

EMERGENCY SMS SERVICES FOR DISABLED PATIENTS

Aditya Nugraha

*Fakultas Teknologi Industri, Universitas Gunadarma
aditya_nugraha@staff.gunadarma.ac.id*

Abstract

Many learning method to educate children with special needs, such as learning to use the application through iPad, or use other special tools. In the learning phase that usually they are accompanied by a parent/baby sitter. The parents or babysitters not always 24 hours at their side. Could be because parents who go to work, or when the babysitter left the children while sleeping. When left as it is, if the children need help suddenly it will be difficult to recall the parent/babysitter page. To overcome this, there is an idea to make a communication tools using short message service media and using Arduino platform. The tool is specifically designed for patients/children with special needs so it is easy to operate and can quickly contact their parents. The results of the design tool is a tool is capable of sending SMS with a delay 5 seconds from the button is pressed and have outreach as far as 14,5 meters from GSM modem.

Keywords: *GSM modem, Message alert, Arduino, RF remote control, frequency*

INTRODUCTION

SMS (Short Messaging System) is a powerful communication technology now a days. The term "SMS" is used as an acronym for all types of short text messaging and the user activity itself in many parts of the world (Ahonen and Moore, 2011). SMS is the most widely used data application in the world, with 3.6 billion active users, or 78 percentage of all mobile phone subscribers (CNN, 2012). SMS is not only used for

communication between individuals but is used to make transactions can even be combined with digital data storage using SMS Gateway technology. SMS Gateway is a software that combines computers with cellular technology that is used to distribute media messages through SMS. In order to sent SMS from other device like computer or mikro kontroler there must be some tools called GSM MODEM. Figure 1 show number of SMS message sent monthly in USA has increasing number over year.

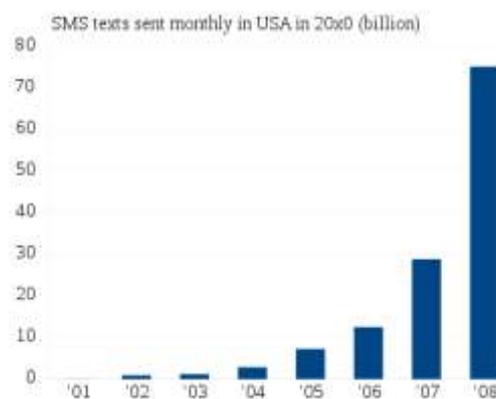


Figure 1. SMS Texts Sent in USA

Today many learning methods to educate children with special needs, such as learning to use the application through iPad, or use other special tools. In the learning phase that usually they are accompanied by a parent / babysitter. But not always the parents or baby sitter 24 hours at their side. Could be because parents who go to work, or when the baby sitter left the children while sleeping. When left as it is, if the children need help suddenly it will be difficult to recall the parent / baby sitter.

In many ways the use of SMS, in Indonesia rare study on the manufacture of the SMS sender tool that is easy-to-use for patients with special needs, such as children with disabilities, the elderly, and the disabled. More study discusses about how to control the device using SMS. Therefore, the project will be made a tool capable of sending SMS messages especially needed by emergency patients can also be operated easily.

RESEARCH METHODS

In this chapter, will be discussed the design and working system of RF (Radio Frequency) Remote Control. System is designed read input from RF transmitter and send the input as the command in to Arduino to send a SMS. RF transmitter designed for easy to use.

In figure 2 RF transmitter is used for the controller of this system. This part has to be easy to use such as one button to operate this system and also be able to achieve as much distance as possible. Before any input on the receiver side, the relay is in a state of NO (normally open) which means that the relay before receiving the input will be in the open circuit condition. In the normally open condition, pin relays are on the side of NC before being given input, and changed it to NO after the given input. After the input has been received, the relay is connected to Arduino and read as input to pin 2 on the Arduino. Arduino is as an intermediary RF transmitter with a GSM modem in order to send SMS wireless and using only one button to operate. GSM modem (GSM) has function sending and receiving SMS (Short Message Service) to mobile phone (general function).

