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	Help Me to See
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DECLARATION

Researchers declare that the proposal document or part of the document is not a copy of a previous work done by any university or organization. This document is a record of an original work done by research team under the guidance from senior lecturer Mr. Jayantha Amararachchi, supervisor Ms Aruni Niroshika and co-supervisor Mr Anuradha Jayakody. The proposal document is a property of SLIIT (Sri Lanka Institute of Information Technology) Bachelor of Science in Information Technology research unit and researchers.

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ABSTRACT

The Help me to see project is an idea to help visually impact people in order to guide them in a market place and help them in recognizing market products in an efficient and more convenient manner. As a major problem in Sri Lanka, most of the visually impact people trying to act as an ordinary person, but they still have confusions in recognizing products by their own. As a solution, research team supposes to implement an efficient application for this situation. Main objective of this project is to come up with a complete solution for this problematic situation of visually impact people in Sri Lanka. The research team supposes to develop a mobile application as a solution for this situation. This application is capable of navigating the user inside the super market indicating the directions and providing the information what each shelf contains. Apart from that, once the user reaches to the correct shelf, user can capture the items in the shelf by holding his/her mobile device in front of the shelf. Furthermore, this application is capable of receiving data such as a list of items which is packed in a shelf. This application will notify each and every information to the user through a voice message. So we will develop a mobile application for blind or visually impaired people to involve with their shopping or marketing. It will be a Personal Shopping Assistance for visually disabled people. An intelligent, interactive virtual assistant with speech recognition capabilities that supports mobiles.

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1 Introduction

There are people in today's society who were born blind or visually impaired either by birth or after several years due to accidents or various other disabilities. Unlike many other ailments, blindness has become a serious dilemma.

In the modern world shopping has become an essential day-to-day activity for the most of the people but for those thousands of disable people are struggled with it. They can't go and buy goods as they wish from the super markets. They can't identify what they need not only that but also they can't find general objects in their home.

Unfortunately there has not been a proper solution for visually disabled people to interact with their shopping. For avoid this situation we propose a friendly, intelligent voice based virtual assistant mobile application to help visually disabled people to interact with their shopping.

Main expected outcomes of the project:

- Develop a mobile application for blind or visually impaired people to involve with their shopping or marketing.
- It will be a Personal Shopping Assistance for visually disabled people. An intelligent, interactive virtual assistant with speech recognition capabilities that supports mobiles.
- Develop the features of image processing technology. Such as Image extraction, object recognition, Pattern recognition, Colour detection, technologies.

We will develop a mobile application for blind or visually impaired people to involve with their shopping or marketing .It will be a Personal Shopping Assistance for visually disabled people.An intelligent, interactive virtual assistant with speech recognition capabilities that supports mobiles.

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1.1 Background

There are people in today's society who were born blind or visually impaired either by birth or after several years due to accidents or various other disabilities. Unlike many other ailments, blindness has become a serious problem. Although blind people too have inborn talents, they have to seek the help of others to carry out some of their day to day activities. There are 285 million people that have been estimated to be visually impaired worldwide: 39 million are blind and 246 have low vision. (World Health Organization). Approximately 90% of visually impaired people live in developing countries [1]. It is predicted that without extra interventions, these numbers will rise rapidly year by year (WHO) [1]. According to Sri Lankan Government statistics over 60,000 Sri Lankans are visually impaired. Blind or vision impaired people have inborn talents and they should not be isolated. They face many difficulties in everyday like self-navigating, financial transaction, recognize the objects, positioning the objects and detecting the text.

Technology has brought a new hope to those who live without seeing the world around them. Assistive technology for the blind and vision impaired makes writing, and reading, much easier. Blind technology also assists the visually impaired with reading books, websites, email, using appliances, navigating cities and towns, and much more [3]. In addition to computers and other devices, talking clocks and thermometers, specialized bar code scanners, and palm pilots all make daily life, education and employment more accessible for people with vision impairments. Recognizing product in a supermarket is one of the major problems the blind people has to face in their day today life. When they do Shopping, they need to deal with various products and product brands. These products have different sizes, and they come in different shapes. It is much needed to help the blind and visually impaired to identify and separate them with greater confidence. But this technique is not applicable to identify product brands correctly. There are some new products introduced to market that have the capability of identifying objects uniquely, but blind people have so many conflicts when they are going to identify each and every Product uniquely.

To address the above problem different hardware devices are developed, but most of them are navigation systems and others are identifying object such as RF ids, QR codes etc. But these portable devices are bulky, expensive and specially those devices haven't include both navigation and recognition procedures.

