13] has considered Power Line Correspondence (PLC) framework as a significant part in the marine electromagnetic investigation framework. The correspondences foundation of marine controlled source electromagnetic transmission framework has been worked by PLC framework and the LabVIEW programming. The correspondence between the deck control stage and subsea utilizes the PLC framework. Also, marine transmitter control stage could opportune showcase and save the data of the working, working flow and working recurrence in the subsea framework.

The basic place of the paper [14] presented by MithileyshSathiyanarayanan et.al is to design a sharp vehicle security framework using IoT, that is to turn a CVSS to a SVSS for getting to and controlling vehicles indirectly using a Smart phone. The all-out framework is arranged contemplating a wide scope of vehicles by giving a direct, amazing straightforwardness of foundation, to give vehicles absurd security and SVSS will be a technique for preventing, distinguishing and counter-assessing theft of vehicles.

3. Proposed System

3.1. System Architecture

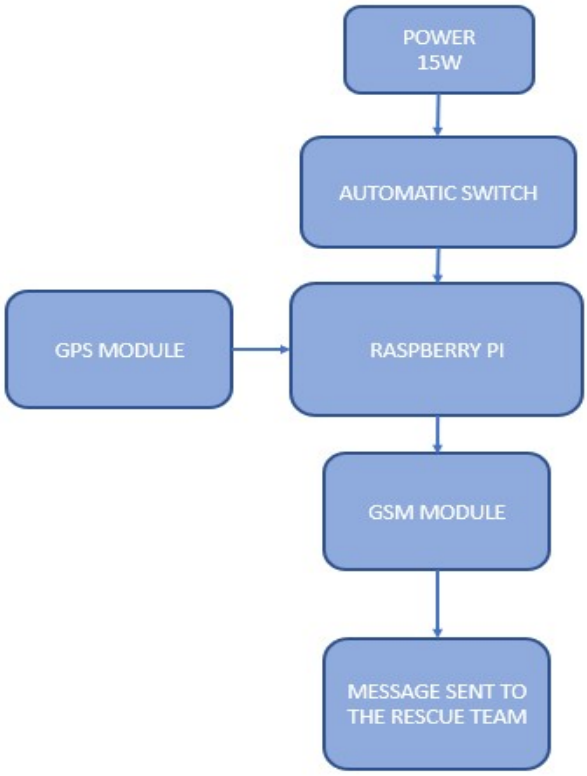

Figure 1: System Architecture of Smart life jacket

Figure 1 explains the basic system architecture involved in modelling the proposed system. The system is activated when the user gets into the water i.e., when the user moves away from the vessel wearing the safety jacket. The power supply to the circuit is the indication that the location needs to be transmitted. Then the Raspberry Pi powers the GPS and GSM module and Serial communication is established between GPS-PL2303-Raspberrypi and GSM-Raspberry Pi. The GPS reads the location of the safety jacket by making use of the satellites nearby to it. Then the serially communicated data about the location from the Raspberry Pi to the GSM module is then sent through SMS.

The 15W power is given to the Raspberry Pi through the automatic switch which turns on when the user is drowning in water. Then the Raspberry Pi powers the GSM module and GPS module. Next the location coordinates of the user are sent to the costal guard.

