Anti Drowning system using remote alert

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Abstract: *This system is very helpful for saving the life of a person drowning in the water. This is done by informing the heartbeat rate of any person in the water to the lifeguard. Our system will monitor the heart rate. It will then transmit using RF. its range would be around 5-6 meters, if under water around 2-4 meters. For this the system includes transmitting and receiver circuit. The receiver circuit is with the lifeguard to inform about the person's heart beat rate, while the transmitting circuit is with the person in the water.*

Keywords: *RF module, Voltage Regulator, ATmega 328 Microcontroller, Heart sensor, Embedded system, buzzer, LCD display, keil compiler*

I.   Introduction

Drowning is the second leading cause of unintentional injury death globally after road traffic injuries. In 2000, an estimated 449,000 people drowned worldwide. Drowning occurs in the ocean, beaches, lakes, ponds, rivers, irrigation canals, animal feeders, swimming pools, spas, and bathtubs. Young infants may drown in buckets filled with rainwater and even in toilet bowls. People drown as a result of Capsizing of watercraft, falling overboard, becoming fatigued or unconscious while swimming, getting entangled in objects underwater and many other causes. Many adult drowning deaths and injuries occur during recreational activities such as boating, swimming, and diving in open waters. Most child drowning deaths in high income countries occur in swimming pools, particularly, domestic pools. Apart from actual drowning, many deaths in water occur due to hypothermia. Even if a victim can stay afloat with the help of a life vest, in cold water, hypothermia can cause death rapidly. In such cases it is difficult to detect whether the person is safe or not. So, the current idea helps to know the status of the person who is in water. By this 99% of the deaths because of drowning can be controlled.

As a result, many inventions to prevent drowning and to rescue drowning victims have been made over the years. The recent trends make the prevention easy by detecting the heartbeat. The proposed system is very helpful for saving the life of a person drowning in the water. The system is informing the heartbeat rate of any person in the water to the lifeguard to save life.

The model of this idea consists of the transmitting and receiver circuit. The receiver circuit is with the lifeguard to inform about the person's heart beat rate, while the transmitting circuit is with the person in the water. The transmitter circuit uses AVR family microcontroller interfaced to LCD screen. This LCD screen is used to display the heart beat level to the lifeguard. This transmitter circuit is powered by 12V battery. Similarly, the receiver circuit also includes AVR family microcontroller and RF module which are attached to 12V transformer. The system also includes heart beat rate sensor. This heart beat rate sensor can be mounted on the hand or head of the person inside water which will help to track the person's heart beat rate. The receiver circuit also includes LED light and a buzzer. This LED light and the buzzer are turned ON when a person's heartbeat level fastens or becomes too low. Thus this system helps to inform the lifeguard as soon as the heartbeat level is not within the limit and thus can save life of the person drowning in the water. This reduces the death rates due to drowning of both the children and the adults.

The heart beat rate sensor can be mounted on the hand or head of the person inside water which will help to track the person's heart beat rate. The LED light and the buzzer are turned ON when a person's heartbeat level fastens or becomes too low. When this happens the buzzer will ring and the lifeguard can get the signal more effectively; even he did not observe the LED glowing, he can save the drowning person by listening to the buzzer sound.
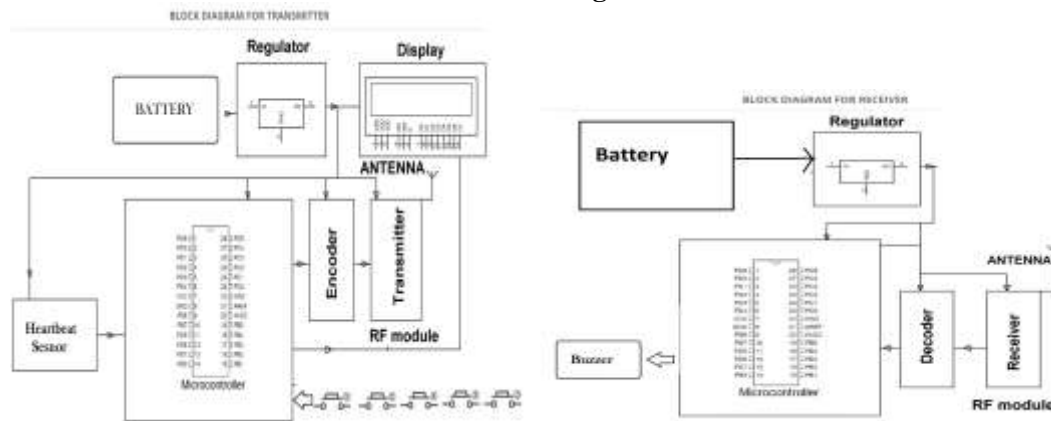
II. Block Diagram

Fig 1.shows transmitter and receiver block diagram respectively.