With the rapid growth of technology, mobile devices, and camera technologies are becoming widely available and acceptable. Google has seen a sharp rise in global market share for its Android smartphones. The open nature of Android can do things others cannot. According to the statistics released by Google in android activations swelling to over 289.1million worldwide (112 countries) on 215 carries and 36 manufacturers, 310 different Android devices and 200,000 Android applications are now available in the marketplace [5]. Most of the time people concern

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about the technologies which provide more benefits to the particular user. For an example, they used mobile applications to provide user friendliness, convenient to use, and portability. According to that situation, most of the applications are based on the mobile applications to provide more benefits.

1.2 Literature survey

The ability to recognize objects without human input is critical for a number of applications. Probably the most important one is assisting vision impaired people. According to World Health Organization, 284 million people (over4% of world population) are visually impaired, including 39 million blind [1].

Currently blind or vision impaired people have several ways to identify objects independently without getting aid of electronic devices. But each method has its own limitations [2]. Most of hardware equipment does not match with the requirement needed by the vision

Most of hardware equipment does not match with the requirement needed by the vision impaired.

Some applications use classic pattern recognition algorithms usually include feature extraction and feature classification. Widely used features such as SIFT [3] or SIFT-likes have high repeatability. SVM and Neural Networks can be trained to achieve high accuracy given enough time and space allowance.

However, these classic pattern recognition approaches cannot be ported directly to mobile devices. Implementing pattern recognition on mobile devices has three major challenges.

- The limited processing power of the device
- The captured scene could contain complex background ,resulting in false positive must be eliminated
- The expectation of the user who typically expects instant feedback and requires on line (real time) recognition.

Above three challenges are related to the speed of the algorithm. The algorithm must be efficient enough to fit in the light-weight device and should be able to discard images or pixels quickly that are not interest and more time can be allocated to the image that contains objects to be recognized. To fulfill these requirements developers need reliable algorithms to detect the unique features of the objects and identify each object.

Most of the time people concern about the technologies which provide more benefits to the particular user. As an example they use mobile applications to provide user friendliness, convenient to use, and portability. According to that situation, most of the applications are based

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on the mobile applications to provide more benefits. By considering these problems team members decided to provide a proper solution to blind people to recognize currency notes easily and more convenient manner.

Development of the navigation system which was used in the indoor space and supported activities of the visually impaired without help of others. Most of systems were composed with optical beacons which is set on the celling and emit the position code as infrared signal, an optical receiver which receives and demodulates infrared signal from optical beacons, and a personal computer which is called navigator or and guides a user by artificial voice. Whenever if an user enter the service area of an optical beacon ,the optical receiver received the area code from optical beacons which are set on the celling ,and the navigator announce the map information and the route to the destination using pre-recorded voice.

This application provide the effective, accurate, reliable and real-time application for the vision impaired people to identifying the objects. This new application could prove to be useful for the visually impaired. It is another addition to the growing number of applications helping to make the android smart phones more accessible to the vision impaired. The application utilizes any android smart phone's camera as a way of reading the objects.

1.3 Research gap

There are many shopping applications available in the market which can serve the users instantly. All the applications are developed to shoppers who are not differently abled. Developers have forgotten the blind people who are helpless when shopping. They have to face to lot of problems when shopping. They can't choose what they desire.

The research team has proposed the system "Help me to See" as a solution for this problem. Beacons will be used to guide the blind user in the super market. When the user enters to the market, he/she will be able to open the application using voice command or smart shortcut. After loading the application, mobile Bluetooth and data connection will activate automatically. Build network infrastructure uses minimum number of beacons to achieve 100% coverage level.

Blind people cannot capture the exact image. The currently available system will be improved by eliminating the background of the image and capturing the exact shape of the item.

Most of the systems check first two parameters, but in this system more parameters will be checked so that the system can compare the images more accurately. This will be helpful when categorizing various images.

Developers use different algorithms for template sorting such as surf. But the research team decides to implement a new efficient algorithm for template searching.

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1.4 Research Problem

In today's society, there are people who were born blind or visually impaired either by birth or after several years due to accidents or various other disabilities. Unlike many other ailments, blindness has become a serious dilemma.

In the modern world shopping has become an essential day-to-day activity for most of the people but thousands of disable people struggle with it. They can't go and buy goods as they wish from the super markets. They can't identify what they need, not only that but also they can't find general objects in their home.

Unfortunately there has not been a proper solution for visually disabled people to interact with their shopping. For avoid this situation we propose a friendly, intelligent voice based virtual assistant mobile application which helps visually disabled people to interact with their shopping.

