Chapter One

Introduction

Chapter One

Introduction

1.1 Preface:

In recent year, shopping became a very hard task to do, with hundreds manufactures and millions products, supermarkets start being bigger and contain thousands of products. The shopping trip started taking long time from the shopper to choose which manufacturer is the best, which product is the right one and the healthiest by noticing things like production date, expired date and product ingredients. With all things mentioned, shopping for every day needs became complicated for normally people and much complicated for people with any kind of impaired.

Many people with visually impaired (VI) shopping dependently. They receive assistance from a friend, a relative, an agency volunteer, or a store employee. Depending on the assistant's availability, the shopper may need to postpone the shopping trip many times [1]. Instead of this, another solution for these people will be presented to make their life easier. This solution is a mobile device that helps the visually impaired to identify the products in the supermarket.

The supermarket presents the device to the visually impaired person when entering the supermarket .They use the device to identify any product in it. Every shelf in the supermarket have tags for every product, every tag contain a code, which is unique for each product. The device which carried by the visually impaired has a reader can read those tags in specific shelve, and compare any tag code in the shelf with all shelves tags codes which are saved in the supermarket database.

Each product specification like name, price, manufacturer and weight recorded by a very clear voice and saved in the database. When the device reads a specific tag, the system will recognize the product according to that tag, thus the corresponding voice file will be played and the visually impaired will hear the product information which exists on that shelve.

1.2 Problem Statement:

Visually impaired people face many problems in their life; they need a lot of outside support in doing anything. One of their problems is purchasing products from supermarkets. This part of the visually impaired problems discussed and covered in this project.

1.3 Proposed Solution:

To design a mobile device carried by visually impaired when getting inside the supermarket to describe the category of the product and it's specifications in the visually impaired section.

1.4 Objectives:

The main objectives of the project are:

• To design a guiding system using Infrared Technology to guide the visually impaired inside the supermarket.

- To design a visually impaired product identification device using RFID and microcontroller technologies.
- To simulate the suggested design of the guiding system by using Proteus simulation environment.
- To simulate the suggested design of the device by using Proteus simulation environment.
- To implement a prototype of the proposed system.

1.5 Methodology:

When this project start, the first phase was to determine the objective of the project, the technologies that can use to achieve this objectives, and to decide which technology is the best to work with. The second phase was to describe the problems that visually impaired facing in shopping, this done by asking people with visually impaired and read researches describe all the problems. After this, some exploring is done revealing some old research in the same area using different techniques and ideas, which was helpful in writing literature review, adding new ideas to the project and showing the point the project need to focus on.

The third phase start with writing the scenario, from the moment that the visually impaired enter the supermarket, movement inside the supermarket, way to recognize the product using the device and until leaving the supermarket. Then drawing the device block diagram, and end with simulate the device and guiding system work. The fourth phase was to build hardware prototype which contain atmega16 microcontroller, radio frequency identification RFID reader and tags, audio recorder chip APR9600 and headphone.

The fifth phase was testing and evaluating the system performance. The final phase was writing the result, conclusion and command.

1.6 Thesis Outline:

- Chapter one consists of preface, problem statement, proposed solution, objectives and methodology.
- Chapter two contains related work about techniques used to solve the problem. Background about the component use to make the device and the guiding system Infrared technology (IR), Radio Frequency Identification (RFID), microcontroller (AVR ATmega16) Audio Play and Record chip (APR9600).
- Chapter three consists of the device and the guiding system block diagrams, information about the component function in the system, supermarket map, the scenario of what could happen to the Visually Impaired in the supermarket and flow chart.
- Chapter four contains the simulation of the device and the guiding system by using protues environment and the result of the device and the guiding system work in the project.
- Chapter five consists of the conclusion of the project and the reference.

Chapter Two

Literature Review & Background

Chapter Two

Literature Review & Background

2.1 Introduction:

For many years in the beginning of time visually impaired people was isolated from society, and treated as burden on their families. However, in the recent century people try to help them interact with the society and depend on their own. One of the most signifies field is making the visually impaired shopping independently for their grocery. One of the main problems facing them in the shopping is the guiding problem, how the visually impaired will know his/her way from the house to the supermarket and vice versa, and how they know their way inside the super market and where they will find their desire products. The other problem is how they recognize this products, some of them was using the smell of the fruits and vegetable to distinguish between it.

One of techniques that help visually impaired in shopping is by going with another person to help him/her purchasing their products. The good thing about this technique that the visually impaired can choose the product personally and can find the alternative if the visually impaired did not find the product. The problem with this technique that these people may not be available at any time.

Other technique that help visually impaired in shopping is home delivery shopping. The visually impaired call the supermarket and give the supermarket list of the products that he/she need, and then supermarket employee deliver the products to the visually impaired in the house. The advantage of this technique is that the visually impaired do not need to go to the supermarket. The disadvantage of this method is that the visually impaired must wait a lot of time until delivery employee arrived [1].

In modern century, many techniques used to help the visually impaired in shopping independently, these techniques design to guide the visually impaired inside the supermarket and recognize the products. Some of these techniques will present in this chapter.

2.2Background:

This section contain information about component that used in this project as shown below:

2.2.1 Voice play and recording chip (APR9600):

The APR9600 is a single chip used for high quality voice recording. It reproduces the voice signals in their natural form. The APR9600 is a device offers true single-chip voice recording, non-volatile storage, and playback capability for 40 to 60 seconds. The device supports both random and sequential access of multiple messages.

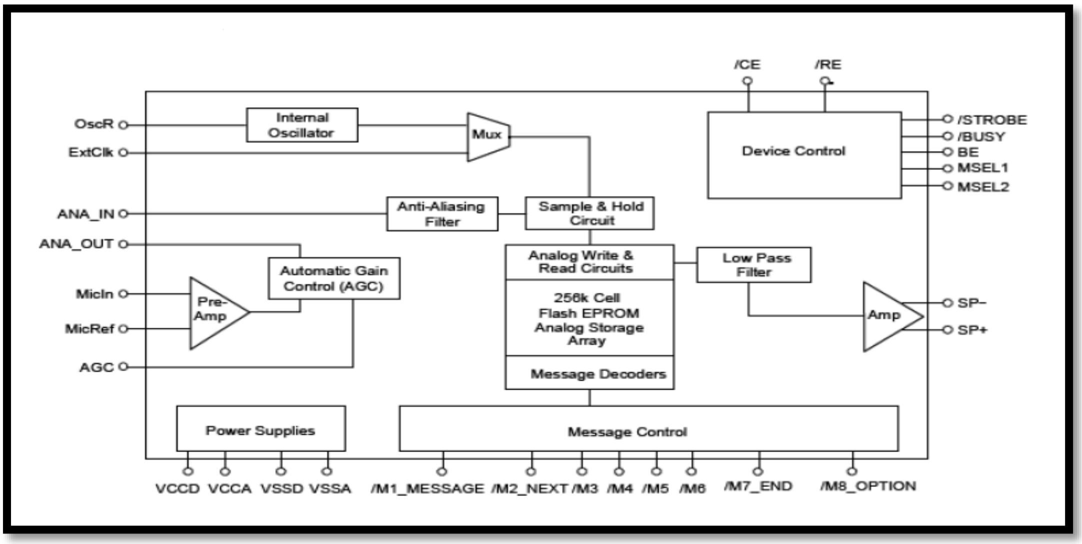


Figure 2-1: voice Play and recording chip (APR9600)

Functional Description:

The APR9600 block diagram is included in order to give understanding of the APR9600 internal architecture. At the left hand side of the diagram are the analog inputs. A differential microphone amplifier, including integrated AGC, is included on-chip for applications requiring its use. The amplified microphone signal is fed into the device by connecting the Ana Out pin to the Ana In pin through an external DC blocking capacitor. Recording can be fed directly into the Ana In pin through a DC blocking capacitor, however, the connection between Ana In and Ana Out is still required for playback.

The next block encountered by the input signal is the internal anti-aliasing filter. The filter automatically adjusts its response according to the sampling frequency selected so Shannon's Sampling Theorem is satisfied. After anti-aliasing filtering is accomplished, the signal is ready to be clocked into the memory array. This storage is accomplished through a combination of the Sample and Hold circuit and the Analog Write/Read circuit. These circuits are clocked by either the Internal Oscillator or an external clock source. When play- back is desired the previously stored recording is retrieved from memory, low pass filtered, and amplified as shown on the right hand side of the diagram. The signal can be heard by connecting a speaker to the SP+ and SP- pins. Chip-wide management is accomplished through the device control block shown in the upper right hand corner. Message management is controlled through the message control block rep- resented in the lower center of the block diagram. More detail on actual device application can be found in the Sample Applications section. More detail on sampling control can be found in the Sample Rate and Voice Quality section. More detail on message management and device control can be found in the Message Management section [2].