Output from relay is still analog. In Arduino, analog output converted into digital input so data can be processed because data can be read if it is digital. In the Arduino, input from relay is in analog and converted by ADC in Arduino to digital so that input can be read as HIGH (1) or LOW (0). In the GSM modem, the digital output is used as a marker when SMS is sent and when it should be on standby.

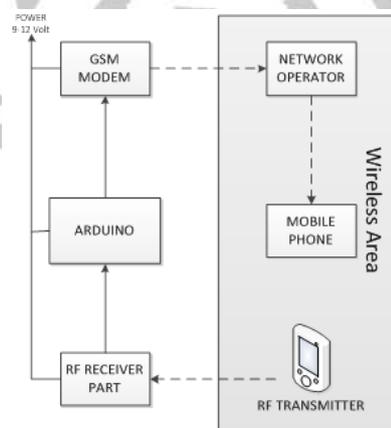


Figure 2. Block Diagram System

Radio Frequency Remote Control

Radio Frequency (RF) Remote consists of 2 part, Transmitter and Receiver. Frequency used in this RF remote is 433 MHz, enough to be used as a remote control in the residential area. Transmitter part is using TWS-434 and the receiver using RWS-434. This transmitter and receiver is set up so that it can be directly used for communication did not need to setting up the frequency. Transmitter part consist of 4 button, one LED and one antenna as seen in figure 3.

Each button in transmitter is presented one relay in receiver. From figure 3 receiver part, relay from below is for button 3, and next up is for button 2, button 1, and the highest is for button 4. Relay is in condition normally open (NO), when there are no input relay is in open state and when the input is coming, relay is in closed state. It means that relay only active when there is an input from transmitter and relay acted as an output with analog value. In Receiver part, antenna

length is 28.5 cm rolled with a diameter of 1 cm and in transmitter antenna can be length as far 2.32 cm.

RF remote control often used to operate another device in few meters like garage door, television, car alarm system, etc. Many studies only work on how to using RF remote and Arduino to operate other tools, but there are no studies using this two part for sending SMS. So, this project can be used as a reference for the advanced study.

Testing Gsm Modem

GSM Modem is a modem that can be used like a cellular phone, send or receive SMS, GPRS, Voice Call, etc. In this project, Fastrack M1306B is used for GSM modem. Simulation is using Hyper Terminal as a simulation tool, the block diagram of this simulation is in figure 4. Hyper Terminal is a software that can be used for emulating serial communication from PC into other device connected by serial cable in serial port.



Figure 3. RF Remote Control



Figure 4. Simulating GSM modem using HyperTerminal

Algorithm System

In this part discussed about flowchart, designing, and making this system. After trying GSM modem and connection between RF remote and Arduino, it is time to design the whole system. The concept shown in figure 5 where the flowchart showing how this system works.

A description of the flowchart was when first turned on, all device is on. Next is check GSM modem and Arduino connection using AT from AT command. After that, Setup the SMS mode for GSM modem using AT+CMGF in Arduino. This part is important, because will be different between SMS mode using Text mode and PDU mode. For this system is using Text mode. This step is marked as a blink indication in LED GSM modem. After check and setup has done, all the devices in standby mode ready to receive

signals from the RF transmitter. Next is the reading on the RF transmitter whether button has been pressed or not, if pressed it will generate a HIGH value and if it is not pressed, the system remains standby.

After a HIGH value received in RF receiver, it will be passed as an input on port2 Starduino. Because reading is HIGH value, then enable the command to send AT command from the Starduino into GSM modem connected using a serial cable. AT command read the GSM modem so that GSM modem can send SMS at that time. SMS sent, and eventually arrive at a destination that has been previously programmed.

After modeling the system is complete the next step is programming the system itself. Coding system is the incorporation of the C language with AT command.

