SMART STICK WITH GPS NAVIGATION AND SENSOR DETECTION

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(SOFTWARE DEVELOPMENT)

UNIVERSITI SULTAN ZAINAL ABIDIN

2018
DECLARATION

I hereby declare this report is based on my original work except for quotations and citation, which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at University Sultan Zainal Abidin or other institutions.
CONFIRMATION

This project report title Smart Stick Using GPS Navigation and Sensor Detection Based on Rapid Application Development (RAD) was prepared and submitted by Nurafiqah Binti Rosman and has been found satisfactory in terms of scope, quality and presentation as a part of fulfillment of the requirement for the Bachelor of Computer Science (Software Development) with honors in University Sultan Zainal Abidin.

Signature : ........

Supervisor : Mr. Isa Bin Awang

Date : 
DEDICATION

First of all, I am thankful to Almighty Allah are The most Gracious and The Most Merciful, who give me strength and patience to work and finish this proposal report. I would like to take this opportunity to work express my heartiest gratitude to my supervisor for the support, patience, guidance and invaluable advice. Thank you to my lecturer of Faculty Informatics and Computing for the guidance to help me to complete this proposal report. A big thanks to my family especially my father Rosman Bin Ahmad and my mother Siti Hindun Binti Othman for the strength and every single advice that you give to me. For my friends thank you for your great support, prayers and encouragement during the completion of this project.
ABSTRACT

This project was developed as we see there are no initiative for blind person to make them feel save when they walk outside without guardians. The life of blind people is very difficult and challenging, they can’t see an object in front them and sometimes they can get hit by object even human and it actually can lead to injured. This Smart Stick is intended to help reduce the difficulties faced by blind people. This stick will be embedded by sensor to senses any object or human in front of them. Besides that, the tendency to blind people get lost is very high because they can’t see the road. With that we use GPS to track where they go and this stick will inform the keeper the current location whenever they go to anywhere.
ABSTRAK

Projek ini dibangunkan kerana inisiatif untuk orang buta pada zaman adalah kurang dan untuk membuakan mereka berasa selamat apabila keluar untuk berjalan tanpa perlu dijaga. Kehidupan jika orang buta sangat sukar dan mencabar, mereka tidak dapat melihat objek di hadapan mereka dan kadang kala mereka boleh terkena objek walaupun manusia sendiri dan ia boleh menyebabkan kecederaan. Smart Stick ini bertujuan membantu mengurangkan kesukaran yang dihadapi oleh orang buta. Kayu ini akan diletakkan sensor untuk mengesan sebarang objek atau manusia di hadapan mereka. Selain itu, kecenderungan untuk orang buta hilang adalah sangat tinggi kerana mereka tidak dapat melihat apa yang berada dihadapan mereka. Dengan itu kami menggunakan GPS untuk menjejaki tempat mereka pergi dan kayu ini akan memaklumkan penjaga lokasi semasa setiap kali mereka pergi ke mana-mana sahaja.
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<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD</td>
<td>Context Diagram</td>
</tr>
<tr>
<td>DFD</td>
<td>Data Flow Diagram</td>
</tr>
<tr>
<td>ERD</td>
<td>Entity Relationship Diagram</td>
</tr>
<tr>
<td>GPS</td>
<td>Global Positioning System</td>
</tr>
<tr>
<td>GPRS</td>
<td>General Packet Radio Service</td>
</tr>
<tr>
<td>GSM</td>
<td>Global System for Mobile</td>
</tr>
<tr>
<td>LCD</td>
<td>Liquid Crystal Display</td>
</tr>
<tr>
<td>RAD</td>
<td>Rapid Application Development</td>
</tr>
<tr>
<td>IoT</td>
<td>Internet of Things</td>
</tr>
</tbody>
</table>
Chapter 1

Introduction

1.1 Introduction

Vision is the most important part of human physiology as 83% of information human being gets from the environment is via sight. Based on report Sinar Harian on 4 October 2018, at least one individual in the country is at risk of having blindness every week due to eye diseases such as diabetes Retinopathy (diabetes eye disease), Glaucoma (eye disorders due to high intraocular pressure) and cataract. Head of Ophthalmology Department of Sultanah Aminah Hospital Johor Bahru Dr Francesa Martina Vendargon said the average risk of blindness often attacks individuals aged 40 years and over.