3.2. System Flow

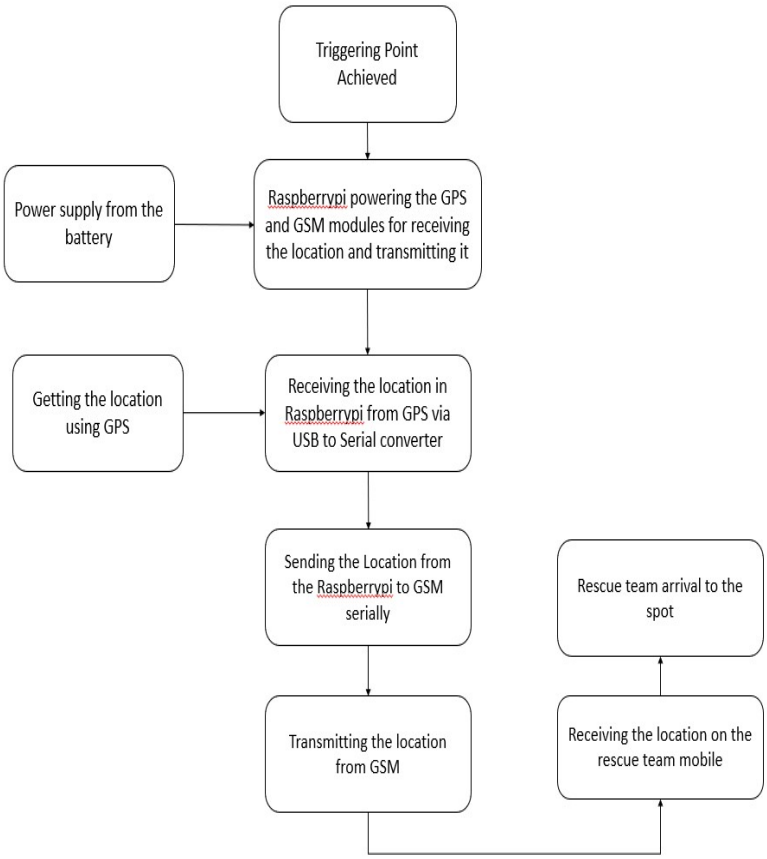

Figure 2: System Implementation Flowchart

Figure 2 portrays the proposed system model. The model is activated, when the user/victim is out of the vessel. This is when the user fell into the water and the pull switch is activated.

Then the details that needs to be transmitted are received by the Raspberry Pi. The Raspberry Pi further parses the data from the raw data which contains the information about longitude, latitude, altitude, etc., Now the parsed data contains the location details. The data is then packed in the Raspberry Pi in the understandable format. Further the location detail of the victim is sent to the rescue team.

4. Experimental Setup

When the life jacket gets out of contact with the vessel, the switch gets triggered. Then the switch allows the power supply to the raspberrypi4.The raspberrypi4 then powers the GSM and GPS module. At the same time the python code starts to execute inside the Raspberrypi4 automatically at boot. The

python code waits for 5 min. During the 5 min gap the GPS and the GSM module gets initialised and starts to receive the location and signal respectively. Then the Raspberry Pi starts to read the raw location data from the GPS module through the serial port of the raspberry Pi and parses the required information from the raw information obtained. Next the Serial communication between the Raspberry Pi board and the GSM module is established. Now parsed location details containing the latitude and longitude coordinates of the GPS module is then transmitted to the GSM module through the serial port of the Raspberry Pi board. Next the serially received data from the Raspberrypi is sent as SMS to the Rescue team.

