PREPARED FOR

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Radius Based Distress Call System

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Abstract. A distress signal is usually used to attain some help [1]. States of emergency come with no prior information [2]. This paper presents a new approach of sending distress messages to registered users within a certain radius. The approach consists of a device, in the form of a wearable gadget and will have a button, linked to an Android app. If a user in danger presses the button, it will record a short message of 5 second audio clip while creating a character "N". This information's will be pushed to user's android device via Bluetooth technology. The dedicated app will then broadcast the clip and other information throughout a radius of 1 kilometer. The combination of modern technology with Arduino and the usage of Android Studio is a revolutionized way of introducing a distress signal transmitting device. A number of experimental tests have been made to measure the performance and yielded an encouraging result with the accuracy of 95.416%, which satisfy the required objectives and specifications of the study.

Keywords: Distress signal, Arduino, Bluetooth, Problem, GPS.

1 Introduction

It's very important for both the victim and the rescue team to communicate during emergency situations [2]. Emergency can be categorized into three types - medical, accidental and security threats [3]. When emergency arises, traditional means of communication may no longer be available for use [2]. But invention of smart phones such as GOOGLE Android device in the field of communication is powerful enough to overcome this problem. Android is an open-source Linux-based operating system which allows developers and manufacturing companies to design software according to their need [4]. Research teams are using this feature of Android to build a system which will allow a person in danger to call for help. At present in Bangladesh, this kind of system is not efficient enough due to lack of innovation. So, distress signal transmitting system is usually designed for the common citizen of Bangladesh who needs help in critical situation. In addition, it's a very low cost, simplified system which will respond to emergencies quickly.

In the past when a person needed immediate help he/she called the rescue team from his/her phone/landline and tell the location [10]. But sometimes there is a chance that the helpline service may be down or busy and the service may be unavailable in that particular location [10]. In that case, victimized person may lose his/her life. So, making tracking system become a top priority. There are several approaches which have been taken to develop tracking system such as Distress Signal Tracker using GPS (Global Positioning Tracking System) and SMS Technology [5], Designing Mobile Applications for Emergency Response: Citizens Acting as Human Sensors [6], Emergency Management System Using Android Application [7] and so on.

Some of the papers proposed very expensive models as they are made of expensive devices such as Zephyr Bluetooth HR device [8], Arduino interfaced with 3G shield

[13] are used. These devices are expensive in respect to Bangladesh. In addition, many of the systems needed a long time to respond to emergencies as the data and information related to the situation are first sent to a remote server [2, 5]. After verifying the situation, necessary steps are taken to help the person in danger. Another intelligent system has been designed which has the feature to take a picture or record a video [6]. This system is useful to verify whether there is actually a real emergency taking place or it's just a prank done by someone. Moreover, some of the systems only work in a particular area [5, 11] and while a person/user is driving in a vehicle [8]. So, if a user faces any problems in other locations, he/she won't be able to use the service for which a person may face grave danger. Furthermore, one of the papers [4] suggests a system which can be used in remote areas with the help of wireless technology. By using this system, instant assistance can be provided during natural disasters. In a study [7], a model is proposed which can only be accessed by registered users so that no one can misuse the device. A new user will need to sign up before using the device and the information of the new user will be stored on a cloud server. However, a major drawback is that the user will need to login every time whenever he/she is to use the application. One of the systems [9] is used to track within a building using Wi-Fi. If the Wi-Fi is down for bad weather or some technical difficulties, tracking won't be possible. Lastly, there is also a device designed for elderly people where a very unique feature is present. Google Cloud Service is used to send direct push notifications to previously registered phone numbers within 5 seconds [12]. Although making a system with registered phone numbers is quite a difficult process for our country.
In this paper, we propose a system which will consist of an app, Android device which will be connected to a Bluetooth sensor. When a person/user need help, he/she will press the button on the device. After that a character "N" will be generated which will be sent to users' android device. Immediately after this, the app will start searching for helper. If found, then the emergency location will be shown to the helper.