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2.0 Objectives

This chapter mainly focuses on the desired or needed result to be achieved by a specific time with available resources. One objective can be broken down into a number of specific goals.

2.1 Special Objectives

1. Develop a real time mobile Application for blind or visually impaired people to involve with their shopping

It will be a Personal Shopping Assistance for visually disabled people. An intelligent, interactive virtual assistant with speech recognition capabilities that supports mobiles. We mainly focus on following areas to develop the application

- Identify the objects through Image Processing
- Using beacons navigate through the super market.

Using voice alerts navigate through the super market, and whenever he/she closes to the objects it will identify available products.

2. Indoor positioning with beacons

Blind person comes into the super market and we will navigate him in the supermarket. We prepare a network infrastructure using beacons. Our team try to get the maximum coverage through the minimum number of beacons. In the Supermarket haven't big space to walk that the difficult all blind people face. Overcome this problem we navigate them properly.

3. Identify Specific Object

The blind person moves his mobile phone to the product and the camera forces match our template it comes beep sound. We already have templates in our server. When the beep sound comes, user want to hold the mobile phone. Then it will automatically capture the image. So we have to ignore the unwanted area and get the object only.

4. Use more important parameters to verify the object

Get the colors form image using color detection algorithm. Color detection algorithms access each pixels of the image and convert each pixel into an approximate color type based on its HSV

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color components in the image below, show some pixels are converted to red, some to Orange, and some to green etc. Pass all the color details to the server as a percentage. It pass to the server as a parameter. And convert image into bit stream and pass to server and using template. We try to get shape of the product. In our server we have template. Compare with that template and suggest most similar shape of product and it also pass as parameter. Get the size of the captured image (width and height) all these parameters pass to the sorting algorithm and verify the actual product.

2.2 General objectives

1. Develop a user friendly environment to the user

The application is developing for blind or vision impaired people. There for the user friendliness is more important to them because they cannot see anything. Proposed system try to create the interface simpler and understandable by generating voice instructions and other directions.

2. The accuracy of the input image

The accuracy of a translation depends on the accuracy of the input image as well as on the software. Product recognition in an uncontrollable environment is a very difficult task due to a large number of variable conditions affecting image quality. There are many other challenges while getting an accurate image such as,

- The visually-impaired user needs to locate text in the environment and point the cameraphone in the relevant direction.
- The environment has poor lighting conditions.

3. Generate voice instructions

Generating voice instructions for each and every operation is a very important part of this system. Otherwise there is no way to identify the execution sequence of the system. Voice instructions will be very useful for blind or vision impaired people.

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3.0 Methodology

This chapter presents the methodology for managing the project. It's a systematic approach to the research, project development and implementation in order create successful solution within time, budget, and using current technologies and tools.

3.1 System Overview

We will develop a mobile application for blind or visually impaired people to involve with their shopping or marketing .It will be a Personal Shopping Assistance for visually disabled people.An intelligent, interactive virtual assistant with speech recognition capabilities that supports mobiles.

We mainly focus on following areas to develop the application.

- Identify the objects through Image Processing
- Using beacons navigate through the super market.

Based on our final outcome we have categorize in to 4 components.

- 1. Indoor guidance system
- 2. Image capturing and object recognition system
- 3. Handling sub components and color detection
- 4. Object Validation and Verification System

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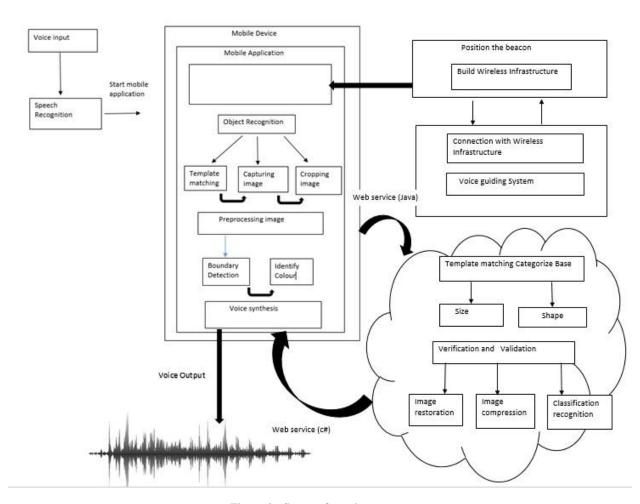


Figure 2: System Overview

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3.1.1 Indoor guidance system

Beacons are a new technology that enables proximity sensing. They are small, cheap devices that can be detected by smartphones in order to provide location information when GPS is not available. The new breed of beacons, based on the Bluetooth Low Energy specification, have the potential to simplify projects that need proximity awareness.