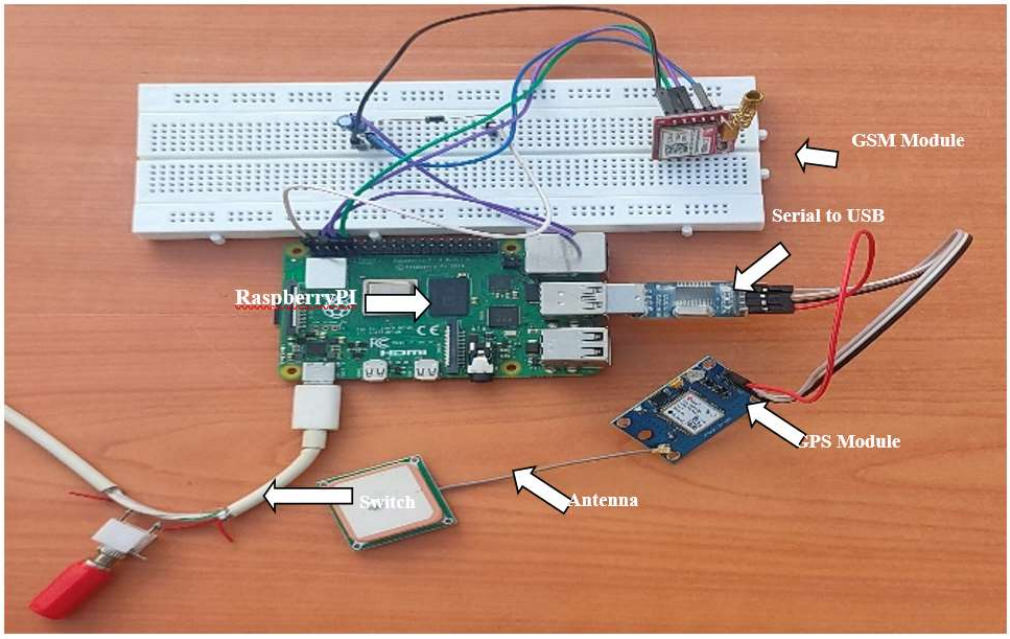

Figure 3: Experimental Setup of the proposed model

5. Hardware Specifications

The Neo-6M GPS module receives the pinpoint location coordinates and communicates the same to the Raspberry Pi through the Serial to USB converter. The process that needs to be performed are programmed in the Raspberry Pi. The Raspberry Pi acts as the receptor of the GPS location coordinates from the GPS module and communicates the parsed information to the GSM module. The received location coordinates are transmitted through SIM800L the GSM module.

6. Results And Discussion

This instrument has been implemented with the help of Raspberry Pi and has been studied efficiently. It was observed that the location data has been transmitted every 2 min after the 5 min activation time and the triggering point was achieved. It worked as programmed through the software.

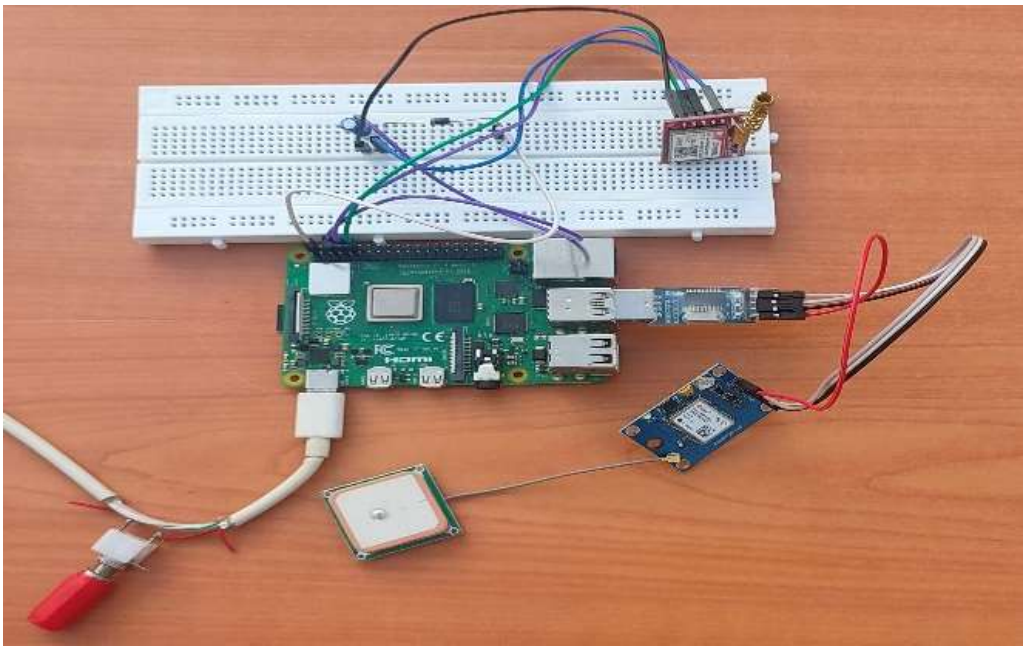

Figure 4: Initial state of the model.

Figure 4 shows the initial OFF state of the system, where the push - pull switch is in push position due to which the system is in OFF state.