Figure 2-2: The APR9600 module [3]

2.2.2Infrared (IR) Sensor:

Infrared (IR) is invisible radiant energy with longer wavelength than visible lights. The communication can be between one portable communication device and another or between a portable device and a tethered device, called an access point or base station.

There are many applications of IR like thermography, which used to remotely determine the temperature of the object, tracking which, uses the emission from a target of electromagnetic radiation in the infrared part to track it, furthermore it use in communication it employ in short range communication among computer peripherals and remote controls etc. [4].

Figure 2-3: Infrared transmitter and receiver [5]

IR band can divided based on the response of various detectors to:

Table 2-1: The range of Infra-Red:

Type of Infra-Red	**The Range (micro meter)**
Near	0.7 – 1
Short	1 – 3
Mid	3 – 5
Long	8 – 12 , 7 – 14
Very Long	About 30

2.2.3 Microcontroller:

A Microcontroller is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output ports peripherals.

Microcontrollers are the heart and soul of many everyday appliances they lead to a small and compact system that is more reliable and cost effective because of the fewer number of components and the fewer number of interconnections. Today there are many microcontroller families Motorola's 68HC11, Microchip's PIC and now Atmel's AVR.

The function of microcontroller in this project is to compare the code come from the reader with the codes saved in it, and when it find the matched code it sent to the APR9600, to play the voice record attach to the code [6].

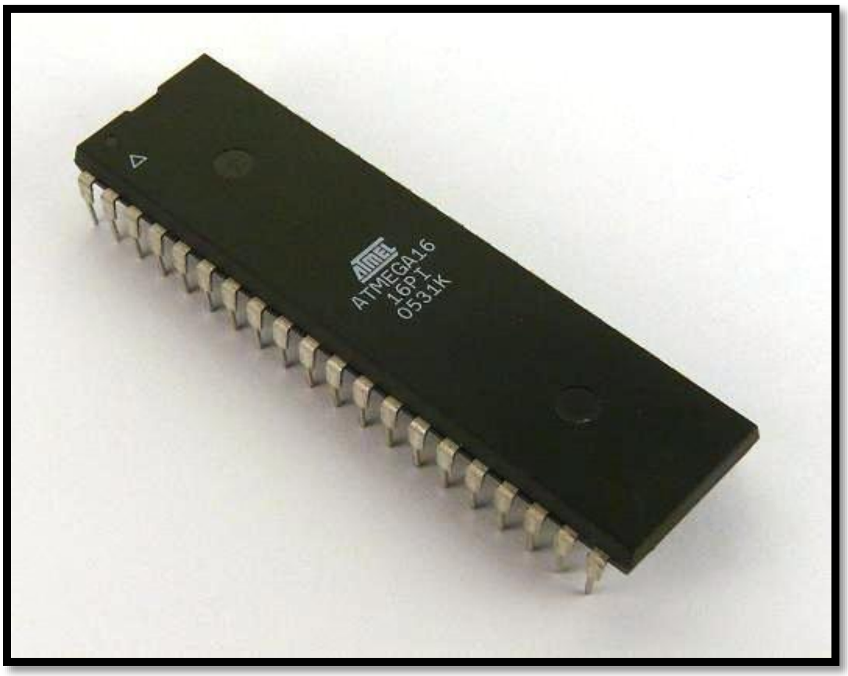


Figure 2-4: ATmega16 [7]

Comparison between microcontroller, microprocessor:

Table 2-2: Comparison between microcontroller, microprocessor and PLC [8]:

Microcontroller	**Microprocessor**	**PLC**
Programmable.	Non -programmable.	Programmable.
Dedicated	General	Dedicated
Small computer on a chip (IC)	IC circuit that executes program instructions	Computer based system for logic based control
Integrated	Needs to interact with other devices	Integrated
Includes (CPU, RAM, I/O ports, ADC, etc.)	Includes CPU only, use external memory	Contain one or more microprocessors.

2.2.4 Electrically Erasable Programmable Read Only Memory (EEPROM):

EEPROM is a type of stable, non-volatile memory used in computer and other electronic devices to store small amounts of data that must be saved when power is removed.

An EPROM usually must be removed from the device for erasing and programming, whereas EEPROMs can be programmed and erased in-circuit, by applying special programming signal. Originally, EEPROMs were limited to single byte operations, which made them slower, but modern EEPROMs allow multi-byte page operations. It also has a limited life that is the number of times it could be reprogrammed was limited to tens or hundreds of thousands of times. That limitation has been extended to a million write operations in modern EEPROMs. In an EEPROM that is frequently reprogrammed while the computer is in use, the life of the EEPROM can be an important design consideration. It is for this reason that EEPROMs were used for configuration in information, rather than random access memory [9].

2.2.5 Radio Frequency Identification (RFID):

RFID systems consist of small transponders, or tags, attached to physical objects. The tag wirelessly interrogated by RFID transceivers, or readers, and it respond with some identifying information.

Tags attached to all objects to be identify in an RFID system. Every tag is typically composed of an antenna and integrated circuitry. RFID readers communicate with tags through an RF channel to obtain identifying information [10].

The RFID system depending on the tag has three types:

Table 2-3: RFID Passive, Semi-passive, and Active tag comparison:

Tag Type	**Passive**	**Semi-Passive**	**Active**
Power Source	Harvesting RF energy	Battery	Battery
Communication	Response only	Response only	Response, initiate
Max Range	10 M	> 100 M	> 100 M
Relative Cost	Least expensive	More expensive	Most expensive
Example Applications	EPC Proximity cards	Electronic tolls Pallet tracking	Large-asset tracking

The RFID system can work in different frequencies:

Table 2-4: Common RFID operating frequencies:

Frequency Range	Frequencies	Passive Read Distance
Low Frequency (LF)	120-140 KHz	10-20 cm
High Frequency (HF)	13.56 MHz	10-20 cm
Ultra High Frequency (UHF)	868-928 MHz	3 meters
Microwave	2.45 & 5.8 GHz	3 meters
Ultra-Wide Band (UWB)	3.1-10.6 GHz	10 meters

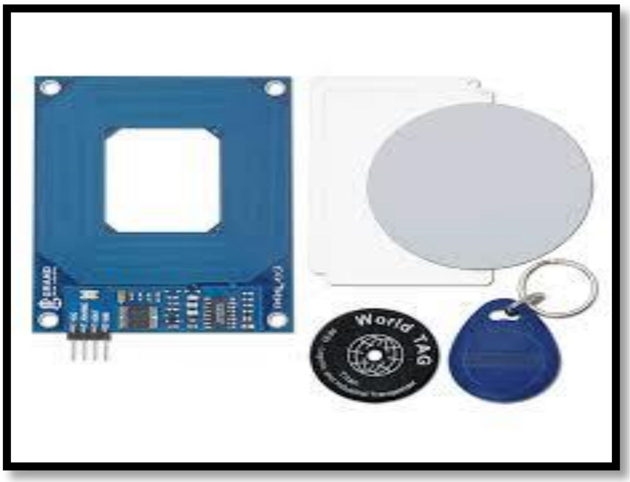


Figure 2-5: RFID reader and tag [11]

2.3 Related Work:

In 2002, Vladimir Kulyukin, et.al presented research entitled "A Robotic Way finding System for the Visually Impaired". The core of the system is a mobile robotic base with a sensor suite mounted on it. The sensor suite consists of an RFID reader and a laser range finder. Small passive RFID sensors are manually insert in the environment.

In this system a Way finding Toolkit (WT) mounted on top of the platform of the cart and powered from the on board batteries. The WT includes a small 10-key keypad was attached to the handle for product selection shopping list browsing, a laptop connected to the platform's microcontroller. The communication between the laptop and the microcontroller done through an USB.

The laptop interfaces to radio-frequency identification (RFID) passive reader through another USB to serial cable, which detect RFID sensors (tags), placed in the environment. Each tag programmatically assigned a unique ID to identify specific objects and allowed the robot to keep track of its position in each aisle. Finally, the laptop connected to laser range finder mounted on the front of the robot to detect obstacles.

Robotic way finding system partially succeeds in meeting mobile product selection because its keypad programmed as a mobile phone keypad, which allows the shopper to select items by list browsing , meeting store navigation through robot navigation , product search and product identification though a wireless barcode scanner. In the other hand Robot Cart, addresses neither have utilization of existing devices, nor minimal environmental adjustments [12].

Sreekar Krishna, et.al present a new system design, using Electronic Product Code (EPC) and Radio Frequency Identification (RFID), to provide a wearable wireless device capable of delivering product information.