The life if blind people is very difficult and challenging, they can’t see an object in front them and sometimes they can get hit by object even human and it actually can lead to injured. The number of visually impaired people are expected to grow in the future due to various reasons. Visual information is the support for most navigational tasks, so visually impaired people are facing difficulties because of lack of necessary information about the surrounding environment and atmosphere. Physical movement is a challenge for visually impaired persons, because it can become tricky to distinguish where he is, and how to get where he wants to go from one place to
another. To navigate unknown places that he will bring a sighted family member or his friend for support. Over half of the legally blind people in the world are unemployed. Because limited on the types of jobs they can do. They have a less percentage of employment. They are relying on their families for mobility and financial support.

One of the initiatives is for blind person to make them feel save when they walk outside without guardians is Smart Stick. The Smart Stick is intended to help reduce the difficulties faced by blind people. This stick will be embedded by sensor to senses any object or human in front of them.

The tendency to blind people got lost is very high because they can’t see the road. With that we use GPS to track where they go and this stick will inform the keeper the current location whenever they go to anywhere. It is not much helpful for them in order to avoid obstacles, the Smart Stick for Blind people in which visually impaired person can be able to detect the object from a further distance and they could avoid it using ultra sonic sensors, and if they are lost, using GPRS and GSM modules their family members can track them easily.
1.2 Problem Statement

Blind person has trouble to maintain daily activity, lots of difficulties get raised while they are travelling from one place to another place. The most important one is detection of the obstacles when they are walking. Since they cannot see, they often get hit by objects in roads like poles, walls, cars, people etc. as a result they may severely injured.

To navigate unknown place, he will bring a sighted family member or his friend for support. There are chances that they can get lost. In such cases, it is very difficult for their family members to find them. One of troublesome problem is, they forgot where they put their stick.

1.3 Objective

i. To study a system that can help blind people to walk properly without getting hurt

ii. To implement and design a system that can help keeper to find out where blind people go using GPS and to detect any obstacle in front them using sensor detection

iii. To test the effectiveness and beneficial of the system to blind people and people close by.
1.4 Scopes

i. Blind People
   • Give direction to the guardian.

ii. Keeper / Guardian
   • Register themselves as guardian.
   • Can view where blind people go.

1.5 Limitation of Work

i. The stick does not detect the water.

ii. Need many ultrasonic to used

iii. The stick need internet connection to detect the GPS.

1.6 Expected Result

i. The stick will able to help blind people to walk properly, without need any help from others

ii. The keeper or guardian doesn't need to worry about where they want to go, because they can track it.

iii. Able to create a low cost and efficient stick to blind people.
1.7 Project Planning

The project schedule is designed in Gantt Chart to describe the flow of activities which involves while developing this project.

<table>
<thead>
<tr>
<th>No</th>
<th>Activities</th>
<th>Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Topic Discussion and Determination</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Topic Project Proposal</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Proposal Writing-Introduction</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Proposal Writing-Literature Review</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Proposal Slide Presentation</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Proposal Progress Presentation</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>Discussion and Correction of the Proposal</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>Proposed Solution-Methodology I</td>
<td>7</td>
</tr>
<tr>
<td>9</td>
<td>Proposed Solution-Methodology II</td>
<td>8</td>
</tr>
<tr>
<td>10</td>
<td>Proof of Concept - Prototype</td>
<td>9</td>
</tr>
<tr>
<td>11</td>
<td>Drafting Report of the Proposal</td>
<td>10</td>
</tr>
<tr>
<td>12</td>
<td>Submit draft of report to supervisor</td>
<td>11</td>
</tr>
<tr>
<td>13</td>
<td>Seminar Registration-Project Poster</td>
<td>12</td>
</tr>
<tr>
<td>14</td>
<td>Seminar Registration-Project Slide</td>
<td>13</td>
</tr>
<tr>
<td>15</td>
<td>Seminar Presentation and Evaluation I</td>
<td>14</td>
</tr>
<tr>
<td>16</td>
<td>Correction Report</td>
<td>15</td>
</tr>
<tr>
<td>17</td>
<td>Final Report Submission and Evaluation I</td>
<td></td>
</tr>
</tbody>
</table>

Table 1.1: Project Planning

5
1.8 Report Structure

This project thesis structure consists of five chapters. Chapter 1 explains the project been proposed and develop which includes background, problem statement, scope, expected result, project planning and project structure.