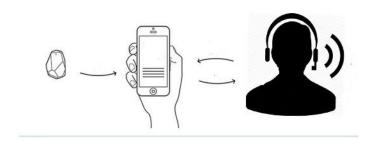


Figure 3: Indoor positioning with beacons and navigate through the super market.

Using indoor guidance we guide the person using beacons to the relevant positions in the supermarket. In this system we place beacon in Custom perspective manner.

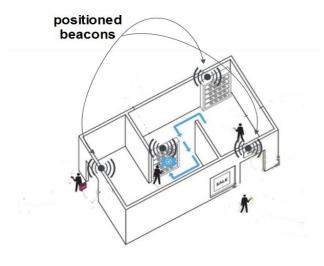


Figure 4: indoor guidance

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- Position the beacons and build wireless infrastructure through the building [7].
- Implement voice navigation system.
- When initiating this application, Bluetooth and the data connection of the mobile device will activate automatically.
- Whenever User enters to the market, he/she can open up the application using voice command or smart shortcut.
- Phone will recognize beacon's signal range and receive feedbacks from the beacons. Beacons are capable of storing data such as the items in each and every nearby shelf. User will receive a welcome message along with the information what each shelf contains and in which direction it is situated as soon as he/she enters to the super market. So user can decide on to which direction he/she should move to find the relevant product. Once the user reaches to the correct shelf, the beacon nearby to that shelf will send the list of items which is packed in the shelf to his/her mobile device. Each and every information which receives to the application will converts to a voice message in order to notify the user.

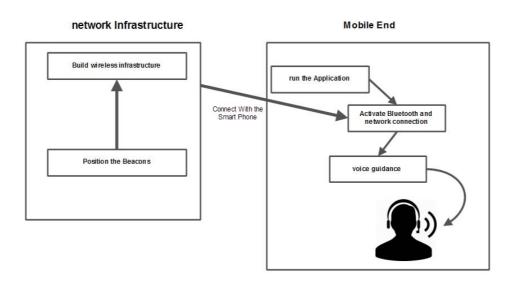


Figure 5: indoor guidance System

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3.1.2 Image capturing and object recognition system

Through this system whenever user closes to a shelf it will auto focus goods in it. Before capture the image we have to remove the unwanted area and identify only interest area. Then crop the image and pass it in to next process.

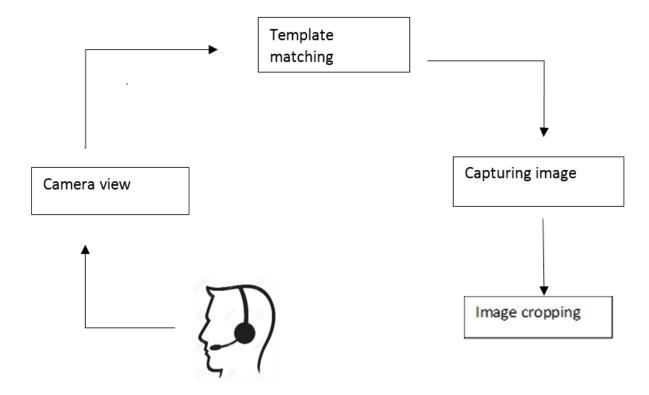


Figure 6: Image capturing and object recognition system

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• Template matching

- When user moves the camera on top of the item label, application will automatically identify whether it is exactly an item label or not.

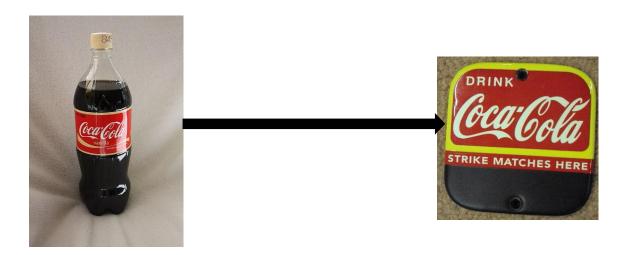


Figure 7: Template matching

• Capture image

- Blind people cannot capture the exact image. The currently available system will be improved by eliminating the background of the image and capturing the exact shape of the item in autofocusing [6].

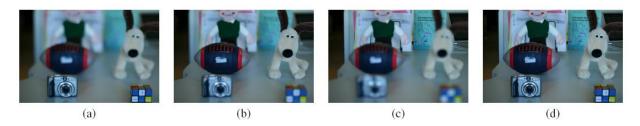


Figure 8: Capture image

As an example (a),(b),(c),(d) is image focus various thing.

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• Cropping image

After capturing the image perform image cropping by removing irrelevant parts from the image. Then the cropped image.

