

Kids Detector System via Radio Frequency Identification (RFID)

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Abstract- This paper will discuss about how to create a system or device that can help teacher or caretaker in monitoring their kids at the kindergarten using the RFID technology. The system is operates by warn the caretaker in term of sound if their kids over the area/ boundries of the antenna. Visual Basic. Net was used to process the data and show the output. Finally the strength of the RF wave was measured to determine how far the antenna of the system can transmit signal and to determine if there is any different when the tag is at different locations.

Keywords -Radio Frequency Identification (RFID), Visual Basic. Net (VB.Net), Graphical User Interface (GUI).

1.0. INTRODUCTION

Radio frequency identification (RFID) is an emerging technology and one of the most rapidly growing segments of today's automatic identification data collection (AIDC) industry. In general term, RFID represents a way of identifying objects or people using radio waves. Identification is possible by means of unique numbers that identify objects, people and information, stored on microchip which can be read automatically, unlike barcodes that need to be scanned manually [1]. In bar coding, laser light is used as the data carrier. Bar coding is therefore referred to as an optical technology and RFID is called a radio frequency or RF technology [2].

RFID have severals types, such as low frequency (LF), high frequency (HF), ultra high frequency (UHF) and microwave frequency. Each type of RFID have its own frequency. This frequency indicate the distance that the RFID reader can detect and capture the information from the tag. If the frequency is high, the distance that the reader can detect is long [4].

All RFID system are comprised of the three main components which is tag, reader and data processing subsystem sometimes called controller[1] as shown in Figure 1. The basic functions of a RFID tag is to store and transmit data to the reader. Each RFID tag has the unique identifier, says unique ID and is attached to some object. Data processing subsystem reads the

unique ID of a RFID tag through the RFID reader. That enables user to identify the data provided with the RFID tag and derive appropriate information about the object. RFID tags are classified into two types. One is active tag that has own battery. Active tag use its on-board power supply to transmit its data to reader. Its doesn't need the reader's emitted power for data transmission, and the other type is passive tag that is battery- less [3]. Passive tags are typically smaller and less expensive to produce than active tags [4]. Usually RFID tag consist of chip and antenna. RFID tags are interrogated by readers, which in turn are connected to a data process in subsystem. In a passive system the RFID reader transmit an energy field to energize[4], wakes up the tags and powers its chip enabling it to transmit or store data to the reader. An RFID reader also called interrogator, is a device that can read from and write data to RFID tags. Reader consist of antenna, an RF electronic module and controller electronic module. Thus a reader is also double up as a writer. The act of writing the tag data by a reader is called creating a tag [4]. In addition, the reader often includes a serial communications (RS232 cable) capability to communicate with the data processing subsystem [3]. Data processing subsystem is the 'brains' of any RFID system, that recieve and process the information that the reader collect from the tags [5], and the data processing subsystem will come up the outputs or results after process the information based on the information recieve from the reader.

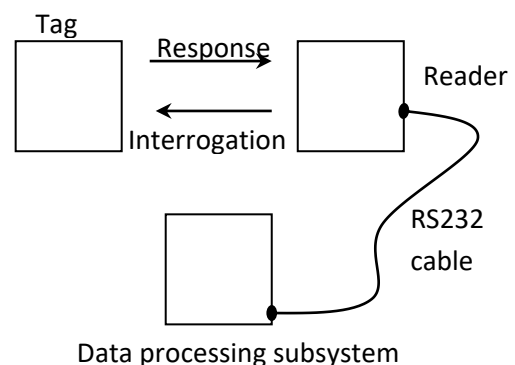


Figure 1: Three main components of RFID.

Visual Basic.Net language was designed to make user friendly program and easier to develop. Prior to the creation of Visual Basic, developing a friendly user interface usually required a programmer to use a language such as C or C++, often requiring hundreds of lines of code just to get the window to appear on the screen. Now the same program can be created with much less time and fewer instruction using a language that is a direct descendent of BASIC and Visual Basic coming up with the graphical user interfaces (GUI). Graphical User Interfaces or GUIs is a visual operating display that the monitor present on the monitor to the computer operator. GUI usually have common characteristic such as windows, icons, menus and push buttons (WIMP). Collectively WIMP are pictures that bring forth a certain action or an action space. The user issues commands via the GUI to computer applications [6].

