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ANTI DROWNING SYSTEM USING IOT DEVICES

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Abstract *- Drowning is one of the major causes of unintentional death in the world. owning to this reason, there is a need to curb the issue of drowning. Some systems have been developed over the years, but most of the systems are not accurate in detecting a drowning person and do not provide an effective rescue scheme to prevent the swimmers from drowning. The smart anti-drowning and alert system is a system which detects, rescues the swimmer experiencing drowning and alerts the necessary authorities. The system uses two sensors, pulse sensor and accelerometer for the detection of the heartbeat rate and tilting pattern of the swimmer. The Arduino Nano microcontroller receives analogue signal from the sensors and sends a signal to trigger the air vacuum pump and sends a message, when the threshold value is met. The threshold value of the pulse sensor is 45bpm-150bpm(minimum and maximum value) while the threshold value of the accelerometer is750 -1100 (minimum and maximum value).*

Key Words: Arduino , GPS, GSM, LCD, Jtag, Sensors

1.INTRODUCTION

Numerous people lose their lives to drowning every year, especially in swimming pools, beaches, and open bodies of water. This is still a global public health problem. The effectiveness of traditional drowning prevention strategies, such lifeguards and signs, is limited, particularly in crowded or unsupervised swimming conditions. In order to increase swimmer safety and lower the number of drowning events, creative solutions that make use of cutting-edge technologies are desperately needed. This need is intended to be met by the Smart Wearable Anti-drowning System (SWADS), which offers real-time monitoring and alerting capabilities to quickly identify and react to possible drowning incidents. SWADS consists of a small wearable gadget with a variety of sensors that can track the motions, orientation, and physiological data of swimmers. The system can recognize unusual behavior patterns that indicate distress or submersion by evaluating sensor data in real-time. This allows the system to promptly notify designated rescuers, including lifeguards or nearby persons.

2. Literature Review

Numerous drowning events take happen in areas with little supervision. Large stretches of the coastline cannot be monitored by lifeguards due to their expensive expense. As a result, their primary duty is to police well-known beaches. Furthermore, not all domestic pools or rivers are staffed by lifeguards. Comprehensive monitoring is not practical due to the cost. Another option is to create a low-cost autonomous system that uses a movable Unmanned Aerial Vehicle (UAV), such a quadcopter or fixed-wing aircraft, or an above-water vantage point, like a pole or observation tower, to identify swimmers in difficulty. Prior studies in this area have been on the use of UAVs to take better footage for skilled staff to monitor or autonomous systems to identify swimmers, independent of their degree of distress. Implemented an anti-drowning system using remote alert. The system developed uses a RF module for wireless communication consist ing of a transmitter and receiver, a heartbeat sensor which monitors the heartbeat rate of the user, was interfaced with an At-Mega 328 microcontroller which was also interface with LCD, LED and a buzzer for indication. The system is scalable, flexible and of low cost. However, the anti-drowning system using remote alert communicates at a very short range and not so efficient in informing the person, if the person is not close to the buzzer or LED. Even though drowning is a serious public health danger, estimates from throughout the world may greatly underestimate its actual prevalence [3,4]. Certain groups of people who participate in water-based activities—like kids and young men—are especially vulnerable to this risk [5]. There are several underlying reasons for drowning, making it a complex problem [6,7,8,9]. Nonetheless, the main causes of drowning include inadequate child supervision, fear of the water, and incapacity to swim [10]. It is noteworthy that victims of drowning seldom show signs of convulsions and that the incident is frequently quiet. Rather, they have to work very hard to stay afloat and are frequently unable to indicate their need for assistance or distress. They may get terrified and have spasms if water gets inside their trachea or larynx, which keeps them from yelling. It might be difficult to identify drowning victims because they may fight in the

water, have breathing difficulties, or irregular heartbeats. It may only take 20 to 60 seconds for someone to submerge in the water without the assistance of a qualified lifeguard. Finding a lost individual in the water is therefore essential to their life.