Chapter 2 briefly explains about the literature review that shows a simple summary of the source for the literature review but it has organizational pattern and combine both summary and synthesis.

Then Chapter 3, research methodology, system development lifecycle, framework, context diagram, data flow diagram, entity relationship diagram and database design of the system.

Chapter 4 explains the implementation design and result. A detail description on system interface and functionality are described in this chapter. System testing and result are discussed. All test and result performed on a system that has been developed are reported clearly in this chapter.

Lastly, Chapter 5 is the overall conclusion for the full thesis and system already been developed. The achievement and contribution of the develop system, future works, project constraints and conclusion of this project are highlighted in this chapter.
1.9 Summary Chapter 1

Throughout this first chapter, background, problem statement, expected result, project planning and thesis structure are discussed and explained.
Chapter 2

Literature Review

2.1 Introduction

Literature review discusses published information in a particular subject area and sometimes information in a particular subject area within a certain time period. It just a simple summary of the resources for the literature review but it has organizational pattern and combine both summary and synthesis. The important information can recap from the summary but a synthesis needed to re-organization or reshuffling that information. Literature review provides with a handy guide to a particular topic. It can give us an overview or act as steeping stone if we are limited time to conduct a research. The purpose of writing a literature review is to provide background for the topic chose using a previous research that already been done by others.

Literature review for Smart Stick with GPS Navigation and Sensor Detection contains the previous research on Smart Stick for blind people. Based on the literature review, it is to increase the knowledge and gave deeper understanding of the proposed system.
2.2 Research on Smart Stick based on GPS Navigation.

<table>
<thead>
<tr>
<th>No.</th>
<th>Title of Research Paper</th>
<th>Author / Year</th>
<th>Content</th>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Development of a low-cost GPS/INS integrated system for tractor automatic navigation</td>
<td>Hak-Jin Kim, Xiongzen Han, Chann Woo Jeon, Hee Chang Moon, Jung Hun Kim (March, 2017)</td>
<td>Their aim is to provided navigation to agriculture vehicles for precision farming due to drastic potential improvements in agricultural mechanization. Using Global Position Systems (GPS) it can collect data more accuracy and calculate the position, orientation and velocity of vehicles.</td>
<td><img src="image" alt="Diagram" /></td>
</tr>
<tr>
<td>2</td>
<td>Land-Vehicle Navigation Using GPS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>----------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eric Abbot</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>David Powell</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(January, 1999)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The main function of this project is to know the exactly the location of the vehicles. It is to collect data using the sensor that mounted inside the vehicles.

<table>
<thead>
<tr>
<th>3</th>
<th>Analysis of Position Tracking Using Motorcycle GPS Tracking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A R Putra</td>
</tr>
<tr>
<td></td>
<td>A Sukoco</td>
</tr>
<tr>
<td></td>
<td>(2017)</td>
</tr>
</tbody>
</table>

One initiative that been taken by Indonesian to reduce the loss of a motorcycles. They will apply GPS on each vehicle and it will send the data continuously to our phone. It using GPS because it will provide location and time that is reliable in all-weather condition at all time.
<table>
<thead>
<tr>
<th>4</th>
<th>Smart stick for Blind: Obstacle Detection, Artificial vision and Real-time assistance via GPS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>— Shruti Dambhare</td>
</tr>
<tr>
<td></td>
<td>— Prof. A. Sakhare</td>
</tr>
<tr>
<td></td>
<td>(2011)</td>
</tr>
</tbody>
</table>

The focusing of the system is to provide a smart electronic aid for blind people. The stick was designed and devised to help the blind navigate independently and safely.

Table 2.1: Research Based on GPS Navigation
2.3 Research on Smart Stick based on Sensor Detection.

