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AUTOMATED DROWNING DETECTION AND SECURITY IN SWIMMING POOL

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Abstract - *Every year, many individuals, including kids under the age of 5 drown in the deeps of the swimming pool, and the lifeguards are not well trained enough to handle these situations. Thus arises the requirement for having a system that will consequently detect the drowning individuals and alarm the life guard at such risk. Swimming pool surveillance systems plays an essential role in safeguarding the premises. In this project differential pressure approach is used for detection of drowning incidents in swimming pools at the earliest possible stage. The children's life is saved during drowning incidents in the swimming pool by lifting the acrylic plate. The proposed approach consists of RF module, Pressure Sensor and Motor Driver. The demo system based on pressure sensor has an advantage of convenience, cost saving and simple algorithm.*

Key Words: RF module, ATmega32 Microcontroller, Acrylic plate, Pressure sensor, Motor driver.

1. INTRODUCTION

Swimming is a kid's favorite aquatic sport and it's a great stress buster. But in the water, beginners often feel hard to breathe which causes choking actions, loss of balance and results in a drowning accident. Some special circumstances, such as cramps, collide with each other, disease or mental stress and so on may also cause swimmer to drown. Drowning is a leading cause of death and disability for children. Worldwide, drowning produces a higher mortality rate than any other cause of injury in children less than 15 years of age [3]. Younger kids underneath the age of five are at precise threat, suffering the very best drowning mortality rates international. According to the Centers for Disease Control and Prevention, approximately one thousand children die from drowning annually in the world. In this project drowning accidents is avoided automatically by using the acrylic plate. The earliest swimming alarm system appears in the 1976, then there are some patent applications, but due to various reasons, these techniques are not popular[1]. In 2001, the French Vision IQ company produced the world's first set of drowning alarm system Poseidon; this is the first commercial promotion system. In 2003, Singapore Nan Yang, University of Technology design DEWS.

2. LITERATURE SURVEY

2.1 POSEIDON- Video based drowning detection system in the swimming pool

Swimming pool drowning monitoring system based on video technology is mostly reported in the literature. There are three kinds drowning monitoring system according to the different position of the camera. One is that the camera is mounted on the underwater swimming pool wall, then monitor underwater swimmer status. A limitation of this equipment is that if too many swimmers, the occlusion problem arises. The other is that the camera is mounted upon the water, and monitors the Swimmer posture change. The reflection and refraction of light in air-water interference will affect the image quality, and drowning man feature this method detected is not easy to distinguish swimmers and divers obviously. The third is a combination of the two, underwater camera and aerial camera matched, monitoring the swimmer posture. This system needs constant observation which is the main disadvantage.

2.2 Wearable devices for early monitoring and alarming for drowning incidents

The wearable drowning monitor device can detect drowning accident and alarm. The device has seven main modules, including microprocessor, power module, SD memory card module, LED warning module, acceleration sensor module, water pressure sensor module, and keys module. When swimming the human arm must constantly waving in the water, if drowning, arm motion of floating is significantly reduced, and if falling into the water, almost motionless. According to the physiological response of human drowning, it can detect drowning accident by recording arm motion real-time through wearable wrist accelerometer device. This accelerometer is packed with embedded functions with edible user programmable options, configurable to two interrupt pins. The pressure sensor is installed to judge whether the human body is in the water. The red LED is used for drowning warning. One blue LED is used to get the work status of the device which wills flash every few seconds in order to save the precious energy. Because LED light-emitting angle generally relatively small, 5 red LED lights of upward and around direction is installed to make LED alarm signal caller. Two keys are designed for the demo device.

One is the switch for power. The other is a self-help button. If drowning danger occurs, the swimmer can push the button and the blue LED will shine for help, and if a swimmer accidentally hit the button, he can push the button to cancel the alarm. If the swimmer lost consciousness because of drowning, the device detects the drowning accident and will ON LED light to inform the lifeguard.