2.1 Existing System

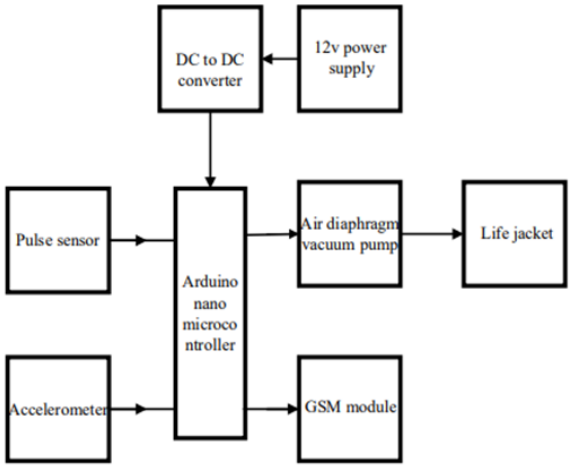

Fig -1: Existing Block diagram

3. PROPOSED SYSTEM

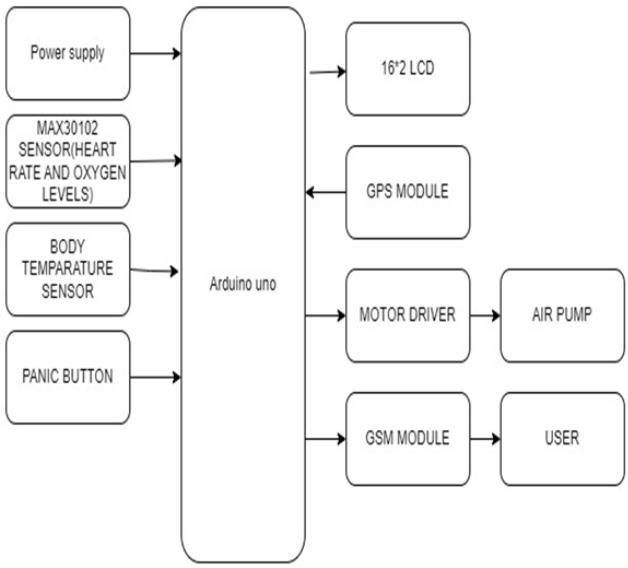

Fig -2: Proposed Block diagram

4. HARDWARE DESCRIPTION

4.1 Arduino

Based on a microcontroller board with an integrated development environment for programming the board, Arduino is an open source physical processing system. A few inputs, like switches or sensors, are sent into the Arduino, which then controls a few different outputs, like lights, an engine, and other things. Unlike other microcontroller frameworks, which are limited to functioning on Windows, the Arduino application is compatible with Windows, Macintosh, and Linux operating systems. Beginners and amateurs alike may easily learn and implement Arduino programming. With Arduino, you may create a computer that is more capable than a standard desktop computer in terms of control, interaction, and sensing. It's a physical processing stage that is open-source and centered around a simple microcontroller board, along with a programming environment for the board. Arduino may be used to make interactive objects. It can operate a variety of lights, motors, and other physical outputs by receiving inputs from a wide range of switches or sensors. Activities with Arduino may be connected to other applications that are running on your computer, such as Processing, Flash, and Maxmsp, or they can be done alone. The open-source IDE may be downloaded for free, and the board can be constructed by hand or purchased already assembled. An implementation of Wiring, a comparable physical computing platform, the Arduino programming language is centered around the Processing media programming environment.

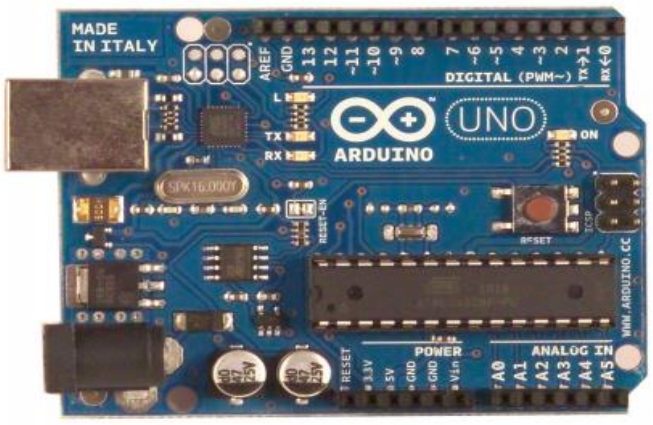

Fig -3: Arduino board

4.2 LCD

A small, flat display device known as a liquid crystal display (LCD) is composed of any number of color or monochrome pixels arranged in front of a reflector or light source. A column of liquid crystal molecules hanging between two transparent electrodes makes up each pixel, as do two polarizing filters with perpendicular polarity axes. Light traveling through one would be obstructed by the other if there were no liquid crystals between them. To enable light entering one filter to pass through the other, the liquid crystal twists the polarization of the light. Input and output devices that speak with people directly must be used by a software to communicate with the outside world. An LCD

display is one of the most often connected devices to a controller. 16X1, 16x2, and 20x2 LCDs are a few of the most often used LCDs that are linked to controllers. This translates to 16 characters on a single line. There are sixteen and twenty characters per line by two lines, respectively.