2.0. SCOPE OF WORK

2.1 Problem Statement

Today, lots of parents is a working, so they find someone else to take care of their children such as send their children to kindergarten. This situation cause the caretaker need to pay more attention and effort in order to monitorize the kids. Sometimes the caretaker couldn't monitorize all of the kids because of large numbers of kids to be monitorize.

In response to this situation, this project is aiming to develop a Kids Detector system via RFID in assisting caretaker by warn them if the kids is outside the radiation pattern of the antenna of the system using Radio Frequency Identification (RFID) technology.

2.2 Objective of The Project

The project title is Kids Detector System via Radio Frequency Identification (RFID). The objective are:

- ♣ To develop a system that can help and warn caretaker if the kids is outside the radiation pattern of the antenna.
- ♣ To evaluate tags contact position.
- ♣ To find how far the antenna of the system can transmit signal.
- ♣ To measure the strength of RF wave when the tag is at different location.

3.0. METHODOLOGY

The research methodology used for this project is implementing steps by steps of progress as shown in Figure 2 below.

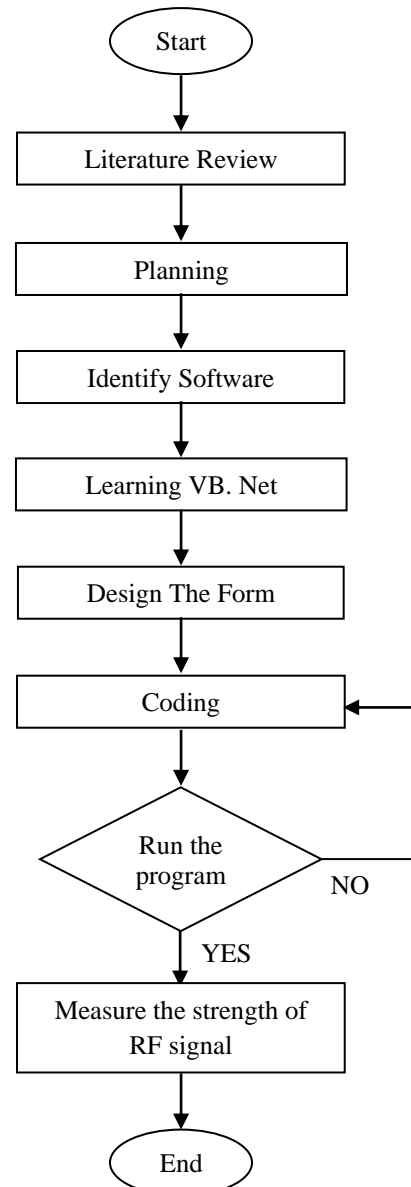


Figure 2: Flow chart of methodology

3.1 Literature Review

The literature review, survey and analysis work has been done. The literature review has been done in order to understand and study the history and the purpose of this project.

3.2 Planning

The study of the RFID system and specification. After that the detail system study requirement has been identified. Then the study about the development of the RFID system.

3.3 Identify Software

To identify the software to be use, the description of the proposed application system to be developed in language that the user can understand has been describe. Software design use system process flow, data flow diagram and documentation is transforming the solution in conceptual/ logic to necessity of the application system.

3.4 Learning Visual Basic. Net

Study the source code command of VB. Net and learn to create a project for the web browsing program. A project in VB. Net is a place to store the pieces of your program and keep those pieces organized. The project, a form also known as a form designer displayed in the Integrated Development Environment (IDE). This form represent a window that will display when the program is run. Then learn to build the user interface the visible part that users interact with by adding controls from the toolbox to the form.

3.5 Design The Form

In design the form, included the identifying of element to be displayed on the screen.

3.6 Coding

Lastly coding which is each computer program has written data.