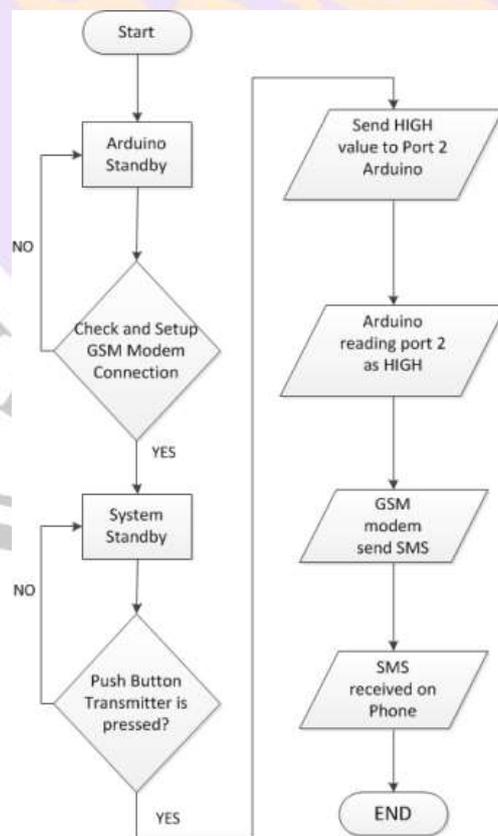


Figure 5. Flowchart How the System works

Method of Measurement

After doing modeling and coding program prepares next step is to merge the two, which is uploading program on Starduino and try such a tool could very well. The testing tool will measure how long it takes from the time delay on the RF remote button is pressed until the SMS is received at the destination number, in addition there will also delay the distance measurement range of the RF transmitter with 3 kinds of antenna length is used, and the last delay is a measurement of the distance from the RF transmitter.

The first experiment was a failure to run the tool, which when in standby mode, the value is read on port 2 is not always LOW. Therefore, the design of the new, of there lay port A representative NO Arduino connected to port2, then the resistor 100K Ohm parallel towards ground. For port B on the relay, connected to a voltage of 5v Starduino taken from the board. Based on the latest design, apply to the actual tools that can

be seen in figure 6. For the 9-12 volt power adapter used to power the Arduino with the RF receiver. Arduino is connected to GSM modem using serial cable.

In the distance measurement data acquisition and delay receiving SMS, conducted in the room with the room layout as in figure 7. Thee xperiments were conducted in the room is intended to determine whe ther the system is able to work well with the condition of many obstructions such as walls. The receiver part is located in star symbol.

The experiment will be carried out in stages starting with the conditions measurement antenna RF transmitter was not stretched and measured from the transmitter to there ceiver conditions adjacent to the later receivers can no longer catch the signal transmitter so that SMS was not sent. The experiment was repeated with gradually lengthening the antenna is divided into 3 stages: 0.14 cm antenna, antenna 1.32 cm, 2.32 cm antenna.