<table>
<thead>
<tr>
<th>No.</th>
<th>Title of Research Paper</th>
<th>Author / Year</th>
<th>Content</th>
<th>Block Diagram</th>
</tr>
</thead>
</table>
| 1   | Smart Blind Stick        | - Shubhangi Nalage,  
- Kiran Nalawade,  
- Dr. Prof. V. R. Pawar  
(May 2018) | This research using infrared sensor to detect stair and another obstacle in the user path. It also gives alert to user using earphone with give warning message about the obstacle. It most focus on height, width of the obstacle and stairs, using ultrasonic it will display on LCD the value of height and width the stairs. The data will transfer to the phone using Bluetooth. | ![Block Diagram Image] |
|   | Smart Blind Walking Stick | - Vipul V. Nahar  
- Jaya L. Nikam  
- Poonam K. Deore  
(April, 2016) | This stick using moisture sensor along with ultrasonic sensor to detect water. It using microcontroller to calculate range of the obstacle. It also has buzzer to detect the stick when we misplace it with button using remote. The buzzer also has different type of sound to alert user. |
The aim of this project is to provide a low-cost project and to give navigation to blind people by giving information. The system consists of proximity sensors, ultrasonic sensors, gps module, stereo cameras and dual feedback system- auditory as well as vibratory circuit.

Table 2.2: Based on Sensor Detection
2.4 Summary Chapter 2

In conclusion, the selection of accurate technique is very important to make sure that system is successfully implemented and achieved the objective.
Chapter 3

Methodology

3.1 Introduction

This chapter focuses on methodology used in this project development. It is important to choose a perfect methodology in developing a system because it will concentrate to a better development and management. In this project, methodology that has been chosen is Rapid Application Development (RAD). Rapid Application Development has been implemented during the development process of Smart Stick with GPS Navigation and Sensor Detection.
3.2 Rapid Application Development (RAD)

The term Rapid Application Development or RAD is taken to relate to projects based around tight timescales, which use prototyping and combine high-level development tools and techniques. Rapid Application Development (RAD) is a concept that was born out of frustration with the waterfall software design approach which too often resulted in products that were out of date or inefficient by the time they were actually released. Rapid application development RAD is an agile project management strategy popular in software development. Unlike waterfall development life cycles, where testing is done at the end of the project, iterative life cycles specify testing at multiple points during development. It is easy to understand the importance of including system performance analysis and predictive tuning in the process. Identifying the addressing flows early, especially performance limitations, has as advantage the cuts of the cost to fix them and at the same time minimizes the impact on the project schedule. RAD has been proven to be a valuable software strategy.

The key benefit of a RAD approach is fast project turnaround, making it an attractive choice for developers working in a fast-paced environment like software development. This rapid pace is made possible by RAD’s focus on minimizing the planning stage and maximizing prototype development. Proponents of RAD claim that it increases productivity, reduces delivery time and gains high usage because of the extent of user involvement in the development.
RAD follows four main phases:

3.2.1 Phase 1: Requirements planning

This phase is equivalent to a project scoping meeting. Although the planning phase is condensed compared to other project management methodologies, this is a critical step for the ultimate success of the project.

During this stage, we need to determine the goals and expectations for the project as well as current and potential issues that would need to be addressed during the build.

3.2.2 Phase 2: User design

Once the project is scoped out, it’s time to jump right into development, building out the user design through various prototype iterations. This is the meat and potatoes of the RAD methodology and what sets it apart from other project management strategies. During this phase, we need to work hard to ensure that the project met every planning that has been discussed in Requirement Phase.
The developer needed to design a prototype of the project until it meets the expectation and if we cooperate with customer, we need to fulfill their expectation until the project has been agree. The developer will be need to try and test the project until satisfied each side and every mistake will be discussed. This phase is to make sure there are no potential for any mistake happen for the future.

3.2.3 Phase 3: Rapid construction

This phase takes the prototypes and beta systems from the design phase and converts them into the working model. Because the majority of the problems and changes were addressed during the thorough iterative design phase, developers can construct the final working model more quickly than they could by following a traditional project management approach.

The phase breaks down into several smaller steps:

- Preparation for rapid construction
- Program and application development
- Coding
- Unit, integration, and system testing

In this stage everyone in the group will work together to make sure everything works smoothly and at the end result will satisfied everyone expectations and objectives. Every suggest, changes and even new idea still can be used to solved every problem that arise.
3.2.4 Phase 4: Cutover

This is the implementation phase where the finished product goes to launch. It includes data conversion, testing, and changeover to the new system, as well as user training. The objectives of this stage are

i. To install the system in production operation with minimal disruption of normal business activity.

ii. To maximize the effectiveness of the system in supporting the intended business activities.

iii. To identify potential future enhancement.