The rest of the paper is organized as follows. Section 2 describes details on proposed model with a block diagram. In section 3, detailed description of circuit components is presented, as well as the hardware implementation of the proposed model. Section 4 describes the result analysis. Finally, section 5 concludes the paper.

2 Proposed Model

Figure-1 shows the component required for the proposed model and their working flow.

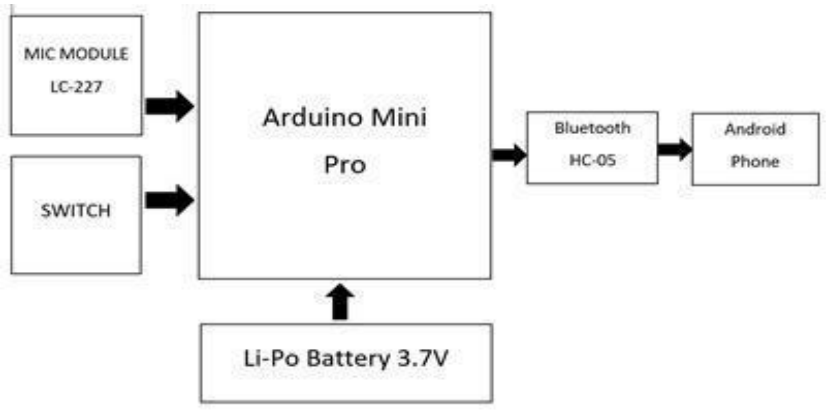


Figure 1: Block diagram of circuit

The two blocks on the left are input device, a mic module and a switch. The middle block is an Arduino pro mini connected with battery. The Bluetooth module and an Arduino device in their respective block serve as output devices.

2.1 Input

We used an LC-227 microphone module which is compatible with the Arduino mini used pro mini used. Our model uses its recording function to record function to record the user's audio message for a brief moment to be transmitted to the android device. The recording starts on the press of a button located on the Arduino board. So long the switch is pressed, the recording is live. Moreover a character 'N' is sent to the Arduino device as soon as the button is pressed, acting as a trigger for some functions**.**

2.2 Processing

Following up input, the recorded audio signal along with the character 'N' is processed and passed to the Ardunio device from the android device from the Arduino pro mini. The Arduino pro mini gets its power from a rechargeable battery set on it. We've panel indicator LED's to show where a signal has transmitted in addition to indicating when the hardware has been connected to an android device.

2.3 Output

Finally, the passed signal is received in the android device with the help of a Bluetooth module and a dedicated app for the purpose. We've used HC-05 as our Bluetooth module. A dedicated application on the android device receives the transmitted audio and the character 'N' and broadcast it in a Kilometer radius around the user. Upon broadcasting, anyone who has the app on their phone and is inside one K.M. radius will get an instant and the audio message. He/She will definitely have the option to help or not according to his /her will..This module maintains routine data, meaning when locations are periodically updated after certain internals to the database if the user wished. The database we've used is Firebase Real time database. It is worth mentioning that upon completion of a distress sequence, its record is automatically time out from the database, ensuring security of the users. The whole algorithm if the workflow can be understood easily from figure-2.