3.1.3 Handling sub components and color detection

• Handling the communication between mobile and the server

Describes how the communication happens between mobile phone and remote server. KSOAP is used as the communication protocol. KSOAP specially designed to deal with small embedded devices like mobile phone. KSOAP is a lightweight and efficient SOAP library for the Android platform. KSOAP toolkit provides great functionality, relative simplicity and ease of use for the developer.

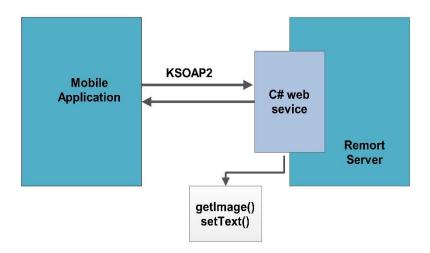


Figure 9: Handling sub components and color detection

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• Image pre-processing

The aim of image pre-processing is to suppress undesired distortions or enhance some image features that are important for further processing or analysis. Some noise will appear on the image. Image noise is the random variation of brightness in images. Removing the noise is an important step when image processing is being performed [9].

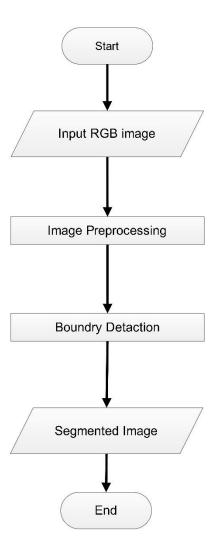


Figure 10: Image pre-processing

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• Color Detection

Input for the color detection algorithm is the image that defines the region of interest. Color detection algorithms access each pixels of the image and convert each pixel into an approximate color type based on its HSV color components in the image below, show some pixels are converted to red, some to Orange, and some to green etc. Pass all the color details to the server as a percentage.

Dominant color is a compact and efficient descriptor which employs representative colors to characterize the color information in the interesting region of an image. Dominant color descriptor is suitable for representing local features of images and can be used for quick retrieval in large image databases [10].

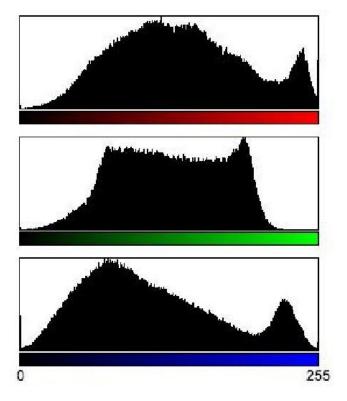


Figure 11: Color Detection

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3.1.4 Object Validation and Verification System

Binarized images are send to the server. In the sever end all images are categorized inside the folders according to its shape, size, logo and color. In each folder various types of template images are stored. According to the template matching process it will redirects to the relevant category of object templates and do the template matching until get the correct matching result. So following steps are used for validate and verify the object

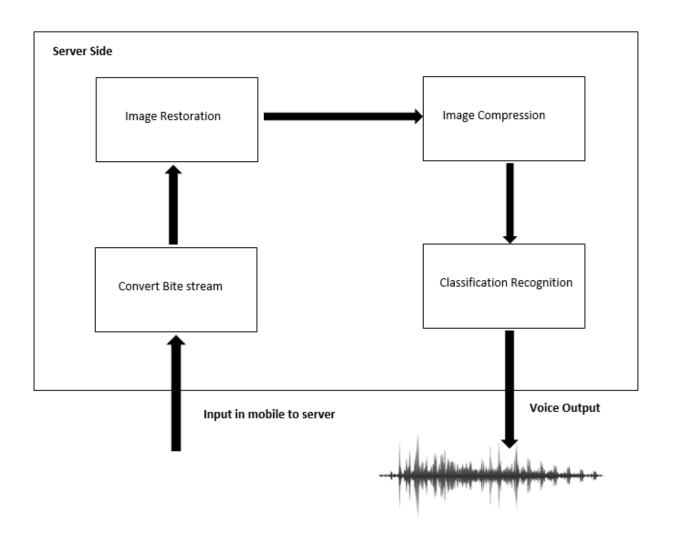


Figure 6: Object Validation and Verification System

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• Template Matching

Images are categorized inside the folders according to the shape, size and color of the objects. In each folder various types of template images are stored. According to the detected value from the color detection component it redirects to the relevant category of object templates and do the template matching until get the correct matching result. We have to develop a template matching algorithm to perform the template matching function more efficiently.

• Segmentation - Thresholding

In this section image will be partition into its constituent parts or objects. Based on the binary image it will need to segment the small objects, the logo, digits from the large images.