The system goal is to have a wearable RFID reader and a portable computing element like PDA that a customer can use to access information about products in a shopping environment. There are two-component architecture one involves the wearable device on the customer collects the unique EPC code from products on the shelves, and central server in the store contain database for all the products. The communication between the RFID reader and the PDA enabled by using Bluetooth module. The PDA and the store server establish communication over a Wi-Fi network.

The database holds the information about various products and their locations within the store, and an interface between the database and the wearable device. This technique supports product identification, it partially support store navigation and product search (RFIDs on the products can used in navigation and search). It doesn't support minimal environmental adjustment [13].

The GroZi project in 2010. The GroZi project aims at allowing visually impaired user to independently navigate a grocery store and collect the items on their grocery list. Shelf Scanner technique presented to do that aims in the GroZi project. This project has three components: The first one is an accessible web site for visually impaired users to create grocery shopping lists in the comfort of their homes. The Second is computer vision software for recognizing products and signs in stores by using Shelf Scanner technique. The third is portable devices that can execute computer vision algorithms and give the user haptic and verbal feedback.

The system contain two devices: the MoZi Box and the GroZi hand glove with a small portable camera and vibrating motors. In a typical GroZi use case, a visually impaired shopper uses the web site to compile a shopping list of products and uploads it on the portable device. In the store, the shopper takes out the device and uses it to receive directions for each item in the shopping list. For example, if the shopper wears the glove and points at an aisle, the portable unit will indicate the components of that aisle and guide the shopper to the desired item. The primary focus of the project has so far been on various object recognition algorithms for detecting items on the shopping list in continuous video streams. The GroZi team's long-term objective is to enable the user to sweep the portable camera's field of view across the grocery shelves. When an item on the user's shopping list is detected in the video stream, the system will give the user either haptic or verbal guidance as to how to get to that item.

The disadvantages of this system are, the system does not have a mobile product selection to the complete shopping list, is taken for granted, the shopper is not supposed to modify the shopping list in the store. The system component of the GroZi hardware is completely-off-the-shelf, which makes for easier maintenance, and the system is unlikely dose not minimal environmental adjustment due to significant maintenance costs. The system could do minimal environmental adjustment outsourcing the maintenance [14].

PIRAmIDE project presented in 2011. PIRAmIDE is overcoming the difficulties blind people usually encounter whilst shopping in a supermarket without the help of someone else, by taking advantage of smartphones potential to behave as disabled users' sensorial complement.

The distributed component architecture of PIRAmIDE is composed of the following three components, firstly navigation system, It is in charge of guiding the blind user inside the supermarket. It provides through a headphone connected to her smartphone simple verbal navigation instructions. It combines a white cane with a portable RFID reader attached to its tip, a set of road mark-like RFID tag lines distributed throughout the corridors of the supermarket.

Secondly, product recognition. Once the user reaches the target product section, she points with her camera phone to an embossed QR or UPC code attached to a shelf section or product. The smartphone camera recognizes that code and then informs verbally about the product main features.

Thirdly, System management Blind Shopping includes a web front-end for Blind Shopping RFID and QR code infrastructure management. It allows the registration of the collection of RFID tags scattered though the supermarket floor and the QR- codes attached to products or shelf sections.

The operation Details of PIRAmIDE a Nokia 6131 NFC was used, initially, for reading RFID tag floor markings and deliver them through a Java ME Bluetooth application to a user carrying Android phone. An alternative implementation using the autonomous Bara coda Tagrunner1 RFID Bluetooth reader has then been used. The mobile application in an Android phone allows the blind person to choose an action through a gesture interface or by issuing a voice command. Concretely, the navigation system operation requested by drawing an “L” or issuing the “Location” voice command. Drawing a “P” or issuing a “Product” voice command, the user will access the product recognition component that allows obtaining information about a product. A backend server contains the system data and business logic of the Blind Shopping platform. In a real deployment, this back-end should be integrated with the inventory management system of the supermarket [15].

Chapter Three

System Design

Chapter Three

System Design

3.1 Block diagram of Product Recognition Device (PRD):

This section include block diagram represent how component connected and each component specific job in the PRD:

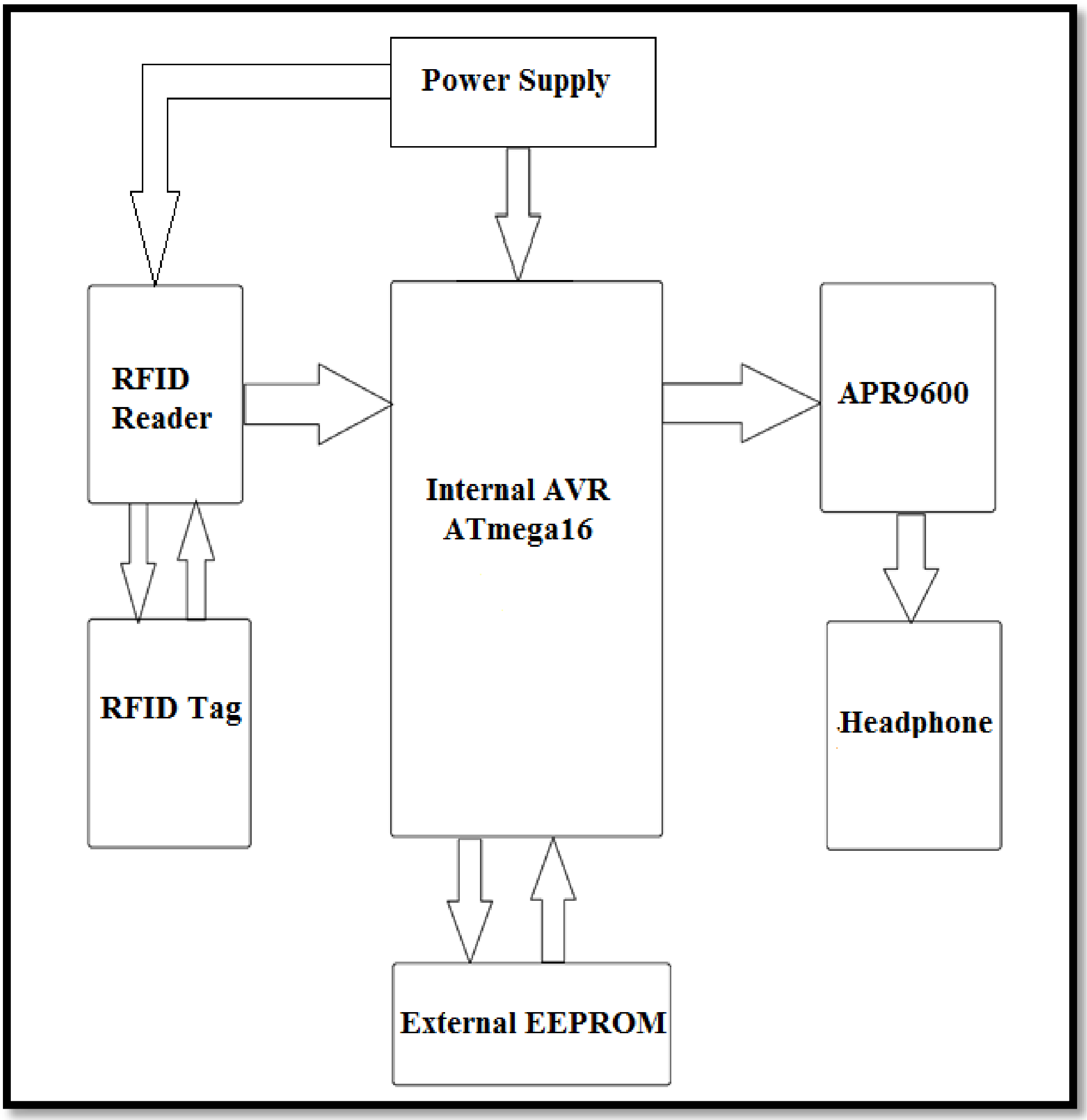


Figure 3-1: The PRD block diagram

The PRD function is make the visually impaired recognize the product in the supermarket. This device consist of:

3.1.1 Radio Frequency Identification (RFID) TAG:

RFID tag will be attached to the shelf where supermarket products will placed. It has a unique worldwide ID number is stored on the chip transmit to the reader through radio frequency.

3.1.2 RFID READER:

Mobile reader serve for detecting the data on varies object. The reader energize the passive tag and wait for receiving a code from it. Then the reader send the code to the microcontroller. Data transfer to the microcontroller uses wireless standers by the antenna, which integrated directly in the device.

3.1.3 AVR ATMEGA 16:

It compare the code come from the reader with the codes saved at it, and when it find the matched code it sent signal to the APR9600, to play the voice record attach to the code, the voice record is played through the headphone.

3.1.4Voice play and recording chip (APR9600):

APR 9600 connected to the microcontroller by specific four pins, the APR 9600 record the voice through microphone and can produced to hear through speaker whenever it receive a signal from microcontroller.