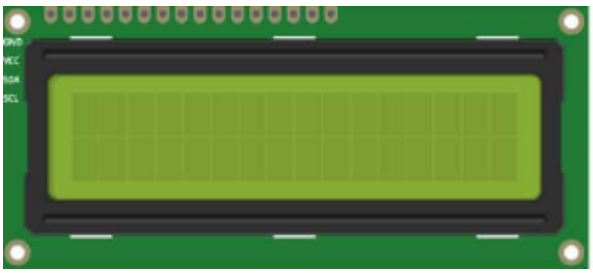

Fig -4: LCD

4.3 MAX30102 SENSOR

Maxim combined produced the combined pulse oximetry and heart-rate monitor module known as the MAX30102. Because it packs two essential features into a small, low-power container, it may be used in medical monitoring applications as well as wearable health and fitness gear. An overview and description of the MAX30102 are provided below:ECG and heart rate monitoring pulse oximetry The MAX30102 is a single module that combines heart-rate monitoring and pulse oximetry functions. The user's heart rate is monitored by the heart-rate monitor, and the oxygen saturation level in the blood (SpO2) is measured via pulse oximetry.High Sensitivity and precision: The SpO2 and heart rate detection capabilities of the module ensure dependable monitoring results with their high sensitivity and precision.

Fig -5: MAX30102

4.4 GSM

The Global System for Mobile Communications, or GSM, is a cellular network that is connected by mobile devices looking for nearby cells. GSM networks function within four distinct frequency bands. The majority of GSM networks use the 900 MHz or 1800 MHz bands for operation. • In certain nations in the Americas, the rarer 400 and 450 MHz frequency bands are allotted, because these frequencies were previously utilized for first-generation systems. These countries employ the 850 MHz and 1900 MHz bands because the 900 and 1800 MHz frequency bands were already allocated. GSM offers suggestions rather than mandates. The GSM standards do not include hardware; instead, they provide a detailed definition of the functionality and interface requirements. The switching system (SS), base station system (BSS), and operation and support system (OSS) are the three main systems that make up the GSM network.

Fig -6: GSM

4.5 GPS

There is only one complete Global Navigation Satellite System (GNSS), which is the Global Positioning System (GPS). GPS receivers are able to detect a user's location and speed with the use of a constellation of 24–32 Medium Earth Orbit satellites that emit accurate microwave signals. It was the US Department of Defense that created GPS. NAVSTAR-GPS is its formal name. A number backronyms have been coined for NAVSTAR-GPS, despite the fact that it is not an acronym. The US Air Force's 50th Space Wing is in charge of overseeing the GPS satellite system. The Global Positioning System is an earth-orbiting satellite-based system that may be used to precisely establish time and the three-dimensional position of a GPS receiver. Signals from the system are available anywhere on or above the globe, twenty-four hours a day. Geographic Information Systems (GIS) are using GPS as an input more and more, especially for field data collecting and accurate geospatial data location. GPS receivers at reference sites that provide corrections and relative positioning data for distant receivers enable precise positioning. Another usage for GPS is time and frequency dissemination, which is managed by

the monitor stations and is dependent on the exact clocks on board the SVs.

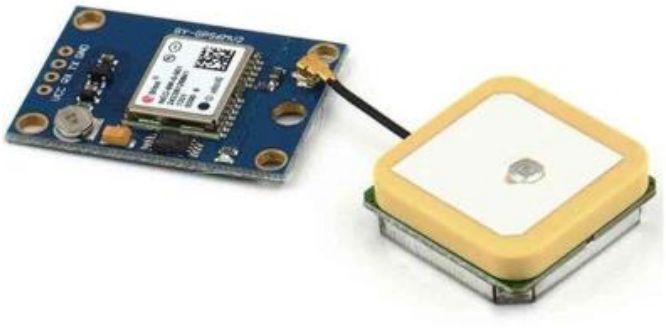

Fig -7: GPS

Fig -7: Result

5. Results

The heart rate will be tracked by this system. The detecting range would be between two and four meters while submerged in water. Both transmitting and receiving circuits are part of this system. The person in the water is the transmitter circuit, and the lifeguard is the receiver circuit, which provides information about the individual's heart rate. An LCD screen is interfaced with a microprocessor from the AVR family in the transmitter circuit. 12V batteries are used to power the transmitter circuit. Similar to this, the receiver circuit has an RF receiver and microprocessor from the AVR family that are connected to a 12V transformer. A heart rate sensor is also included in the system. A buzzer and an LED light are also included in the receiver circuit. The transmitter block is made up of an LCD, a push-button switch, an IC regulator, a cardiac sensor, an RF module with an encoder and transmitter, and a battery. This battery is rechargeable, meaning that it charges to its maximum capacity when the main supply is ON and serves as a backup power source in the event of a power outage.

6. CONCLUSIONS

To sum up, creating a Smart Wearable Anti-drowning System (SWADS) is a potential way to improve swimmer safety and lower the number of drowning occurrences that occur in aquatic environments. SWADS provides an early warning system for possible drowning incidents by utilizing cutting-edge sensor technology and real-time monitoring features. The incorporation of wireless communication channels enables prompt notification to lifeguards or persons in the vicinity, therefore expediting rescue operations and reducing the likelihood of casualties.

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