Thresholding is the most common method of segmenting images into two regions called particle regions and background regions. Threshold can be select by manually or by using automated techniques. Manual threshold selection is normally done by using a histogram as a guide. Automated thresholding techniques select a threshold which optimizes a specified characteristic of the resulting images. In proposed system Automated Thresholding will be used. The processing procedure would start with filtering or other enhancements to sharpen the boundaries between objects and their background. Then, the objects are separated from the background.

• Channel Subtraction

Using this approach subtract an image from a known background before thresholding. Background should be specify clearly otherwise many more details than just the target feature will appear in the resulting image. If there is noise in the image the subtraction will be unfeasible.

Morphology Filtering

In a binarized image can have some discontinuous practices such as further noise and some unexpected edges. We apply morphological transformations to the binary images to make the recognition task easier.

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3.2 Flow of the project

Purpose of this phase is to identify the constraints, evaluate and analyze of the potential of a proposed project. Determine the financial viability, operational feasibility, technical possibility and organizationally worthwhile. The major constraints identified are time and scope.

3.2.2 Feasibility study

Purpose of this phase is to identify the constraints. Determine the financial worthwhile, technical worthwhile and organizationally worthwhile. Time and Scope are another two constraints which is entangled with the above.

3.2.2.1 Technical feasibility

This phase is to determine whether the project is able to carry out with the technical requirements it needs. This phase can be considered as process of proving that the concept is technically possible.

Following are the areas that group members focused on Technical Feasibility study.

- Develop mobile application to capture and process the image.
- Handle a web service.
- Combine mobile phone and web service through Internet.

3.2.2.2 Economical feasibility

Economical feasibility means, the project benefit of the proposed system outweigh estimated cost. We focus on following areas to determine the total cost of the project.

- Hardware and equipments
- Formal and informal learning(technologies)
- Stationeries
- Transportation
- Resources
- Tangible benefits
- Intangible benefits

After considering all the expenses against the benefits, the benefits of the system over weighted the expenses. Therefore the proposed project can be considered as an economically feasible project.

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3.2.2.3 Organizational feasibility

Following activities must be performed before moving to the next phase.

- Work Plan
 - A Work Breakdown Structure will be generated, which represents the project in terms of the hierarchy of deliverables and services it will produce.
- Distribute the Functions in the Project
 - Allocate group members to each and every task or sub task of the system which we have created earlier. Member allocation is done considering their skilled areas in software engineering.
- Controlling and Directing the Project
 - The Gantt chart will be generated under this activity. Each sub task identified in the system will be allocated for certain time period. This chart will be useful to the project manager to trace the project deviations from the original entries

3.2.3 Requirement analysis

Requirement analysis phase encompasses those tasks that go into determining the needs or conditions to meet for a new product. This phase is involved with three major tasks,

- Requirement gathering and analysis
- Requirement specification
- Preparing Software Requirement Specification

3.2.3.1 Requirement gathering and analysis

- Requirements were gathered from
- References (web, books etc.)
- Interviews
- Ouestionnaires

Followings are the identified important tasks at the requirements gathering phase.

- Identify different types of currency notes use in Sri Lanka.
- Identify differences between each currency notes. (Identify Sequences)
- Find more details about current difficulties to identifying currency notes for visually impaired people.
- Identify portability of the system.

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3.2.4 Design phase

Based on the information gathered, group members were able to identify the requirements that need to fulfill. Design phase of software development deals with transforming the requirements into a form implementable using a programming language. In order to be easily implementable in a conventional programming language, designing phase has divided in to following areas.

3.2.4.1 Designing the database

In this section E-ER diagram will be designed and then translate E-ER model in to relational model. Final outcome of this step is relational schema which is much similar to the format of a table in the SQL database.

3.2.4.2 Designing user interface

Details of the data items exchange among different modules are figured out by designing user interfaces. These interfaces enable the users to retrieve, and modify data according to their access levels. Numbers of interfaces are depending on the complexity of the system.

3.2.4.3 System designing

This phase will be the key entry to the implementation phase. Tasks which are allocated are designed and implemented .In this phase group members will draw following UML diagrams,

- Use case Diagram
- Activity Diagram
- Sequence Diagram
- Class Diagram

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3.2.5 Implementation phase

This phase would be the conversion of the design into a working code. Objective of this phase is to develop the modules assigned to each member of the project team. Once the modules of each member are developed it need to combine all together under one system. Proposed system will based on Android mobile application for java and .Net with C. To create the database, MS SQL Server 2008 will be used.