3.1.5 EARPHONE:

Earphone are very small headphone that are fitted directly in the outer ear used in this system to tell the visually impaired the information about the products.

3.1.6 EEPROM:

Is a type of memory used in this system to store database of the product codes.

3.2 The overall system description:

In most of the supermarkets, there are employee help the visually impaired in shopping, but in this project the situation will change, the employee mission will be limited in recognize the visually impaired and present the mobile device with telling simple instructions to the visually impaired.

There is a dedicated lane on the ground, from the entering doors, passing through all the subsections, the visually impaired walk on it.

In the beginning of the section, there is Infrared technology (IR) system contain transmitter (LED) send light to receiver (Photo Sensor), which connected to speaker , when the visually impaired enter the special section, the visually impaired cut the light from the receiver, and send signal to speaker which play audio.

When the visually impaired arriving to the point of intersection of two subsection, one on the left and the other on the right, a sound will play to make the visually impaired recognized the place, then the visually impaired choose the direction to go.

The visually impaired will follow the lane to the subsection, in the begging of each subsection, there is another Infrared technology (IR), which contain transmitter and receiver, the transmitter send light to the receiver, the receiver which connected to speaker, and audio file will play in speaker to tell the visually impaired in what subsection the visually impaired is.

In each shelf, there are two racks, at the beginning of the each shelf there is tag. The visually impaired preside PRD to the tag, and read the tag code on the rack shows the same product manufacturing by many companies, the PRD has ability to identify the product type, company, name, weight, price and another specification, according to the product type. Many bottoms do this characteristic.

3.3 The System Scenario and Supermarket Map:

This section contains the supermarket map, the scenarios of what could happen to the VI inside the section and 3D pictures to the section.

In the supermarket map the blue line represent lane, the green area represent the first sound spot to direct the VI to the VI section. The yellow line symbolize the VI section entrance IR, the brown area symbolize second sound spot subsections indicator, the red lines exemplify the subsections entrance IR. The grey area exemplify the third sound spot tags indicator, and finally violet area represent where the tags placed.

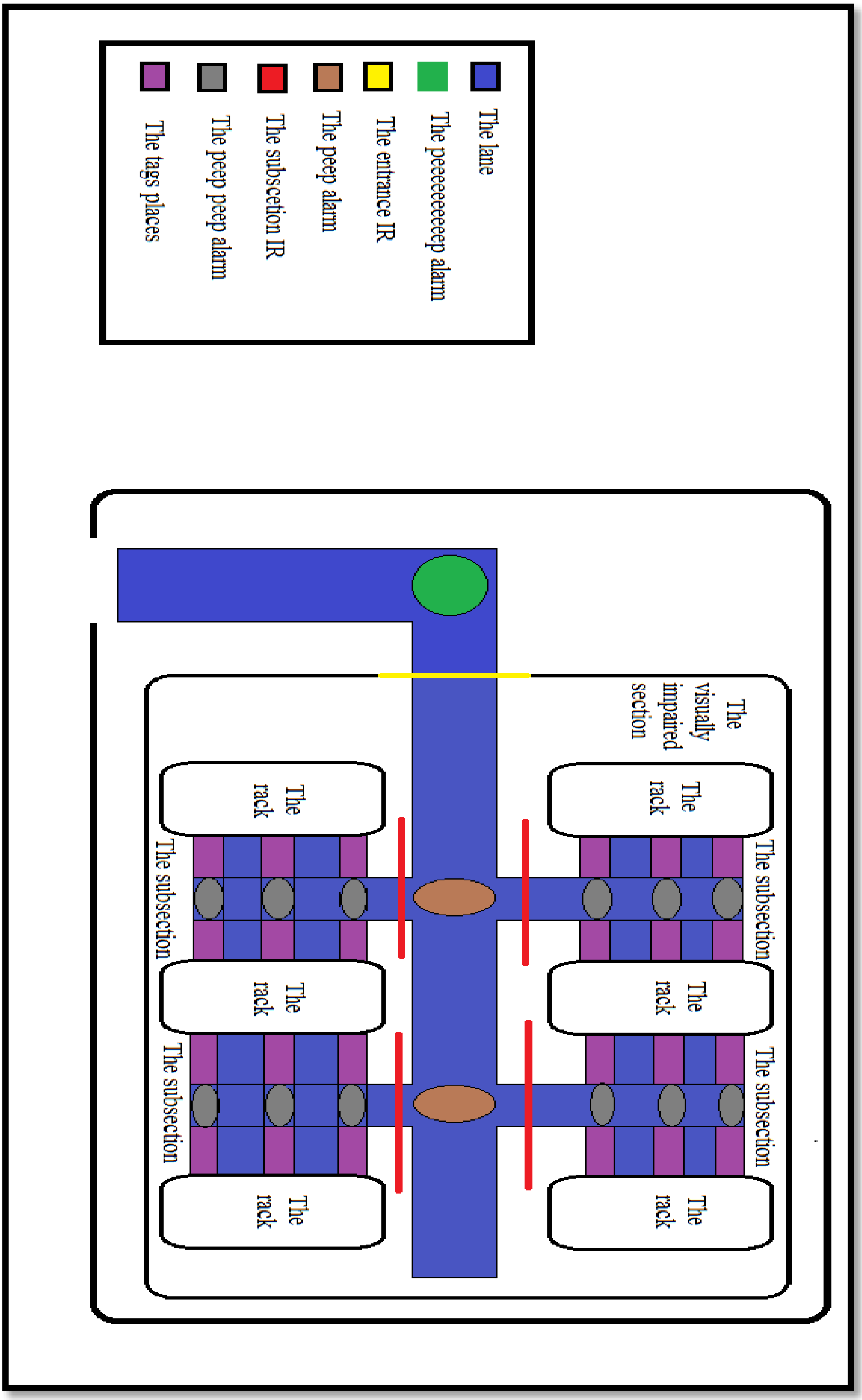


Figure 3-2: The Supermarket Map

This design scenario can be divided as following:

- The first scenario starts when the visually impaired enter the supermarket, the supermarket employee recognize him/her from the rest of the shoppers entering from the same door. The employee takes the visually impaired to the beginning of the lane, give him/her the device after turning it on and check the battery. Then he tell the VI instructions:
  1- Walk forward on the lane until hearing "peeeeeeeeeeeeep" then turn right to enter the VI section.
  2- Move forward in the section until hearing "peep" then you can decide to go either left or right to enter subsection or forward to the next intersections.
  3- When hearing "peep peep" that mean there is tags and you can turn left or right and move the device to read.
- In the second scenario the visually impaired walk on the lane (blue color) until he/she arrive the (green area) which contain the first alarm "peeeeeeeeeeeeep" which mean "this is the end of the way tarn right". The visually impaired continue walking until he arrive to the entrance of the visually impaired section. When the visually impaired enter, the section he cut the Infra-Red light (Yellow color) and voice record will play welcoming him/her inside the section.
- The third scenario start after the visually impaired enter the section he/she walk throw it until reach the brown area, then the second alarm work to indicate that "there is a subsections in the right and left from your place", then he/she choose a side to go. In every side there is an Infrared system connect to a speaker to tell the visually impaired in which section he/she is (red color).

- The fourth phase is in the subsection after the visually impaired entered he/she walk until hear alarm “peep peep” to indicate, “There are tags to read in the left and right of its place” this tag contain the information about the product in that shelf.