3.7 Run

While the program and unit testing, included module test which is the program should be compile and assemble and do necessary software debugging until all source codes can be successfully assemble into object files without any errors. As included module integration which is link together all object files to create the final executable code, and lastly functional test which is to test the programming to ensure that the final results conforms to the project requirement.

3.8 Measure the strength of the RF signal

The strength of the RF signal is measured interm of gain to see what will happen when the tag is at different location.

4.0. RESULTS AND DISCUSSIONS

4.1 The GUI of The System

Figure 3 show the GUI of the system which is consist of two buttons one is to turn on the antenna, while the other one is to activate the reader and a textbox to show up the output of the system. After the antenna is turned on and the reader is activated, the reader will transmit the RF signal to the tag and the tag send the unique ID to the reader through the antenna, if the unique ID of the tag is same as the unique ID that has been programmed in the data processing subsystem the phrase "NO BODY IS OUTSIDE THE AREA" will appear as well as the green box on the textbox as shown in Figure 4. This mean that the kid is inside the range of the radiation pattern of the antenna of the system. If the phrase is "WARNING!!! SOMEBODY IS OUTSIDE THE AREA" appear and the textbox turn to red as well as a sound is produced as shown in Figure 5, this mean that the reader does not get the unique ID to be send to the data processing subsystem to be compared with the unique ID that has been programmed in the data processing subsystem. In other words, the kid is outside the radiation pattern of the antenna of the system that can detected by the antenna.



Figure 3: The GUI of the system

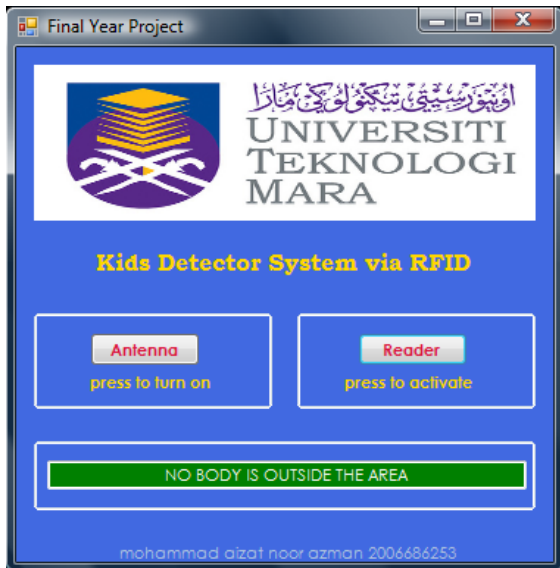


Figure 4: The output of the system if the antenna of the reader detect the tag.



Figure 5: The output of the system if the antenna of the reader can't detect the tag.

4.2 The Measurement of The Strength of RF When The Tag Is At Different Position

A test is done to measure the strength of the RF signal when the tag is at different locations using spectrum analyzer. Figure 6 shows the location of the tag while Table 1 show the strength of the the RF signal when the tag is at several location based on the location in Figure 6.

Based on Table 1, result shows that when the tag is at location A, D and O the gain is high compared to others, this is because the antenna of the reader can't detect the tag at that location, this is

because the location of the tag is outside the radiation pattern of the antenna.

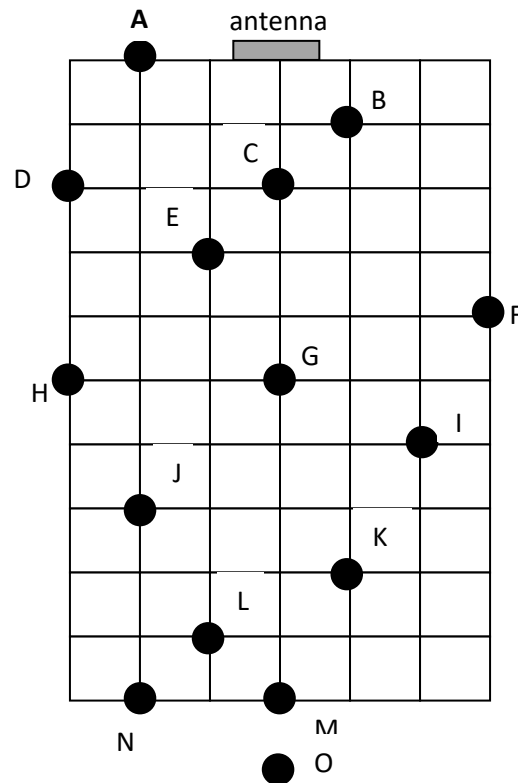


Figure 6: The positions of the tag.