3.2.6 Integration and testing phase

Purpose of integrating is to combine all the components together and build up a complete solution. In order to accomplish the functionalities of the Voting and Counting system there are several minor components to be completed. Once these minor components are ready they need to combine and test whether they function according to the specification. Testing phase will identify the existence of the faults. And the bugs that were found in the tests must be corrected to achieve the objectives. Testing is handled in three levels.

3.2.6.1 Unit testing

Unit testing is a method which individual units of source code are tested to determine if they are fit for use. A unit is the smallest testable part of an application.

3.2.6.2 Integration testing

In integration testing phase individual software modules are combined and tested as a group. It occurs after unit testing and before validation testing. Integration testing takes as its input modules that have been unit tested, groups them in larger aggregates, applies tests defined in an integration test plan to those aggregates, and delivers as its output the integrated system ready for system testing.

3.2.6.3 System testing

System testing of software or hardware is testing conducted on a complete, integrated system to evaluate the system's compliance with its specified requirements. System testing falls within the scope of black box testing, and as such, should require no knowledge of the inner design of the code or logic.

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3.2.7 Maintenance phase

This phase is started once the product is delivered to the user. The defects that could not identify at the testing phase will be identified here. These defects are occurred due to the incompatible environments. Developers develop the projects according to their environments. Such incompatibilities are identified when the time comes to apply the completed product to function. Therefore the implementation must be faultless. Also When Customer Use The application its difficult to change each application separately. There for proposed solution will provide synchronization part to update mobile application from the web server. Ex- When a new currency note introduced, can update mobile application from the web service provide.

3.3 Hardware and software requirements

3.3.1 Hardware requirements

The proposed system may require lot of processing power as well as speed.

- Internet enable android smart phone
- Optical Beacons
- 3 Mega pixel inbuilt mobile phone camera with auto-focus and LED ash
- 4GB RAM and Core i3 processor to implement the server

3.3.2 Software requirements

Software resources are required to successfully complete the project

- Microsoft .Net Framework 3.5 with Microsoft Visual Studio 2008 IDE
- Microsoft SQL Server 2008
- Android SDK For Windows
- Eclipse Indigo Version
- MATLAB 7.5 IDE with .Net Builder
- Rational Rose
- Microsoft Word 2013
- Microsoft Power Point 2013
- Microsoft Project 2010

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3.4 Work Break down Structure

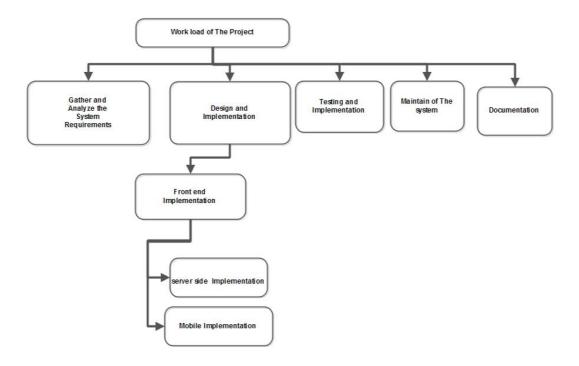
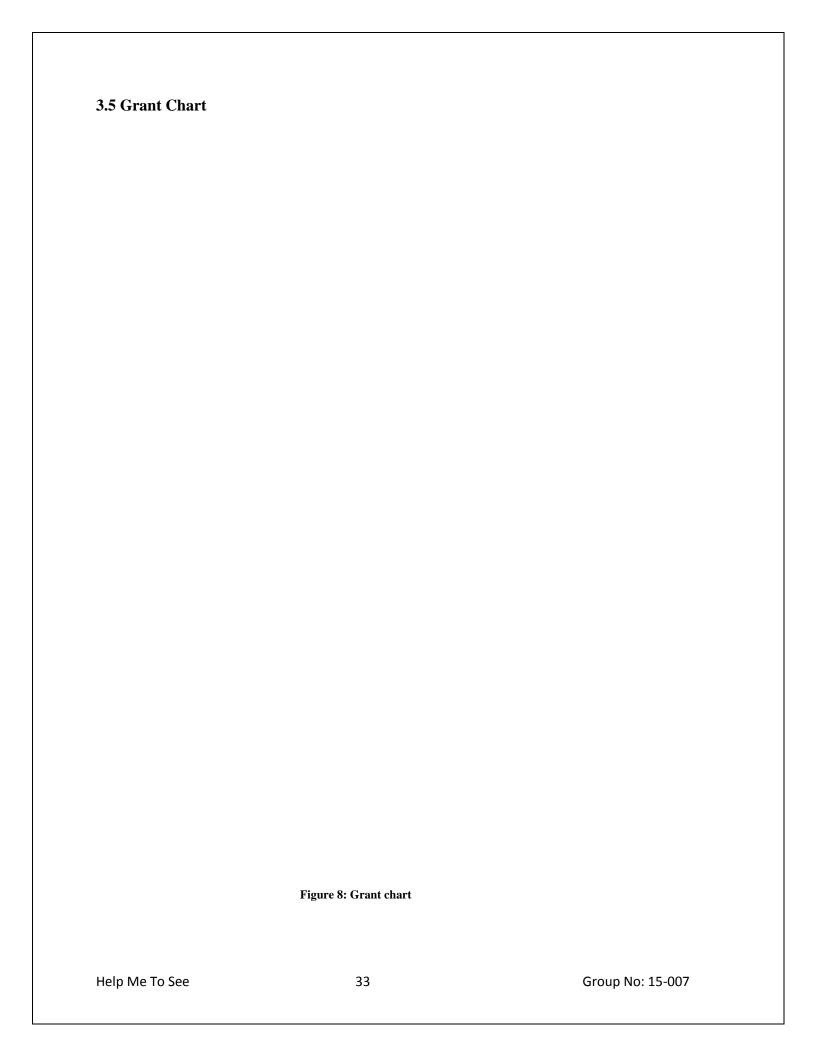