The device is worn on the wrist and move in large amplitude along with the wrist when a human is swimming in the water, and the data acquired from accelerator will dramatically change. If a human is drowning in water, his or her wrist almost motionless, and the data acquired from accelerator will have only small changes due to water movement. The drowning detection method uses threshold. First, data from a water pressure sensor is used to judge whether the human body in the water, if the body in the water, then start drowning judgment process. Then, analog signal obtained from the three axis acceleration sensor is converted to digital signal and three axis acceleration values are gained. Hanning filtering method and the moving average filtering are used to reduce noise error.

2.3 LDR based automated drowning detection system in the swimming pool

In the proposed method the human identification in the swimming pool depends on the LDR and laser. First, data from a water pressure sensor is used to judge whether the human body in the water, if the body in the water,then start downloading judgment process.The iron metal plate is placed in the floor of the swimming pool. The laser and the LDR source are placed in the side of the wall. Here we are using an ATmega8l microcontroller to control the whole process. Embedded c language is used for the coding. Initially the laser source which spreads over the swimming pool and the LDR which sense the laser light and which produces the resistance value. Depends on the resistance value the process has been taken.When the LDR value will be kept constant then the alarm will be activated.The resistance value will be changed with respect to the human movement. The message will be sent to the administration by using the GSM service. After 30 seconds there is no change which means the plate will lift automatically using the motor and motor driver. The human has safe in this technique.

3. PROPOSED SYSTEM

The automated drowning detection system works on the principle of differential pressure. The system contains two fundamental modules: to begin with, the wristband consisting of pressure sensors on the transmitter side. Second, the receiver module at the swimming pool site. The children entering the pool territory should wear the wristband. The Pressure at underwater is different and greater than the pressure at the air - water interface. The pressure at a particular depth is measured and set as the threshold. Once the child gets into the pool, the pressure is continuously measured and monitored by the microcontroller. When the current value surpasses the threshold limit an alerting signal is sent to the receiver. The wireless transmission and reception of signals is done through RF module. On receiving the valid signal microcontroller sets the buzzer ON, turns ON the motor driver which in turn lifts the acrylic plate of the multi-floored swimming pool. The kid is brought to air-water interface, i.e. the top level of swimming pool by the acrylic plate.

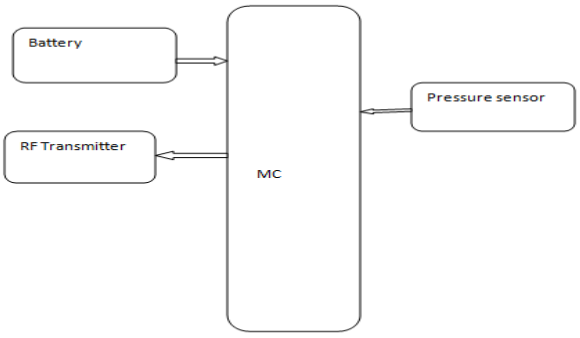

Fig -1: Block Diagram of Transmitter

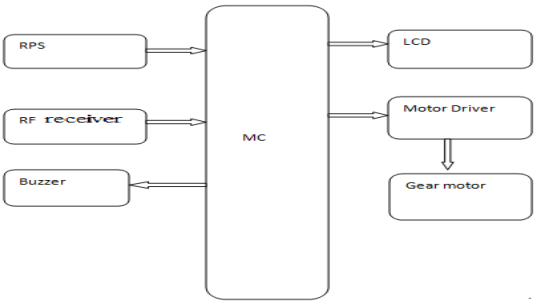

Fig -2: Block Diagram of Receiver

3.1 Microcontroller

AVR microcontroller (Atmega32) is used here. The AVR microcontrollers depend on the propelled RISC design and comprise of 32 x 8-bit universally useful working registers. It is used to monitor the pressure values continuously. As the value exceeds the threshold limit an alerting signal is sent to receiver indicating drowning accident.

3.2 Pressure Sensor

The pressure sensor is used as an input here. The pressure sensor has 4 pins as shown above in figure. This system consists of a diaphragm with the crystal lattice circuit in it. The more the pressure, the more is the bending of the diaphragm and produces a corresponding voltage. This analog voltage is converted into digital and is inputted to the microcontroller.