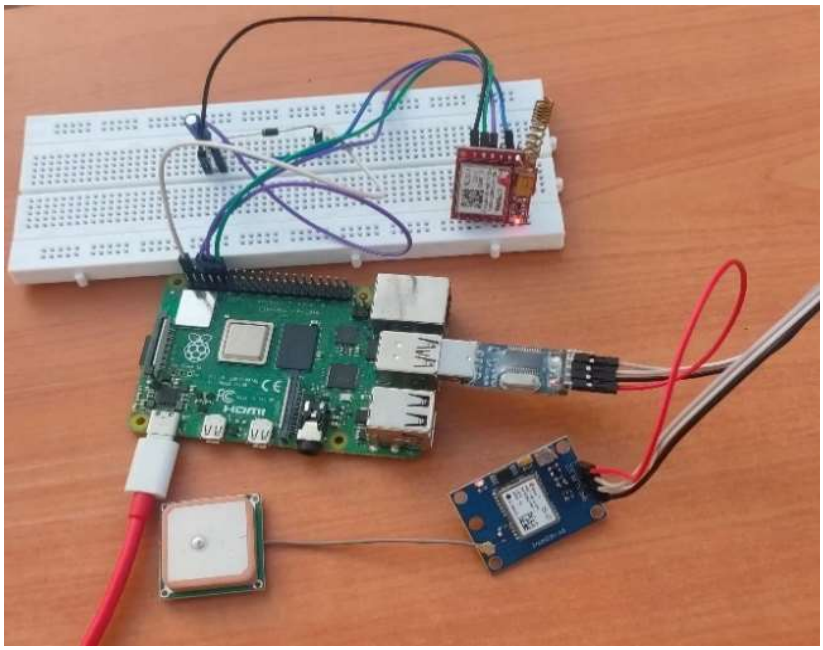

Figure 5: Power ON situation of the system

Figure 5 shows that the Switch is in PULL state which triggers the System to turn ON. As soon as the Raspberry Pi turns ON it powers the GPS and GSM module. The manually configured program then starts and receives the location coordinates.

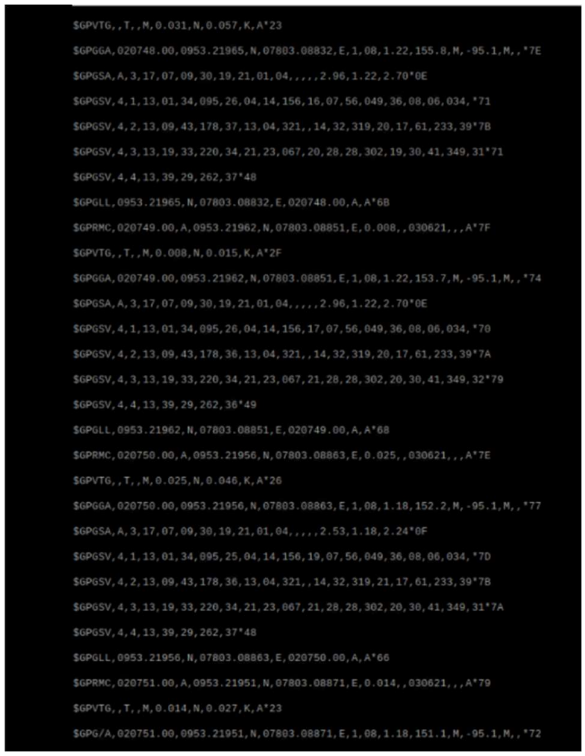

Figure 6: Raw data values

The above figure 6 shows the Raw data values of the system received by the GPS module which has an accuracy of 2.5m.

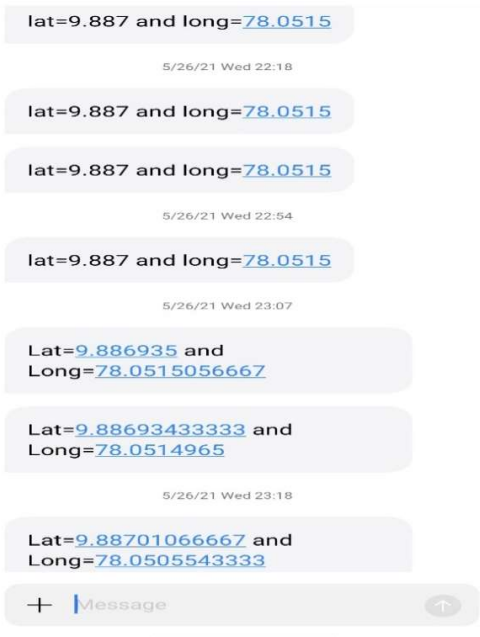

Figure 7: The location coordinates of the system

The transmitted location coordinates of the GPS module, which was done with the help of the SIM800L GSM module is shown in Figure 7.

7. Conclusion

This study aimed to realize location notification system composed of mechanical Push-Pull Switch, Serial to USB converter, GPS module, GSM module and a Raspberry Pi. This system was designed for the purpose of accurately locating accident victims using any mobile phone. This system was designed to indicate the location of accident victims to lifeguards and rescue team and to rescue the victims in remote areas in the process of assisting the search operation for the rescue.

8. References

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