This system will monitor the heart rate. The detection range would be around 5-6 meters and if under water around 2-4 meters. This system includes both transmitter and receiving circuits. The receiver circuit is with the lifeguard to inform about the person's heart beat rate, while the transmitting circuit is with the person in the water. The transmitter circuit uses AVR family microcontroller interfaced to LCD screen. The transmitter circuit is powered by 12V battery. Similarly, the receiver circuit also includes AVR family microcontroller and RF receiver which are attached to 12V transformer. The system also includes heart beat rate sensor. The receiver circuit also includes LED light and a buzzer. This LED light and the buzzer are turned ON when a person's heartbeat level fastens or becomes too low. Circuit diagram: Conventional devices use RF frequency and works with RF transmitter and receiver. The proposed system is works with the RF module where we can use a RF module and thus can provide a multi user interface.

The transmitter block consist of battery, RF module which further has a encoder and transmitter, LCD, push button switch, Regulator IC and heart sensor. Battery used here is rechargeable battery i.e. when the main supply is ON the battery charges to its full capacity and during power failure the battery is used as a power backup. Thus, the battery can be recharged a number of times. To rectify and get a constant voltage inspite of fluctuations in main supply we use here a 7805 voltage regulator IC. Push button switches are used to set the limit for pulse count i.e. upper limit and lower limit. Depending on these limits the buzzer at receiver rings. LCD is used to display the limit values

The receiver block consist of a RF module, buzzer, microcontroller, transformer, rectifier and regulator. Similar to transmitter block receiver also has the same components barring a few changes. RF module here decoder and receiver to receive RF signals. Here we however use a 12-0-12 V transformer which is connected to 230V mains supply. Like transmitter here also we have rectifier and regulator IC for constant output voltage. The most important part of receiver block is buzzer used to indication emergency condition of swimmer and also LED is connected in case if buzzer fails. The ATmega 328 microcontroller is the main heart of the system. It is common to both transmitter as well as receiver. It will process all our signals and function as per the user requirement. ATmega88 and ATmega328 support a real Read-While-Write Self-Programming mechanism. There is a separate Boot Loader Section, and the SPM instruction can only execute from there. In ATmega48, there is no Read-While-Write support and no separate Boot Loader Section. The SPM instruction can execute from the entire Flash.

III. Project Working

1. As the system start you will see two options on display i.e start and setting.
2. We can select any one of the option by pressing up and down key accordingly and then pressing enter.
3. If we select start option the system enter into operation mode.
4. Before enter in operation mode, user must wear the sensor in his hand index finger.
5. As operation mode start it will initialize for few seconds and then it will display pulse rate (i.e pulse per minute).
6. While in operation mode there are 2 way of detecting the distress signal.
a. Manual distress: If user felt any distress, he/she can long (few second) press the help key which will transmits help signal to the receiver which intern set the buzzer.
b. Automatic distress: This signal is transmitted when the pulse being detect fall out of rang then it will transmits signal to the receiver.
7. To escape back to menu from any of the distress condition user have press back key.

8. The second option in the menu is setting which when enter allow user to set heart beat rang.
9. When entered in setting mode ,it will first allow user to set the lower limit of heart beat rang which is selected by pressing up and down key followed by enter key.
10. Once lower limit is entered system will display the setting for the upper limit which is done same as low limit selection.
11. When upper limit is entered then the system will enter in normal operation mode.
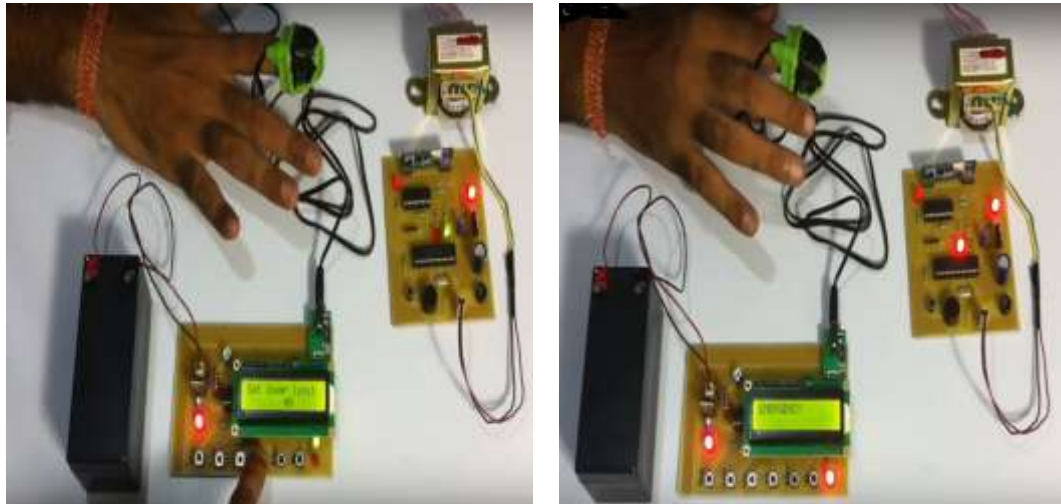

Fig 2. shows setting and working of circuit diagram respectively

IV. Major Building Blocks In The System

Atmega328

PIN DESCRIPTION:

VCC: Digital supply voltage.

