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Lifeguard for River Bed to Detect Active Drowning

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ABSTRACT—

Drowning is a major worry across the world, with a global drowning rate of over 57%, whereas in India the rate is roughly 36%. Even experienced swimmers suffer underwater under exceptional situations. This study proposes a Raspberry Pi-based protection and rescue system to keep humans from drowning. Sensors such as ultrasonic, O2, heartbeat, and PIR sensors are attached to the Pi computer. These sensors can help in the quick diagnosis of human health under water. A rescue is also built and connected to the Raspberry Pi through a GPS module. When the sensor value hits a threshold, the Pi computer will activate the rescue system. The attached GPS will help determine the specific location of the person under water who suffocates, while also alerting the rescue team and activating the buzzer. This helps to save human lives faster, which contributes to reducing the global drowning rate.

Keywords— Riverbed, Ultrasonic sensor, PIR sensor, Reduced morality rate, Raspberry Pi.

I. INTRODUCTION

In recent surveys, most of the drowning accidents happened in river areas, majorly during the festival time. Most drowning incidents are happened because of the lack of lifeguards and rescue systems. We are taking this survey from the Bhavani kooduthurai river a length of about 215km depth up to 20m to 40 approximately these incidents have happened during festival times people are going for a bath in a river, So we are here to give the solution for preventing the people who are drowning in the river. The proposal of our system is to rescue people from drowning by using the device which contains Raspberry pi as a main component of this system which is interfaced with the sensors like an ultrasonic sensor, O2 sensor, Heartbeat sensor, buzzer, and also GPS. Raspberry pi is a small handy computer used to make this system to advance measuring calculation of human health while drowning. In recent decades of the survey, most rescue systems are based on Raspberry pi which is used in small places.

II. LITERATURE SURVEY

[2] epilepsy monitoring and alerting system using machine learning algorithm and WHMS", Journal of Applied Research and Technology [6] makes advantage of the notion of differential pressure. The wristband is attached to the transmitter side's pressure sensors to operate the system, and the swimming pools receiver module is employed [6]. It is suggested in [7] how crucial surveillance systems are for swimming pools. By including a human movement technique for identifying drowning accidents in swimming pools, the goal is to create a safe swimming pool. Inclination is achieved via LDR and LASER [7]. For swimmers, it is crucial to recognize drowning quickly. As is emphasized in [8], early stage detection is more crucial. The general answer includes taking into account various surroundings, from the ocean to a swimming pool, using a workable economic strategy. The classification of the stages of drowning is described in detail in [8]. The phases of drowning are shock and astonishment as the first stage, unconsciousness as the second, hypoxic convulsions as the third, clinical death as the fourth, and involuntary breath retention as the fifth. Either an active or passive drowning may occur. The victim's underwater display of agony marks a distinction [8].

The rescue system [1] was created to lift the human from drowning. The wrist-worn gadget is created to keep track of when a person goes underwater. For the early identification of drowning, image approaches with reliable picture smoothing algorithms were developed. It is suggested to use a reliable adaptive image smoothing technique [4].

III. COMPARISON WITH THE CURRENT APPROACHES

The currently used strategy was centered on the early stage detection and also provided assistance for rescuing those who were drowning. At the corners of the pool, sensors and aluminum plates are affixed. A PIR sensor and an ultrasonic sensor are fastened. By setting a threshold value, the ultrasonic sensors will continue to detect and identify whether the individual was at a safer level or perished beneath the water. Using a PIR sensor, it is possible to determine whether a drowned object is a person, an animal or any other non-living thing. If the sensor detects a living object, it uses an ultrasonic sensor to locate it and compare its location to a threshold value. The currently used strategy was centered on the early stage detection and also provided assistance for rescuing those who were drowning. At the corners of the pool, sensors and aluminum plates are affixed. A PIR sensor and an ultrasonic sensor are

fastened. By setting a threshold value, the ultrasonic sensors will continue to detect and identify whether the individual was at a safer level or perished beneath the water. Using a PIR sensor, it is possible to determine whether a drowned object is a person, an animal or any other non-living thing. If the sensor detects a living object, it uses an ultrasonic sensor to locate it and compare its location.