Figure 7: Work Break Down Structure

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4.0 Descriptions of Personal and Facilities

The tasks of this research will be divided among the members of the group. The project scope is divided into 4 areas and they are carried out by all the group members. The following figures gives a brief description of the responsibilities of each and every group member.

Name	Section	Task
Abhayathunga G.D IT12128464	Object Validation and Verification System	 Template Matching Segmentation Documentation of the project Testing Quality Management
H.M.S.N Bandara IT12128914	Image capturing and object recognition system	 Template matching Capture image Cropping image Documentation of the project Testing Quality Management
D.C.E Dannoruwa IT12010004	Indoor navigation system	 Build the wireless network infrastructure using beacons Indoor navigation Voice notification system Documentation of the project Testing Quality Management
R.M.I.P.Rathnayake IT12115044	Handling sub components and color detection	 Handling the communication between mobile and the server Image pre-processing Color Detection Documentation of the project Testing Quality Management

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5.0 BUDGET AND BUDGET JUSTIFICATION

A budget is a financial document used to project future income and expenses. The budgeting process may be carried out by team members to estimate whether the team can continue to operate with its projected income and expenses.

	Description	Quantity	Amount
Optical Beacons	Bluetooth Devices	1	30,000
Android Smart Phone		1	50,000
Printing Cost	Print out		3000
	Photocopy		500
	Binding		200
Traveling Cost			500
Total Project Cost Estimation			84,200

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6.0 References

[1] Assistive Technology Information for Exchange Students Who Are Blind or Have Low Vision-Mobility International USA-MIUSA[online]. Avilable: http://www.miusa.org/ncde/tipsheets/ wassistivetechnologyforblindstudents[Accessed:03/02/2012] [2] Identifying Paper Money and Coins If You are Blind or Have Low Vision | VISION AWARE.[online]. Avilable:http://www.visionaware.org/difficultyidentifyingcoinspapermoney:[Accessed: 03=02=20121 [3] "Text Analytics vs Natural Language Processing", tom's IT PRO [Online], Available: http://www.tomsitpro.com/articles/social-bi-ibm-social-media-analytics-business-intelligence,2-596-2.html (2014, Feb 22) [4]WHO World Health Organization[online]. Avilable: http://www.who.int/en/.[Accessed:02/02/2012] [5]InterestingAndroid2011StatisticsSharedatGoogleI=O2011[online]:Avilable: http: ==gadgetgizmodo: blogspot:com=2011=05=interesting \square android \square 2011 \square statistics:html[Accessed : 04=02=20121 [6] Generalized Autofocus: http://people.csail.mit.edu/kapu/papers/VaqueroWACV11.pdf [7] Development of the navigation system for the visually impair by using optical beacons: http://www.dtic.mil/dtic/tr/fulltext/u2/a410481.pdf [8] "Text Analytics vs Natural Language Processing", tom's IT PRO [Online], Available: http://www.tomsitpro.com/articles/social-bi-ibm-social-media-analytics-business-intelligence,2-596-2.html (2014, Feb 22) [9] Currency recognition system using image processing: http://www.divaportal.org/smash/get/diva2:324361/FULLTEXT02

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Query:http://www.ee.columbia.edu/ln/dvmm/publications/95/smith95b.pdf

[10]Single Color Extraction and Image