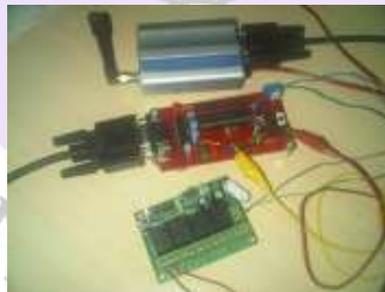


Figure 6. Testing Application

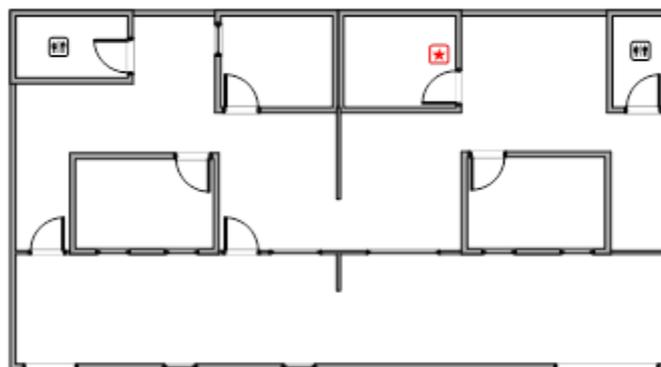


Figure 7. Layout Indoor Testing Room

RESULTAND DISCUSSION

This section discussed about the testing result as a chapter 3 said that there are three condition for this testing based on antenna length in RF transmitter part. In Receiver part, antenna length is 28.5 cm rolled with a diameter of 1 cm. Maximum characters from SMS to be sent is 160 character SMS message read as 1. Because the SMS message to be send is include in program coding, the phrase "Perhatian! Pasien membutuhkan bantuan segera!" SMS the number of characters used is as much as 49 character, do not cross the maximum limit of 160 characters in one SMS message. The simulation soccur from TELKOMSEL operator networks to INDOSAT, but did not measure the delay between other network operators. Retrieval of data for simulations performed at 12:00.

First Configuration

As known earlier, the trial will be held three conditions RF transmitter and calculated how much delay is needed to send SMS after the button is pressed. In this 1st experiment, the RF transmitter antenna is not extended, only 0.14 cm. The experiment starts by measuring the distance from 0 cm or very close to the receiver and will continue until it can no longer be accepted SMS.

In the first experiment the maximum distance measurements for size 0.14 cm long antenna is capable of reaching

the farthest distance 800 cm with varying delay variance. Experiments remain to be done until 1000 cm distance to see if the SMS can still unacceptable and showed that the maximum distance fixed at 800 cm. For the calculation of the average delay, the longest delay, and delay the emergence of the number of times they are used Excel functions. Once calculated using the help function on excel it showed that the average delay of 4.73125 seconds, the longest delay is 5.1 seconds, 4.6 seconds and the fastest of the first experiment six times by 4.6 second delay occurs.

Second Configuration

The second experiment is similar to the first experiment, the difference is only in the length of the antenna is 1.32 cm. The experiment starts again from a distance of 0 cm where the RF transmitter is placed very close to the receiver and continued until the furthest distance that can be achieved with a length of 1.32 cm antenna.

The furthest distance that can be achieved in this second configuration is 1000 cm, exceeding the first configuration which is only capable of 800 cm. Once calculated using the help function on excel it showed that the average delay of 5.035 seconds, the longest delay is 7 seconds, 4.5 seconds and the fastest of the first experiment five times a delay of 5 seconds occurs.



Figure 8. Antenna Configuration For RF Remote Transmitter, 1 Is For 0.14 Cm, 2 Is 1.32 Cm, And 3 Is 2.32 Cm.



Figure 9. System Delay For 1-3 Configuration

Third Configuration

On the third attempt to point the antenna stretched to the maximum of 2.32 cm. Just like the previous experiments, this experiment started again from scratch is the closest distance to the receiver. The point is to get a diverse variety of data regarding the delay system and see if there was an effect of the delay is long antenna.

Last experiments were carried out until 1750 cm fixed and seen that the receiver system is no longer able to receive the signal transmitted by the transmitter so that the SMS was not sent. Once calculated using the help function on excel it showed that the average delay of 4.9137 seconds, the longest delay is 6.4 seconds, 4.5 seconds and the fastest of the first experiment eight times a delay of 5 seconds occurs.

After conducting three experiments above, then do then extstage of the analysis of the experimental results with a comparison tool distribution delay values that exist in three configurations that can be inferred if there is a delay between the distance effects. For the sample was taken at 5 second delay as a pointer analysis. Delay was taken because of the three experimental result, figure 9 show that 5 second delay is the most common value.