Our rescue system's primary goal is to prevent individuals from drowning in the river. It is a suggested solution for avoiding drowning incidents that are based on the Raspberry Pi. A PIR sensor is used to detect when a human crosses the threshold that the ultrasonic sensor is fixed at, and an ultrasonic sensor is placed at a specific level of the water as part of the hardware implementation. Here, we provide a wristwatch with a heartbeat sensor and an oxygen sensor to keep an eye on your health. The wristwatch alerts the Raspberry Pi board, which then turns on the GPS to locate the individual if they begin to drown. The major sensors for identifying people who have reached the drowning limit are the PIR sensor and ultrasonic sensor, both of which are attached to the Raspberry Pi board. Additionally connected to the Raspberry Pi board at the same time are GPS and a buzzer. The wristwatch we supply will track heart rate and blood oxygen levels. If either of these two exhibit aberrant behavior, it will send warnings to the raspberry pi board, which will then activate the buzzer and begin searching for the drowning person using GPS. As a result, it is simple to locate the individual who drowned and to rescue them from the water by using machinery. For people to avoid drowning incidents in rivers, this approach is highly helpful.

IV. HARDWARE DESCRIPTION

The list of hardware elements listed in Table 1 had been used to simulate the concept presented. In the tabular column, the specifications are shown.

Table 1: Hardware components

S. No	Name of the component	Description
1	Raspberry Pi	Model B 2GB RAM
2	Ultrasonic Sensor	HC SR04
3	PIR Sensor	HC SR501
4	Pulse Sensor	
5	O2 Sensor	

A. Raspberry Pi

The Raspberry Pi is a low cost, small computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing The Raspberry Pi has the ability to interact with the outside world, and has been used in a wide array of digital maker projects, from music machines and parent detectors to weather stations and tweeting birdhouses with infra-red cameras.

Figure 4.1 Raspberry Pi Board

B. Ultrasonic Sensor

The ultrasonic sensor will classify the object in the water. As previously stated, the sensor is linked with the following connectors.

- ✓ VCC ->+5V pin
- ✓ GND -> GND pin
- ✓ Trig -> Digital Pin 2
- ✓ Echo -> Digital Pin 2

This is due to the fact that we received a copy sensor with four pins rather than the original sensor's three pins. The received ultrasonic sensor is displayed in Figure. The used ultrasonic sensor HC SR04 has a tolerance of 3mm and measures a distance of roughly 400m.

Figure 4.2 Ultrasonic Sensor

C. PIR Sensor

The PIR Sensor- Passive Infrared Sensor- is used to measure body heat. This sensor is heavily used by the home security system to detect human traces around the house. It defends by detecting heat and movement in the surrounding regions and generating a protective grid. Figure 4.3 shows the PIR sensor utilized in the hardware arrangement.

A. PULSE SENSOR

This sensor is used by athletes, students, mobile & game developers, etc. This sensor clips on an earlobe or a fingertip by connecting right to Raspberry pi board through jumper cables. In real-time, the pulse rate can be monitored through an open-source monitoring app.

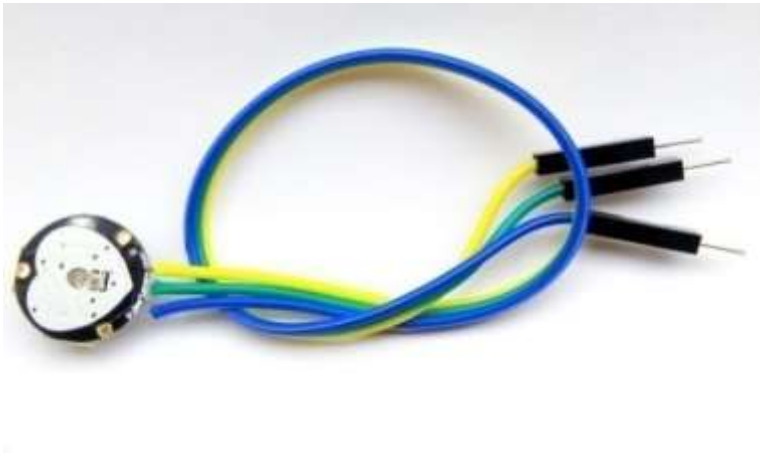

Figure 4.4 Pulse Sensor

A. O2 SENSOR

An oxygen sensor (or lambda sensor, where lambda refers to air–fuel equivalence ratio, usually denoted by λ) or probe or sond, is an electronic device that measures the proportion of oxygen (O 2) in the gas or liquid being analyzed.