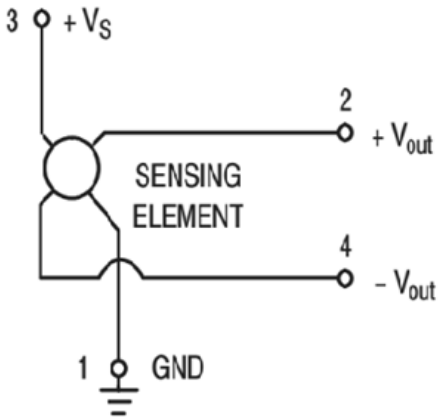

Fig -3.2a: Schematic of pressure sensor

3.3 RF module

The RF module operates at Radio Frequency. This RF module comprises of an RF Transmitter and an RF Receiver. The transmitter/receiver pair operates at a frequency of 434 MHz. An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna. The transmitted signal is received by an RF receiver operating at the same frequency as that of the transmitter.The RF module is used along with a pair of encoder/decoder. The encoder is used for encoding parallel data for transmission feed while reception is decoded by a decoder. Here HT12E-HT12D is an encoder / decoder pair ICs used.

3.4 Motor Driver (L293D Dual H-Bridge)

IC L293D Dual H-Bridge is the motor driver used here. One IC can interface two DC motors which can be controlled in both clockwise and counter clockwise direction L293D has an output current of 600mA and peak output current of 1.2A per channel.The output supply has a wide range from 4.5V to 36V.

4. CONCLUSIONS

Consistently numerous people, including kids, are suffocated or near suffocating in the deeps of the swimming pools, and the lifeguards are not prepared all around to deal with these issues. In this manner raises the necessities for having a framework that will thus recognize the suffocating people and alert the lifeguards at such hazard. It can be installed in International standardized schools where classes are held for training kids.

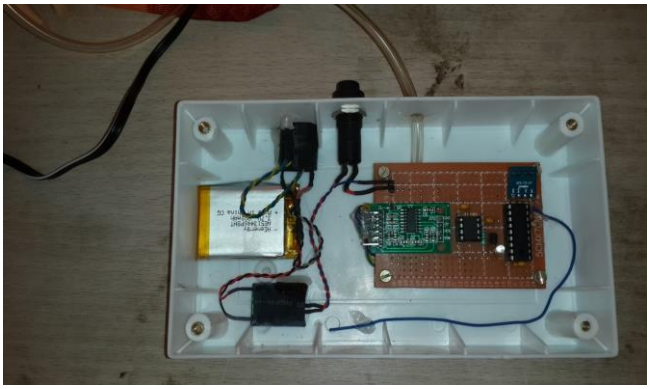

Fig -4.1: Transmitter module

Fig -4.2: Receiver module

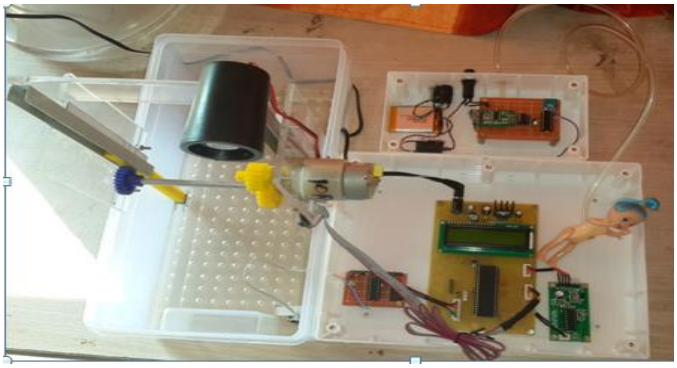

Fig -4.3: Prototype of automated drowning detection system with swimming tub

5. REFERENCES

[1] https://www.linkedin.com/company/aqua-teik

[2] Journal of Computational Information Systems 9: 21 (2013) 8619{8627 Available at http://www.Jofcis.com

[3] International Journal of Innovative Research in Computer and Communication Engineering (An ISO 3297: 2007 Certified Organization) Vol. 3, Special Issue 2, March 2015