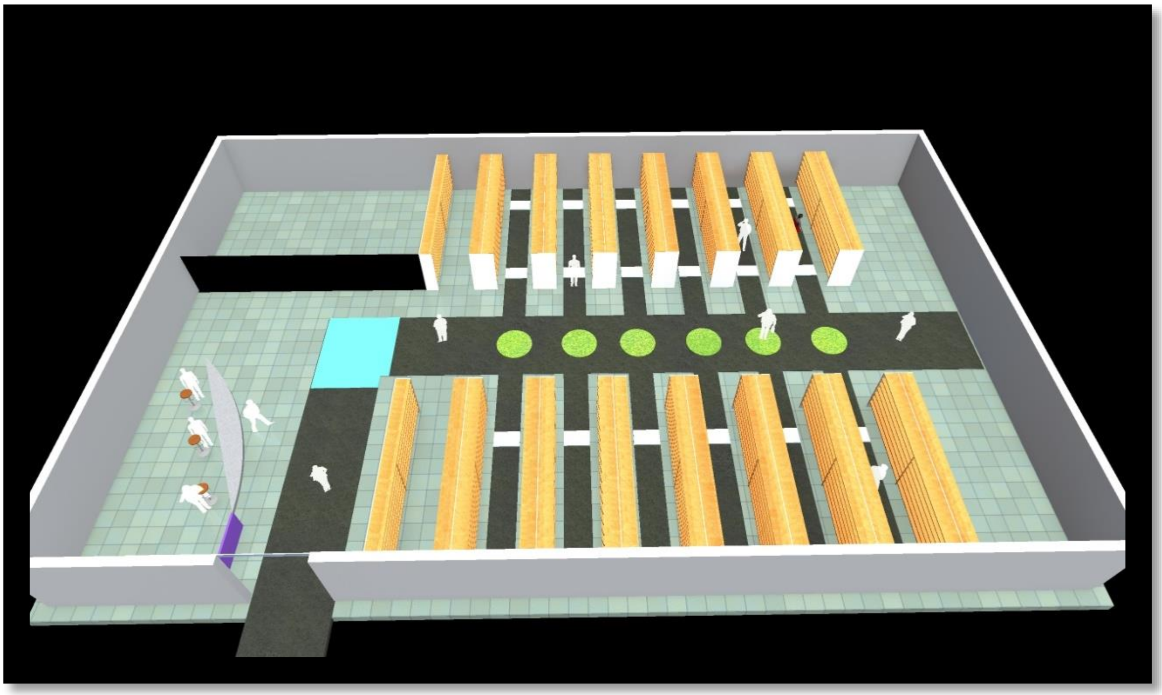


Figure 3-3: The Visually Impaired section in the supermarket

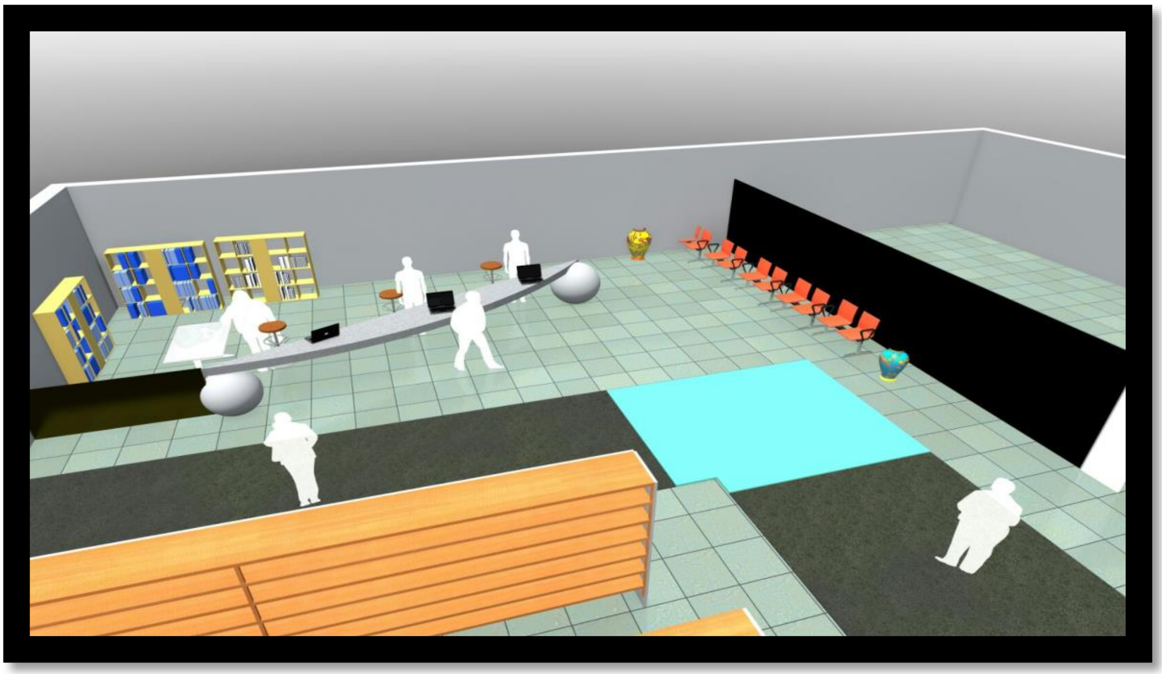
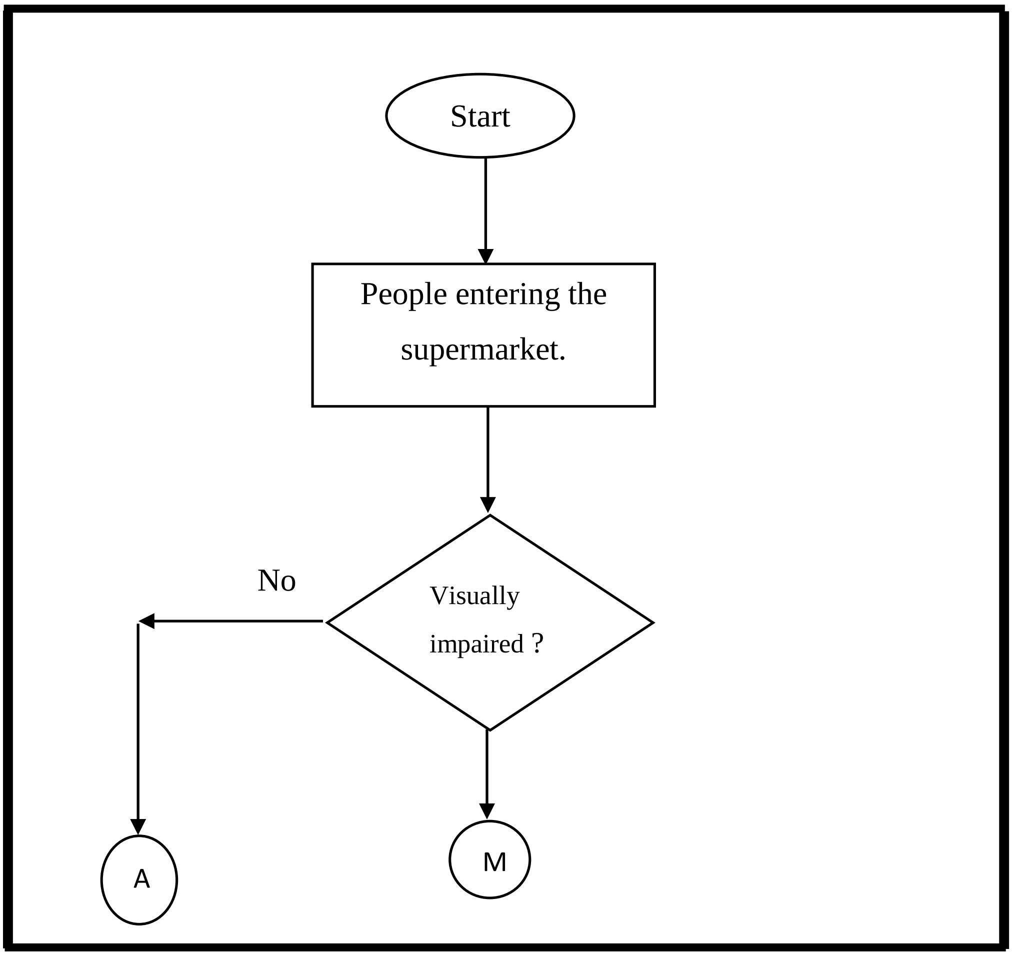
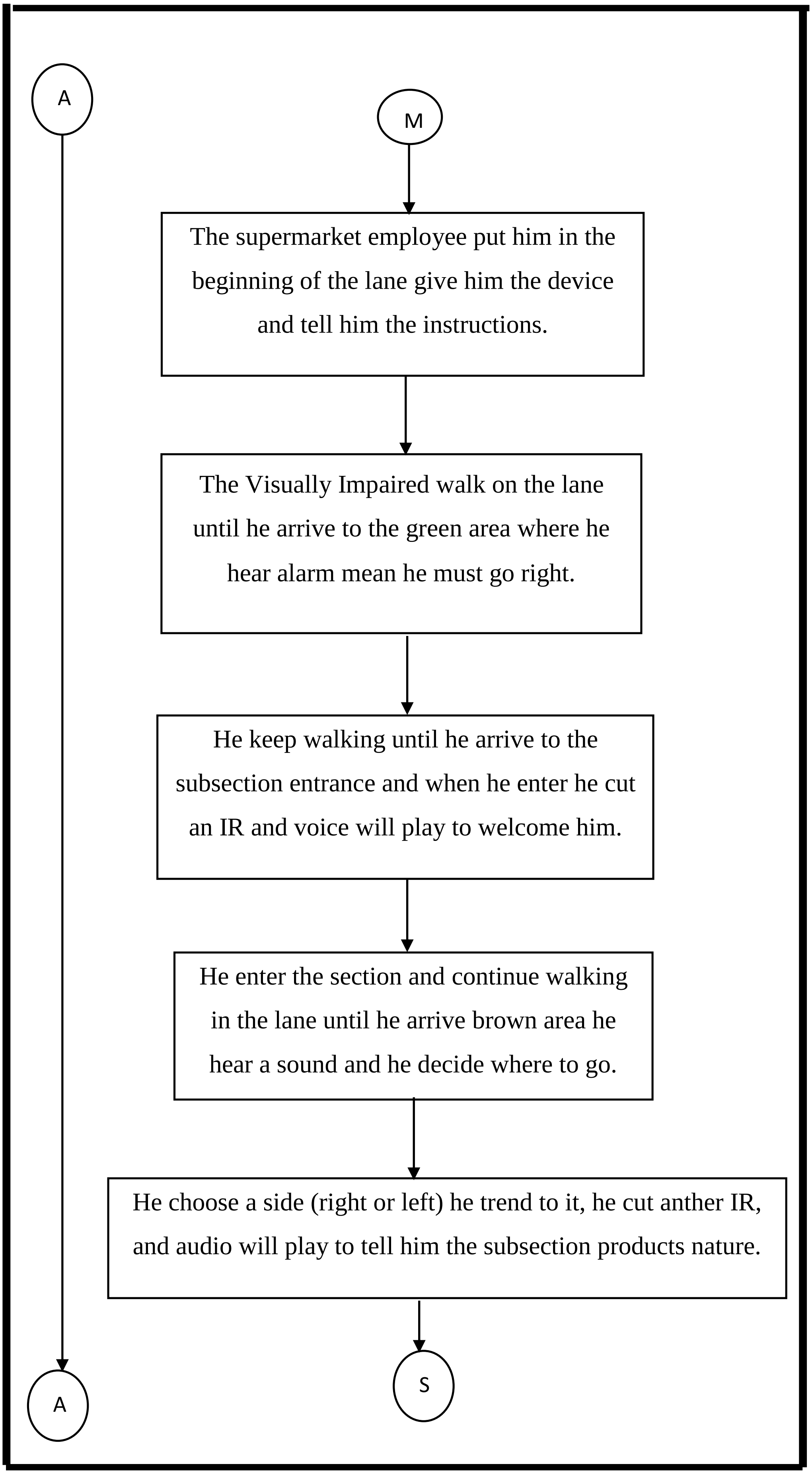