Figure 4.5 O2 Sensor

V. BLOCK DIAGRAM OF THE PROPOSED METHODOLOGY

The hardware implementation deals with fixing up of Rescue system like crane on river bed is connected with GPS and Raspberry Pi. When the Rescue system actives outside the water, it moves upwards so that the person under the water is lifted. PIR sensor used is to sense if the drowned object is human.

Figure 5.1 Block Diagram of the proposed methodology

Ultrasonic sensor is used to measure the distance of the object by using a sound wave. The wristwatch has a heartbeat sensor and o2 sensor by using this measure the heartbeat and oxygen level of the person or animal underwater. If the person or animal is in a critical stage then the buzzer is made ON and alerts the person outside the river. At the same time, the signal passes to the GPS and rescue system which makes them lift. This helps to lift the person or animal that drowns in water. The recovery set mentioned in the block diagram is the main part of the proposed idea which has mechanical setup attached to the rescue system to lift the person. The intimation of suffering due to drowning underwater by detection could not save lives at a faster rate.

VI. FLOWCHART

The figure 6.1 details the flow mechanism of the proposed method. The idea of the proposed work is to save humans by reducing drowning accidents that happens in the natural river beds. The idea proposed is implemented by incorporating the sensor techniques with the raspberry pi controller. The detailed flow mechanism starts with the idea of interconnecting ultrasonic sensor, o2 sensor, heartbeat sensor, and PIR sensor which will be continuously monitoring the river and human health. A threshold value is fixed, below which the person finds it difficult to swim and breathe. The ultrasonic sensor will work concerning the fixed threshold value. If the object is found to cross the threshold value, then it will be reported to the raspberry pi. The controller will also wait for the PIR sensor input. The PIR sensor will detect whether the object under water is living or non-living. If the object is found to be living, then it will be reported to the controller. The four inputs will be processed by the controller. This is to improve the redundancy of the proposed system. The controller after receiving inputs from four sensors initiates the buzzer and operates on the rescue procedures. At the same time, controller will send the location to GPS and the rescue system. The relay is used to drive the rescue system with the controller. The controller will be programmed with a different set of conditions to avoid a false buzzer. The aluminum plate setup used for lifting the person is mentioned as the rescue system in the flowchart figure.