3.2.5 Advantages of Rapid Application Development

i. By using RAD it is easier to implement as the development focuses on each requirement development at a time.

ii. User involvement while developing product helps in improving user satisfaction as more communication occurs while developing products and user can see the product progress.

iii. It takes shorter time to be implemented in working environment.

iv. With less people, productivity can be increased in short time
3.3 Requirement Analysis

In order to develop the system properly, software and hardware are required. Below are the sites of software requirement and hardware requirement which are been used to develop the system.

3.3.1 Software Requirements

<table>
<thead>
<tr>
<th>Software</th>
<th>Function</th>
</tr>
</thead>
</table>
| Microsoft Office 2016 | i. Tools for writing report, proposal and Gantt chart  
|                   | ii. Tools for preparing the slideshow presentation.  
|                   | iii. Tools to build Entity Relations Diagram, Data Flow Diagram and Context Diagram |
| Notepad++         | Tools for developing PHP Programming and MySQL language.                |
| Xampp             | i. Tools for connecting with MySQL database.  
|                   | ii. Tools that support PHP Programming.                               |
| Google Chrome     | A platform that been used to display the system                          |
| Visual Code Studio| An editor to develop a mobile apps programming language                |
| GitLab            | An Open Source cloud storage for save the project online.               |
| Arduino           | A software that been used to develop an Internet of Things (IoT) project.|

Table 3.1: Software Requirement
### 3.3.2 Hardware Requirement

<table>
<thead>
<tr>
<th><strong>Hardware</strong></th>
<th><strong>Function</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Laptop</td>
<td>ASUS X450L Series</td>
</tr>
<tr>
<td>Blind Stick</td>
<td>i. To attached all component to it.</td>
</tr>
<tr>
<td></td>
<td>ii. It will be used by the blind people</td>
</tr>
<tr>
<td>Vibrator Motor</td>
<td>When there are any obstacles, the vibrator will vibrate to inform the blind people.</td>
</tr>
<tr>
<td>Ultrasonic Sensor</td>
<td>This hardware will detect whenever there are any obstacle and hindrance with the distance that has been set.</td>
</tr>
<tr>
<td>Breadboard</td>
<td>To build and test electronic circuits without having to do any soldering</td>
</tr>
<tr>
<td>NodeMCU</td>
<td>An open source IoT platform, it will be attached to the stick, to give a GPS signal to the application.</td>
</tr>
<tr>
<td>Buzzer</td>
<td>It will inform the blind people whenever there is any obstacle with giving a sound to the blind people.</td>
</tr>
<tr>
<td>Smart Phone</td>
<td>Lenovo A6000, to test the apps whether it function or not.</td>
</tr>
</tbody>
</table>

Table 3.2: Hardware Requirement
3.4 System Design

System design is the process of defining the architecture, modules, interfaces, and data for a system to satisfy specified requirements. System design could be seen as the application of system theory to product development. In this Smart Stick with GPS Navigation and Sensor Detection consists of framework, architecture design and process model.
3.4.1 Framework

![Diagram](image)

Blind People  ➾  Apps for Smart Stick with navigation  ➾  Guardian

Figure 3.2: Framework of the System

In this framework, Guardian can find out whenever the blind people go, but they need to register themselves and the blind people first to using this apps. Only the guardian can register for the blind people to protect the safety of blind people. Then guardian can access the apps and can view the location of blind people with the help from NodeMCU at the stick. The NodeMCU will give direction to the phone with the help of GPS.
3.4.2 Process Model

In Smart Stick with GPS Navigation and Sensor Detection the detail process model consists of context diagram and data flow diagram. There are explaining as below:

3.4.2.1 Context Diagram

![Context Diagram of the System](image)

**Figure 3.3: Context Diagram of the System**

There is only one user that can use the apps that is Guardian. Guardian can insert detail about themselves and the detail about Blind People. The apps will serve as direction to the Guardian. This diagram shows the data flow about this project.
3.4.2.2 Data Flow Diagram

Data flow diagram is a two-dimensional diagram that explains how data processed and transferred into the system. Data flow diagram (DFD) consists of entities, processed and files to show the flow of the data in the system.