Figure 3-4: The VI section entrance area

Figure 3-5: Inside VI section

3.4 Flow chart of the scenario:




A
M
The supermarket employee put him in the beginning of the lane give him the device and tell him the instructions.
The Visually Impaired walk on the lane until he arrive to the green area where he hear alarm mean he must go right.
He keep walking until he arrive to the subsection entrance and when he enter he cut an IR and voice will play to welcome him.
He enter the section and continue walking in the lane until he arrive brown area he hear a sound and he decide where to go.
He choose a side (right or left) he trend to it, he cut anther IR, and audio will play to tell him the subsection products nature.
A
S

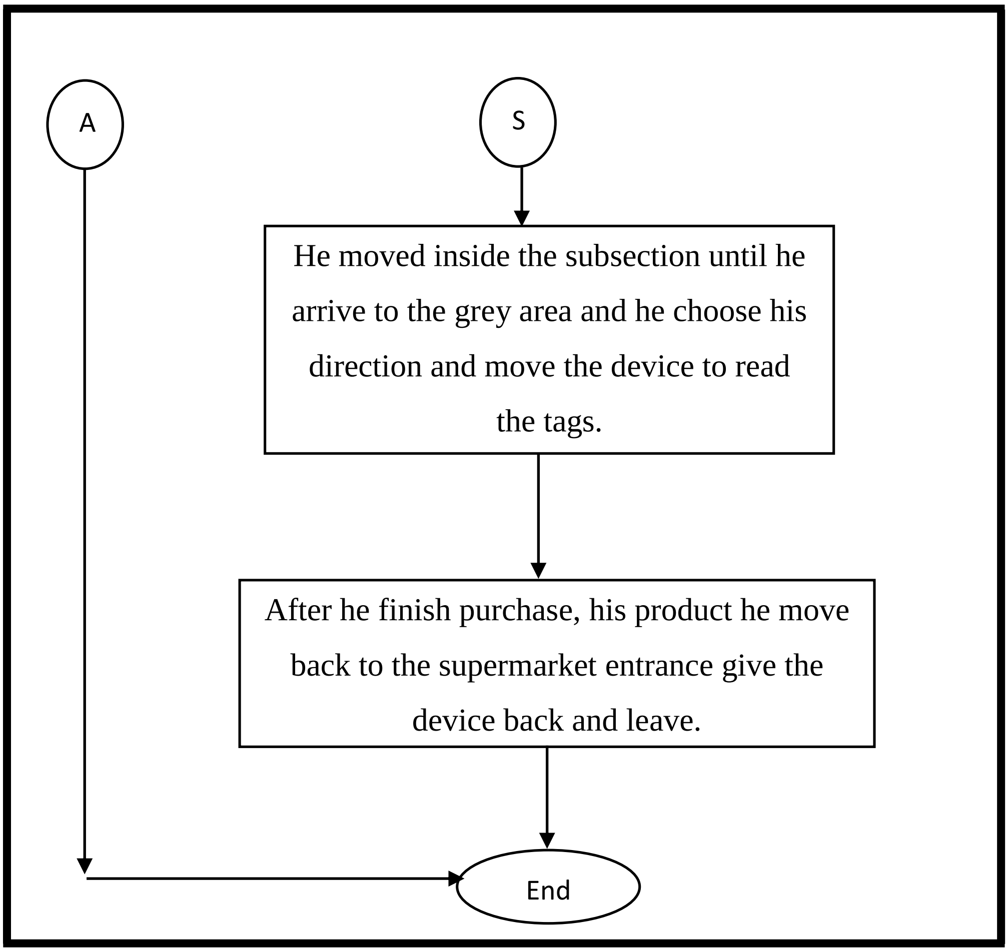


Figure 3-6: The scenario flow chart

Chapter Four

Simulation & Hardware Implementation

Chapter Four

Simulation & Hardware Implementation

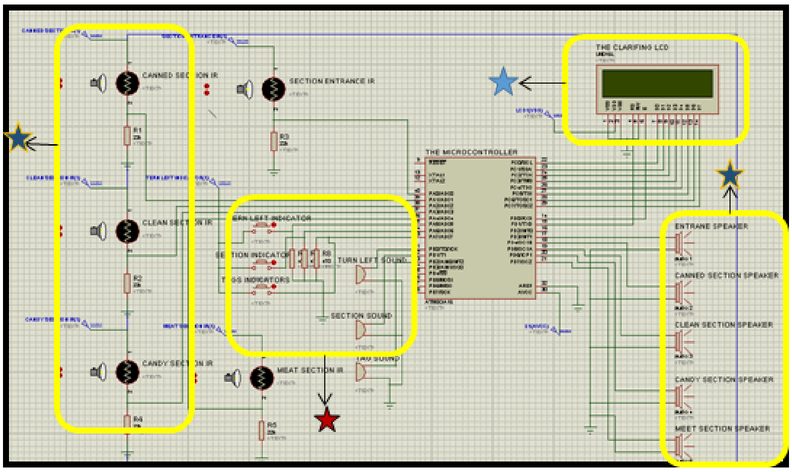
The system in this project decompose of two subsystems the guiding system and the PRD system.

4.1 The Guiding System:

The guiding system contain a sound spot in some places in the lane to help the VI move in specific direction represented here by push button, and infrared system (IR) connected to speaker to tell the VI in which section he/she is.

Table 4-1: Guiding System Simulation Pin Layout:

Microcontroller	**Guiding System Component**
PinA.0	Section entrance IR
PinA.1	Canned Subsection IR
PinA.2	Clean Subsection IR
PinA.3	Candy Subsection IR
PinA.4	Meat Subsection IR
PinA.5	Turn Rigth Sound Spot
PinA.6	Subsection Indicator Sound Spot
PinA.7	Tags Indicator Sound Spot
PinB.0	Turn Rigth Sound Spot Buzzer
PinB.1	Subsection Indicator Sound Spot Buzzer
PinB.2	Tags Indicator Sound Spot Buzzer
PinC.0 – PinC.7	LCD D0 – D7
PinD.0 – PinD.1	LCD RS and E
PinD.3	Section entrance Speaker
PinD.4	Canned Subsection Speaker
PinD.5	Clean Subsection Speaker
PinD.6	Candy Subsection Speaker
PinD.7	Meat Subsection Speaker



The clarifing lcd which show the speaker result.

The infrared attachment to the speaker which clarify the subsections names and the entrancr message.

The sound spot system which contain buzzers whith different sounds.