GND: Ground.

Port B (PB7:0) XTAL1/XTAL2/TOSC1/TOSC2

Port B is an 8-bit bi-directional I/O port with internal pull- up resistors (selected for each bit). The Port B output buffers have symmetrical drive characteristics with both high sink and source Capability. As inputs, Port B pins that are externally pulled low will source current if the pull-up resistors are activated. The Port B pins are tri-stated when a reset condition becomes active, even if the clock is not running. Depending on the clock selection fuse settings, PB6 can be used as input to the inverting amplifier

Port C (PC5:0)

Port C is a 7-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The PC5.0 output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port C pins that are externally pulled low will source current if the pull-up resistors are activated.

PC6/RESET:

If the RSTDISBL Fuse is programmed, PC6 is used as an I/O pin. Note that the electrical characteristics of PC6 differ from those of the other pins of Port C. If the RSTDISBL Fuse is un-programmed, PC6 is used as a Reset input. A low level on this pin for longer than the minimum pulse length will generate a Reset.

Port D (PD7:0):
Port D is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port D output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port D pins that are externally pulled low will source current if the pull-up resistors are activated. The Port D pins are tri-stated when a reset condition becomes active.
AVCC: AVCC is the supply voltage pin for the A/D Converter PC3:0 , and ADC7:6. It should be externally connected to VCC, even if the ADC is not used. If the ADC is used, it should be connected to VCC through a low-pass filter. Note that PC6.4 use digital supply voltage, VCC
AREF: AREF is the analog reference pin for the A/D Converter.

I. RF MODULES
Radio Frequency Module is an integral part with a control module or unit and an antenna it is used for wireless identification. Main tasks of the RF module are to send an energizing signal via the antenna.. Furthermore a field strength dependent digital output is available for synchronization purposes. The RFM is tuned to resonance with the antenna by adjusting the inductance of the tuning coil at the RFM's output stage.
RF Module can be categorized into two parts:
1.   Transmitter
2.   Receiver

A. RF transmitter
        This wireless data is the easiest to use, lowest cost RF link we have ever seen .Using these components to transmit position data, temperature data, and even current program register values wirelessly to the receiver. These modules have up to 500 ft range in open space. The transmitter operates from 2-12V. The higher the voltage, the greater the range. We have used these modules extensively and have been very impressed with their ease of use and direct interface to an MCU. The theory of operation is very simple. What the transmitter 'sees' on its data pin is what the receiver outputs on its data pin range is 500ft for open area.

Fig 4.shows RF Module

Features:
1.   434 MHz or 315 MHz Transmitter Operation
2.   500 Ft. Range - Dependent on Transmitter Power Supply
          RF Receiver
This receiver type is good for data rates up to 4800bps and will only work with the 434MHz or 315 MHz transmitter. Multiple 434MHz or 315MHz receivers can listen to one 434MHz transmitter or 315 MHz transmitter. Use these components to transmit position data, temperature data, and even current program register values wirelessly to the receiver. What the transmitter 'sees' on its data pin is what the receiver outputs on its data pin.

Features:
1.   434 MHz or 315 MHz Operation
2.   500 Ft. Range - Dependent on Transmitter Power Supply
3.   4800 bps transfer rate

V. Applications & Future Scope
1.   Helpful in the swimming classes where the coach can monitor his students without any inconvenience.
2.   Anti-drowning system can be used for many other water borne activities which make it flexible for situations and locations like private swimming pool, garden ponds, river side, sea water, beach, on a boat, floods, travel, etc.
3.   Helpful for parents to keep check on kids in kids pool

VI. Future Scope

1. It can be extended and also modified by attaching another GSM module and thus it can send a message to the person if he is not near the buzzer.
2. Motion sensors can be placed to detect drowning pattern.
3. Range can be extended by using zigbee coordinators.
4. Anti-loss alarms can be added to device to track them.

VII.   Proposed Result

1. Finally, our System which provides safety, security, and Convenience. As it continuously monitors because of buzzer connected to receiver section It is also efficient in water having impurities. Hence, this system is scalable and flexible.
2. The proposed system has many advantages over the existing system such as the inclusion of the buzzer, the light indication system and the transmission through RF. This will help prevent many drowning deaths in the future.

VIII.   Conclusion

1. It is evident from this project work that circuit has no interference. It can be cheaply made from low-cost locally available components and is waterproof in nature.
2. The components required are compact and portable. (So small and few that they can be Embedded on a single small.).

Acknowledgements

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