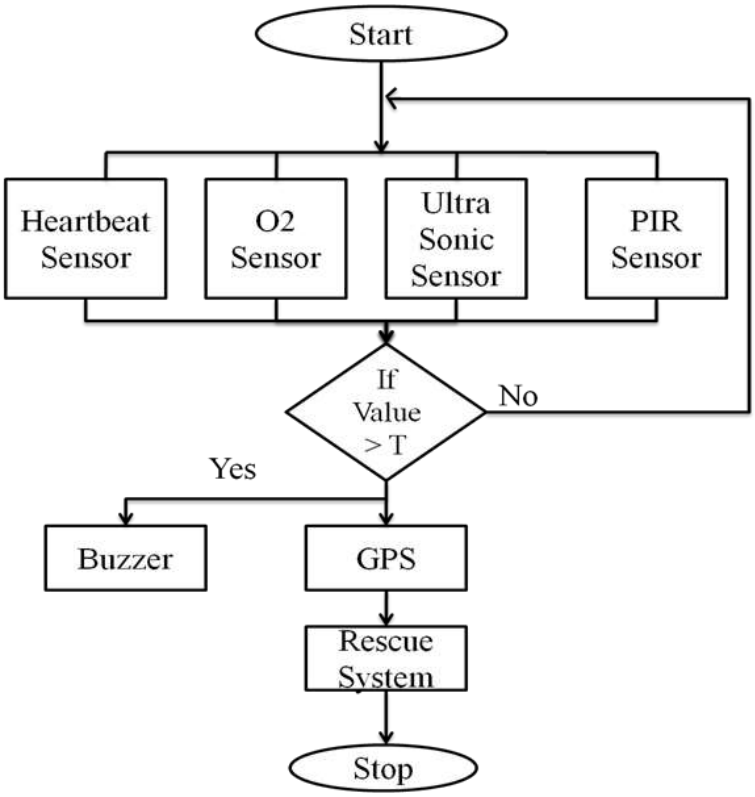

Figure 6.1 Flowchart of the proposed Methodology

VII. PERFOMANCE EVALUATION

The proposed architecture is designed with an Raspberry pi. As mentioned, the projected architecture aims to prevent drowning accidents and to save human life. The Raspberry Pi will receive the data about the person health condition by the sensor.

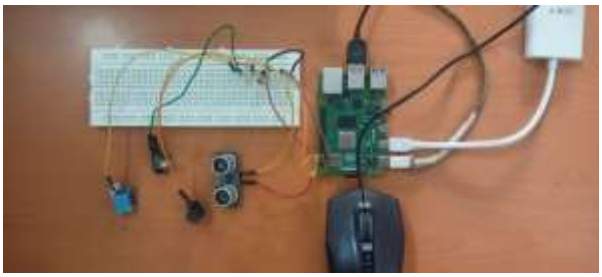

Figure 7.1: Hardware implementation of the Proposed System

The sensor's connections to the Raspberry Pi board's interface are represented by the hardware in Figure 7.1. The health of the individual in the water who is almost drowning is detected by these sensors.

Figure 7.2: Sensors implementation of the Proposed System

Figure 7.3: Raspberry pi at the Proposed System

Figure 7.4: Representation of PIR in Things-Speak

The proposed idea is programmed using the Sysco software platform, and then uploaded to the Raspberry Pi board for decision-making. The sensed data are saved on the Thing speak platform, which is utilized for IOT-based data retrieval. This data are uploaded to the board along with the GPS coordinates.

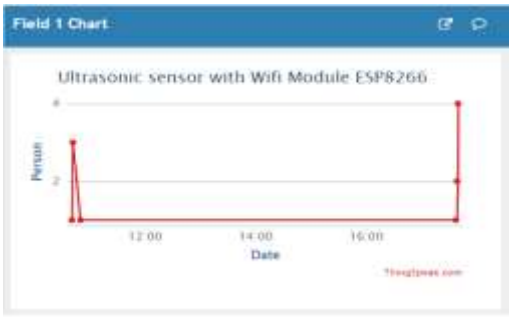

Figure 7.5: Representation of Ultrasonic sensor in Things-Speak

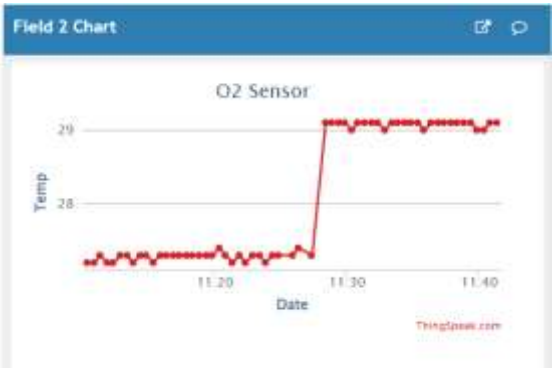

Figure 7.6: Representation of O2 sensor in Things-Speak

The PIR sensor, ultrasonic sensor, and O2 sensor data in the cloud are depicted in Figures 7.4, 7.5, and 7.6, respectively. This data can be exported into the hardware configuration as needed. In order to test the findings, the water level, PIR sensor, and oxygen measurements were exported in the suggested architecture.

VIII. CONCLUSION

The project's goal is to decrease underwater drowning. The approach, in particular, focuses on helping persons who are about to perish through drowning in water. The sensor and Raspberry Pi will be integrated with the crane, which will be very advantageous and enhance response times. Due to the model's hardware implementation, the suggested work has a response time of less than a minute. Real-time implementation can be done and confirmed as part of the project's future scope. When the complexity of the hardware increases, the response time measured by the suggested model will differ from the real-time implementation. The proposed notion advocates for the preservation of human life, whereas the other systems just function as forecasters. The system can be effectively deployed after being tested in a real-world setting.

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