Figure4-1: The Guiding system definition

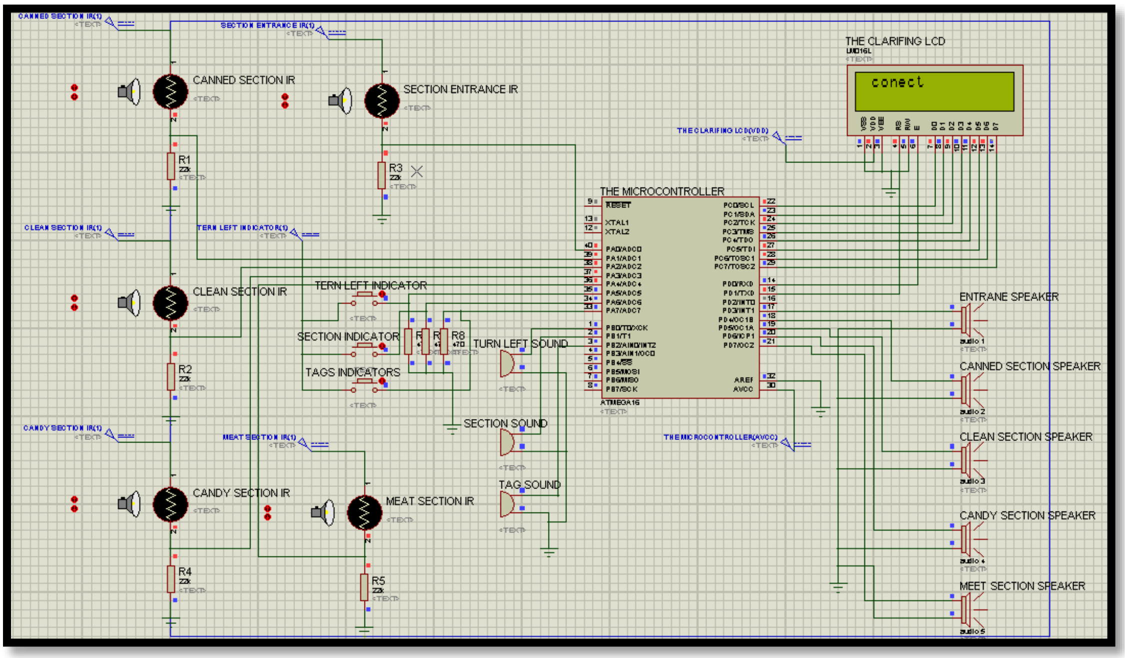


Figure 4-2: The Guiding System in idle mode

4.1.1 The Infra-Red System Simulation:

When the VI enter the supermarket, he/she go to a special section used only by VI people. When he /she enter, an IR will be cut and a message will play throw speaker welcoming the VI inside the section.

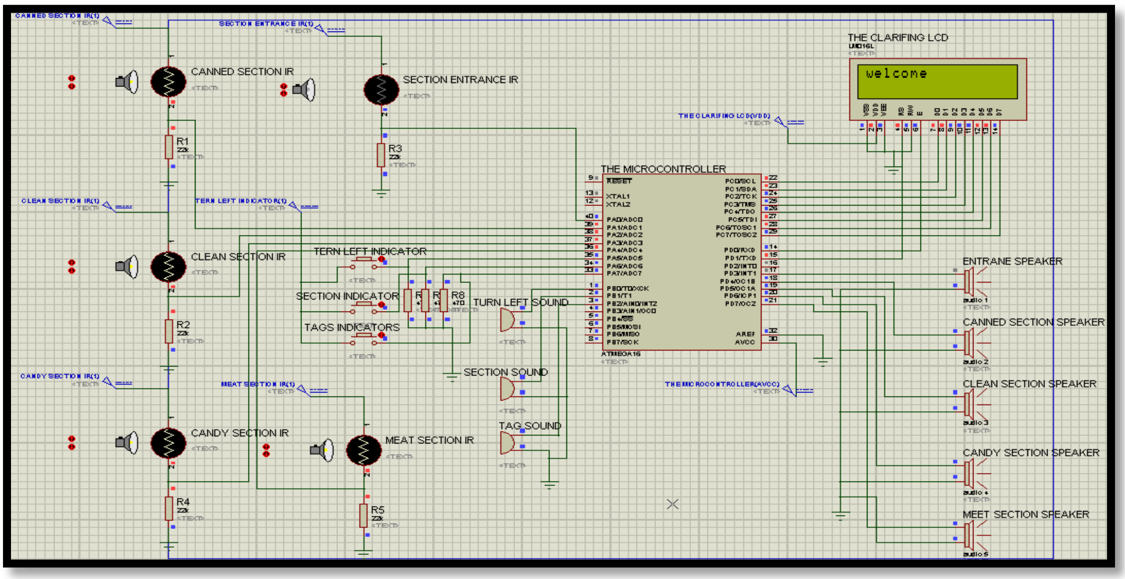


Figure 4-3: The Guiding System when VI enter section

Inside the VI section there are number of subsection each one of them contain an IR system in it’s entrance connected to speaker to tell the VI what this subsection contain.