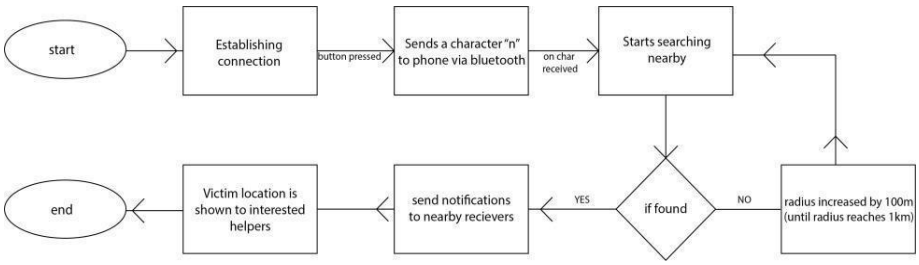
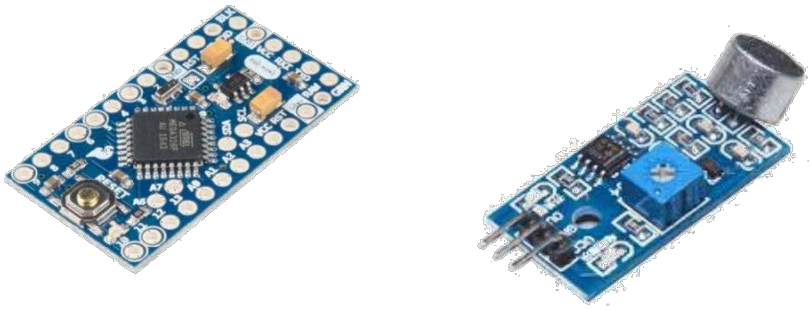


Figure 2**:** Flow-chart

3 System Architecture

For implementing the proposed system an advanced microcontroller called Arduino Pro Mini. This board was developed for applications and installations where space is premium and projects are made as permanent set ups. The Arduino Pro Mini is a microcontroller board based on the ATMega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, an on-board resonator, a reset button, and holes for mounting pin headers. A six pin header can be connected to an FTDI cable or Sparkfun breakout board to provide USB power and communication to the board.



(a) (b)

(c)

Figure 3: (a) Arduino Mini pro, (b) MIC module LC-227, (c) LIPO Battery

In this system a switch is used to start the main processing of the device. It is a simple switch which triggers the Bluetooth module HC-05 to send a Bluetooth signal to the connected device. The switch also starts the MIC module LC-227 and starts recording. We have also used a Lipo Battery of 3.7V which powers the whole system. In figure(5) the Hardware implementation is shown. The Arduino, Bluetooth module, Mic module, battery all are connected with a breadboard.

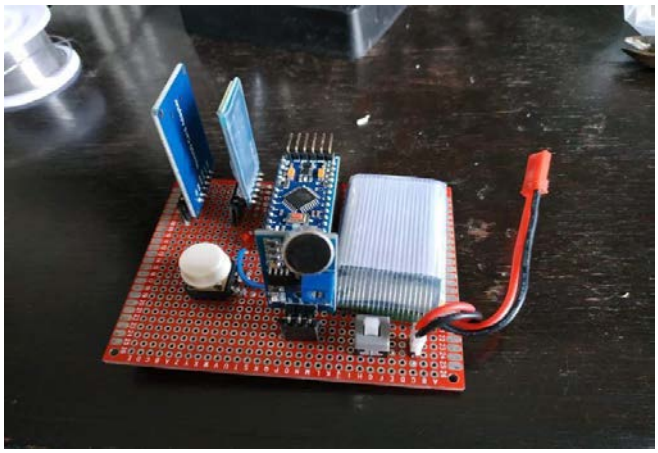


Figure 4: Hardware Implementation

4 Result and Analysis

We measured the parameters by testing out the proposed system. Our parameters includes varying distance, number of users around, and the probability of receiving the distress call by nearby users. The measured results shows expected results and are shown in Table 1 below:

Observation	Radius(meter)	Number of users	Request Received	Error(%)
1	300	10	10	0
2	300	20	19	5
3	600	30	29	3.33
4	600	40	38	5
5	1000	30	28	6.67
6	1000	40	37	7.5

Table 1: Experimental Data

After experimenting 6 test cases, we can conclude that our rate of success in the experimental run was close to a staggering 95.416%.

5 Conclusion

The main aim of this project was to create a low cost distress signal transmitting system which will be useful for getting help during any kind of emergency or disaster. As we designed our system with insufficient resource, it offers a very low budget security system which is quite affordable. With the help of this distress signal transmitting system we will able to save a lot of human life as our system gives rapid service to the victimized persons compared to other pre-existing systems. In the coming years, a re-design of this application can be made where we can add some unique features. But, for now, our project ensures a reliable solution for human safety for our country.

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