Location	Gain (dBm)
A	-12.86
B	-3.34
C	-4.28
D	-12.92
E	-4.38
F	-4.67
G	-5.64
H	-6.15
I	-6.39
J	-6.50
K	-7.19
L	-7.17
M	-7.40
N	-8.16
O	-13.67

Table 1: The position and the strength of the RF.

Table 1 also shows that as the location of the tag is distance away from the antenna the gain will increase negatively. Means that, the distance between the tag and antenna inversely proportional with the gain of the radiation pattern. In addition, Table 1 shows eventhough the distance between when the tag is at location G and location H is same, the result is different because both tag is at different angle of radiation pattern. Gain when the tag is at location G is smaller than gain when the tag is at location H because tag at location G is

perpendicular with the antenna while tag at location H is not. The same thing happen between when the tag is at location M and location N, the results is different because the tag is at different angle of radiation pattern.

5.0. CONCLUSION

In future the technology of the RFID will be paid more attention and will take place of the bar codes technology in identifying objects or people, because of the advantages of the RFID itself compared to the bar codes. One of the application is as being discuss in this paper. This system will help caretaker in monitoring the kids in term of warning them if the kids is outside the radiation pattern of the antenna of the system. So that caretaker can aware and take an early action if the system is alarm.

The strength of the RF signal is depends on several factor, such as the distance between the tag with the antenna and the position of the tag. The strength of the RF signal is inversely propotional with the distance of the tag. When the distance of the tag is close to the antenna, the strength of RF signal is strong, but when the distance of the tag is increase the strength of the RF signal is decrease. Another factor that influence the strength of the RF signal is the position of the tag. When the position of the tag is change, the angle of the radiation pattern will also change. The different in angle of radiation pattern will give different strength of RF signal. The RF signal is more strength when the tag is perpendicular with the antenna.

By using the Visual Basic.Net it also help in the developement of this system. It is not just reduce the number of lines of code, it also have the GUI that can help the user to use this system easily.

In future, hopefully this system will be improved with adding some other function such as the system updated and come up with database so that caretaker can know the details about the kid that outside the radiation pattern of the antenna of the system and connect the system with GPRS so that caretaker know the exact location of their kid.

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REFERENCES

- [1] Harvey Lehpamer, "RFID Design Principle", Artec House, 2008.
- [2] V. Daniel Hunt, Albert Puglia, Mike Puglia, "RFID A Guide To Radio Frequency Identification", John Wiley & Sons Inc., 2007.
- [3] Toshihiro Hori, Yuuki Ota, Norie Ochitomi, Kouichi Mutsuura, Hiromi Okada, "A Multi-Sensing Range Method for Position Estimate od Passive RFID Tags".
- [4] Sandip Lahiri, "RFID Sourcebook", IBM Press Pearson plc, 2006.
- [5] C. Law, K. Lee, K. Y. Siu, "Efficient Memoryless Protocol For Tag Identification", 2000.
- [6] David Schnieder, "An Introduction To Programming Using Visual Basic .Net", Fifth Edition, Prentice Hall, Upper Saddle River, New Jersey 07458, 2003.
- [7] William E. Burrows, Joseph D. Langford, "Learning Programming Using Visual Basic .Net", McGraw Hill Irwin, 2003.
- [8] Evangelos Petroustos, Patrick G. McKeown, Rod stephens, Jim Keogh, Thearon Willis, Bryan Newsome, Bill Sempf, Rachele Reese, "Introduction To Programming Using Visual Basic", Wiley Pathways, 2008.
- [9] Jeff Salvage, "The Visual Basic .Net Coach", Addison Wesley, 2002.