In first experiment, see that a delay of 5 seconds occur at a variety of distances, which is at a distance of 200 cm, 300 cm. From a distance of 0 to 200 cm there was delay of 4.5 seconds. 5 second delay

occurs again at a distance of 700 cm and from 300 to 700 cm occurs delay varying from 4.5 to 5.1 were scattered randomly. In next experiment, found that the value of 5 seconds it happened 5 times and the location was not going to happen within a sequence. In the third experiment was obtained at a distance of 200-300 cm delay always the same, which is 5 seconds, and the remaining 5 second delay spread randomly.

In experiments with the shortest distance, Arduino pin13 LED will blink when the signal is received by the Arduino, then the light will also blink once transmitter and receiver lights continued flashing twice indicates AT command submission process that occurs at 2.6 seconds to get to the GSM modem to send SMS.

The third experiment is done on indoor as described in the design stage, and after the above experiment, the experiment can be described in the layout of the building so we can get the floor plan as in Figure 10.

The system is placed on the red star symbol, and experiments carried out by walking while watching distance from the star towards point C, where C is outdoors. In the picture shown comparisons furthest distance that occurs when data retrieval, there can be seen that the system does not affected by the circumstances surrounding the walls and barriers that are in the room.

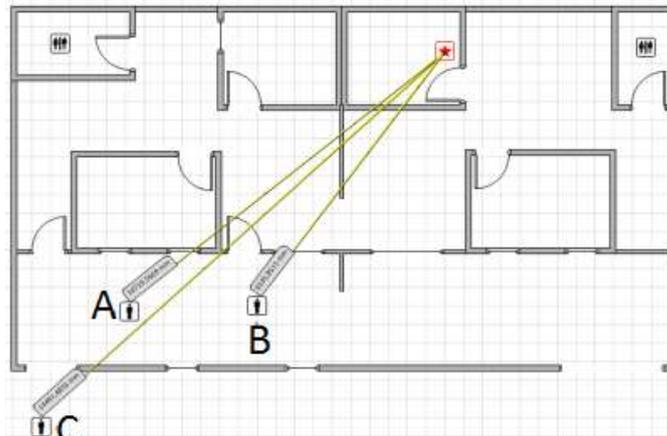


Figure 10. Location of The Third Distance Record Trial

CONCLUSION

System can be applied because the receiver and serial communication works fine. By using only one button in operation, the tool is expected to ease special disabled patients to send emergency messages in the form of SMS. Based on data from the experiment, the system can reach a distance of 14.5 meters to allow the tool to be used in residential, or hospital room. Its use is also not limited by the walls of the room bulkhead. The system had a delay 2.6 second to activate the GSM modem to send the message, and about 5 second until the SMS is accepted to the receiver. SMS received to a number equal to the SMS destination set on the Arduino so there is no problem with the Arduino serial communication between GSM modem.

REFERENCES

- Agsari, W. (2012). Distributed Temperature Sensor Based on Telepon for Mobile Phone. Thesis. Dipartimento di Ingegneria dell'Informazione. Jakarta.
- Aini, E. (2012). Arduino Based Microblogging Service For Emergency Room Capacity Alert. Thesis. Jakarta.
- Chittaro, L., Carchietti, E., De Marco, L., Zampa, A. (2011). Personalized Emergency Medical Assistance For Disabled People. *Springer*. Volume 21, Issue 4-5, pp 407-440
- Katz, Alissa. (2014). Emergency Communication Excludes People with Disabilities, Report Finds. *Hearing Journal*. Volume 67, Issue 7, pp 24 - 26
- M. Shirali-Shahreza. (2006). Emergency SMS. *Proceedings of the SICE - ICASE International Joint Conference (SICE - ICCAS 2006)*, Busan, KOREA, October 18-21, 2006, pp. 1139-1142
- M. Shirali-Shahreza and S. Shirali-Shahreza. (2008). Encouraging Persons with Hearing Problem to Learn Sign Language by Internet Websites. *Proceedings of the Workshop on Advanced Learning Technologies for Disabled and Non-Disabled People*. Santander, Spain, July 1-5, 2008, pp. 40-43.