3.4.2.2.1 Data Flow Diagram Level 0

![Data Flow Diagram Level 0 of the System](image)

Figure 3.4: Data Flow Diagram Level 0 of the System
Based on the DFD shown above, there are only entity. The processes of the system are register user, register Patient (Blind People), Guardian Log in and Guardian can view Location of Blind People.
Process 1.0: Register

Guardian need to register for themselves and for Blind People by filling their information into the registration form before Guardian can login into the system and manage the account. Only Guardian can make registration to Blind People.

Process 2.0: Log In

Only Guardian that register can access the apps.

Process 3.0: View

Only a register guardian can view the location of the blind people using only their smartphone. They also can manage their account and blind people detail’s.
3.4.2.2 Data Flow Diagram Level 1

Data Flow Diagram Level 1 shows the processes in DFD Level 0. There is DFD Level 1 of manage User and Patient.

![Data Flow Diagram Level 1 of View Process](image.png)

Figure 3.5: Data Flow Diagram Level 1 of View Process

In the figure, DFD Level 1 of View is a process of manage Guardian and Patient (Blind People) details. Guardian can update detail about them and about Blind People, they also can manage the account if they want to change the Guardian by delete the detail.
3.4.3 Entity Relationship Diagram (ERD)

The figure shows the ERD of the proposed system which consists of three files which are the tables in the database. There are Guardian, Patient and Navigation. In Guardian tables contains email as the primary key, name, password, ic, no_tel, address, postcode, state, area, gender and relation. The second table is patient, in patient tables contains ic_patient as the primary key, email as the foreign key from guardian, no_oku, name, address, gender, postcode, state, area and no_tel. The third one is navigation tables contains ic_nav_id as primary key, latitude, longitude and ic_patient as foreign key.
3.5 Data Dictionary / Database Dictionary

Data dictionary shows a Table Guardian, Table Patient and Table Navigation

### 3.5.1 Table Guardian

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<td></td>
<td></td>
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</tr>
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Table 3.3: Guardian

### 3.5.2 Table Patient (Blind People)

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Table 3.4: Patient
### 3.5.3 Table Navigation

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Table 3.5: Navigation
3.6 Summary Chapter 3

The methodology and technique to be used to develop the system has been described in detail in this chapter. This methodology has the appropriate phases to facilitate the smooth development of the software system. In addition, system requirements including the hardware and software requirements used in developing this system are described.
Chapter 4

Implementation Design and Result

4.1 Introduction

The implementation is the process of carrying out, execution, or practice of the method, design or model according to the specification given by the user requirement. To get main objective of the system, few testing approaches have been done. System testing and result are discussed. All tests and result performed on a system are reported clearly in this chapter.

The core of this project is Arduino Uno and NodeMCU programming board. The stick also embedded with Ultrasonic Sensor to detect distance of obstacle, Vibrator for the vibration alert and Buzzer to give sound to blind people.
4.2 Interface Design

This section will discuss about how the interface of this system will look alike and explanation of each interface that may have function. Interface design allows the user to explore and browse the entire system smoothly. It is done very carefully. Menu design must be user friendly by using the appropriate color. Attractive features graphics help the user do not get bored using the system.

As a start, figure 4.1 below show the login interface for guardian. Each time when guardian want to entering the system, they will see this page first.

![Login Interface](image)

Figure 4.1: Login Page
Only registered guardian can access the system. For those who want to access the system, they need to register first. The Sign-Up hyperlink can be found below the Login button. After they clicking it, they will access to register form that shown on Figure 4.2.

![Figure 4.2: Step 1 Register for Guardian](image)

There will be 4 steps of Registration before you can use this apps. Step 1 and 2 are for Guardian, Step 3 and 4 are for Blind People. Guardian must register their patient, so that the system can track their patient.
Figure 4.3: Step 2 Register for Guardian

Figure 4.3 shows the second step for Guardian to make registration. Address and other detail are being separated to make ease the registration.

Figure 4.4: Step 3 Register for Patient
All details must be filled to the next step. If the user already registers, it will direct to Login Page.

The navigation bar will display name of the user of the apps at the top of the navigation bar. As for profile and Blind People Profile there will be another dropdown navigation.

Figure 4.5: Navigation Bar
Figure 4.6 shows the Homepage of the apps. It consists some brief about Smart Stick with GPS Navigation and Sensor Detection. User name will display on this page.

Figure 4.6: View Detail
Once you click on Profile at the navigation bar, all the details of the user can be seen. There were Update Button down the detail.

![Figure 4.8: Update profile](image)

Figure 4.8, shows all detail of user that can be update. Email and Identity Card of the user was in disable state, it cannot be update due to system specification.
Figure 4.9: Blind People Profile

Figure 4.9 shows the detail of blind people, the detail of blind people cannot be update, it only can be view by the user of this system.
4.3 Project Implementation

The complete circuit of the Smart Stick with GPS Navigation and Sensor Detection is fully developed. Before attaching the circuit to the stick, the circuit must be tested first to see if it is working or not.

![User testing](Figure 4.10)

The circuit is embedded to the stick after it is test. As can be seen, the position of each component in the circuit.

![Position of component](Figure 4.11)
The vibrator will be placed at the handle of the stick, it will vibrate if there were obstacle in front of the stick.

NodeMcu and Arduino Uno will be put in the box. The Ultrasonic Sensor cannot have any barrier in front of it or the buzzer will keep buzzing.
The stick will look like this once the circuit are attached at the stick.

4.4 Summary Chapter 4

The complete implementation of the Smart Stick with GPS Navigation and Sensor Detection can be used for user that need help in watch blind people. Using this apps, they can know the exactly location of the blind people.
Chapter 5

Result and Conclusion

5.1 Introduction

In this chapter, it will conclude the overall conclusion for the full thesis and system already been developed. The contributions of develop system, problem and limitation, recommendation and conclusion of this project also discussed in this chapter.
5.2 Contribution of Project

Smart Stick with GPS Navigation and Sensor Detection is a system that developed to help blind people to ease their day. The major contributions can be concluded as below:

1. Firstly, blind people can walk easily without need other people to keep watching them. The stick will be embedded with sensor that can detect any obstacle in front them.

2. The keeper or guardian doesn’t need to worry about where blind people want to go, because they can track it through their phone using the application that have been developed.

5.3 Problem and Limitation.

In developing Smart Stick with GPS Navigation and Sensor Detection, there were some problem and limitation that have been faced which were:

1. The stick does not detect the water.

2. Need many ultrasonic to used.

3. The stick need internet connection to detect the GPS.
5.4 Recommendations

Smart Stick with GPS Navigation and Sensor Detection is a project that been developed to help blind people to walk easily and guardian to locate them. Even though the system could function and established all task, but a lot of improvements are needed to make sure this project will be more efficient. Some suggestion that need to be considered is:

1. The system only can have one guardian to watch blind people.
2. Upgrade the stick to detect water and stair, it will more help to blind people to walk.
3. It better to have some emergency button at the stick to inform the guardian when they in needed or they get lost.
5.5 Conclusion Chapter 5

Smart Stick with GPS Navigation and Sensor Detection was developed as we see there are no initiative for blind people to make them feel safe when they walk outside without guardians. Most of the blind people depend on a walking stick to complete their daily tasks. This project uses an Ultrasonic Sensor to measure the distance and Vibrator motors for the vibration alert. The range was set for distance measurement was purposely set at 0 - 50 cm. In this range, the stick will detect the obstacle and generated vibration signal to alert the user.

With help from NodeMCU, the guardian can know exactly the location of blind people, they just need to observe from their smartphones.
REFERENCES


APPENDIX
## Appendix A: Timeline

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Appendix B: Arduino Programming

#define trigPin 13
#define echoPin 12
#define motor 7
#define buzzer 6

void setup()
{
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
  pinMode(motor, OUTPUT);
  pinMode(buzzer, OUTPUT);
}

void loop()
{
  long duration, distance;
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  duration = pulseIn(echoPin, HIGH);
  distance = (duration/2) / 29.1;

  if (distance <= 50 && distance >= 0) // Checking the distance, you can change the value
    {
    digitalWrite(motor, HIGH); // When the distance below 100cm
    digitalWrite(buzzer, HIGH);
    } else
    {
    digitalWrite(motor, LOW); // when greater than 100cm
    digitalWrite(buzzer, LOW);
    } delay(60);
}