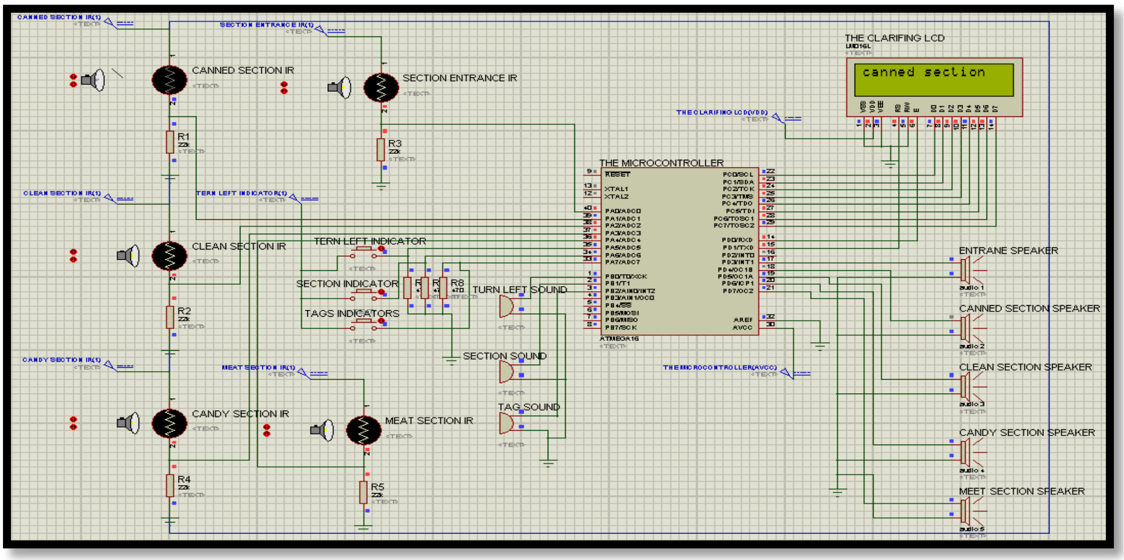


Figure 4-4-a: The Guiding System when VI enter canned subsection

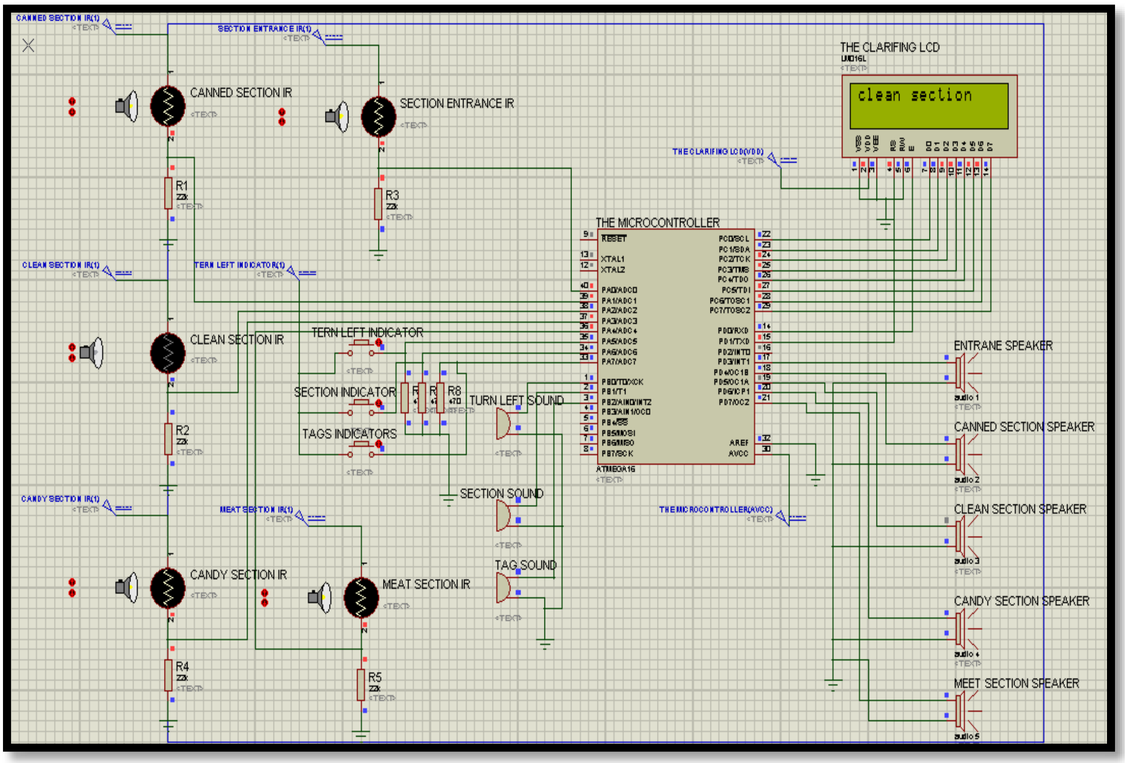


Figure 4-4-b: The Guiding System when VI enter clean subsection

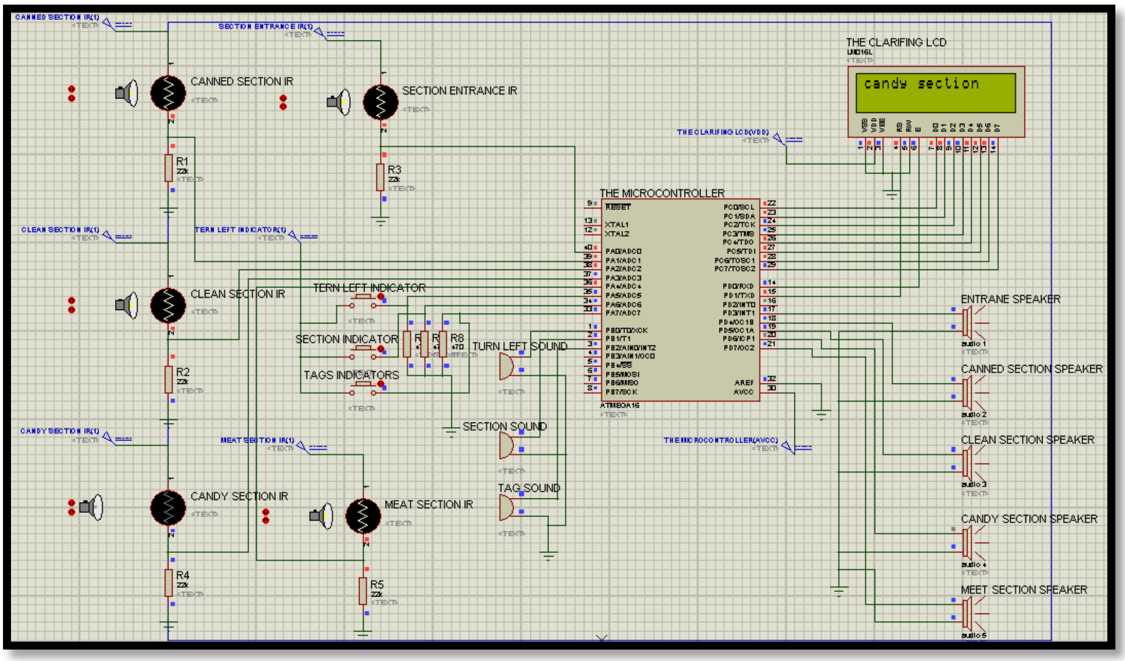


Figure 4-4-c: The Guiding System when VI enter candy subsection

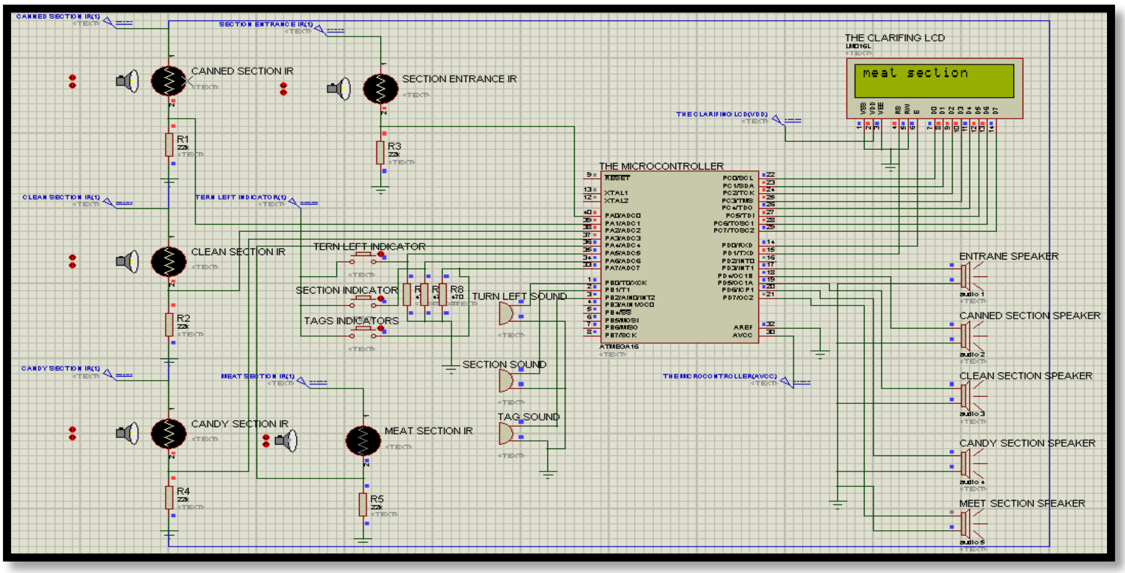


Figure 4-4-d: The Guiding System when VI enter meat subsection

4.1.2 The Sound Spot Simulation:

The other part of the guiding system is the navigation system, it begin before arriving to section by guiding the VI to the entrance. The suction must be close to the supemarket main door here the VI must take one turn " right " to reach the entrance.

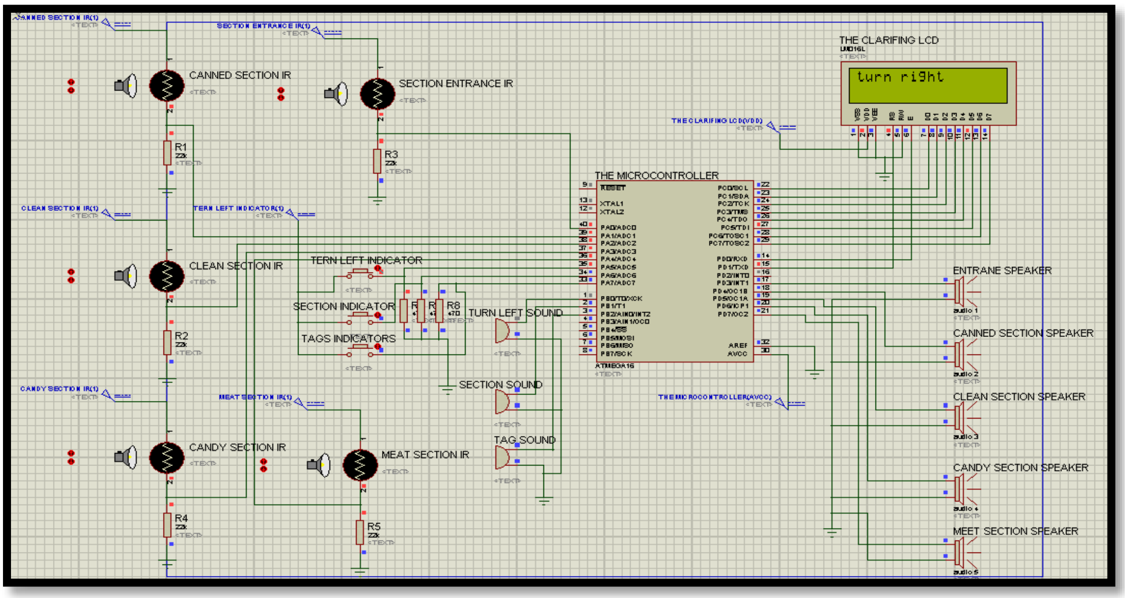


Figure 4-5-a: The Guiding System when VI must turn right to enter the section

Inside the section, the VI walk forward in the lane until he/she arrive to intersection 'high lane' and sound will play to indicate subsections in right and left.

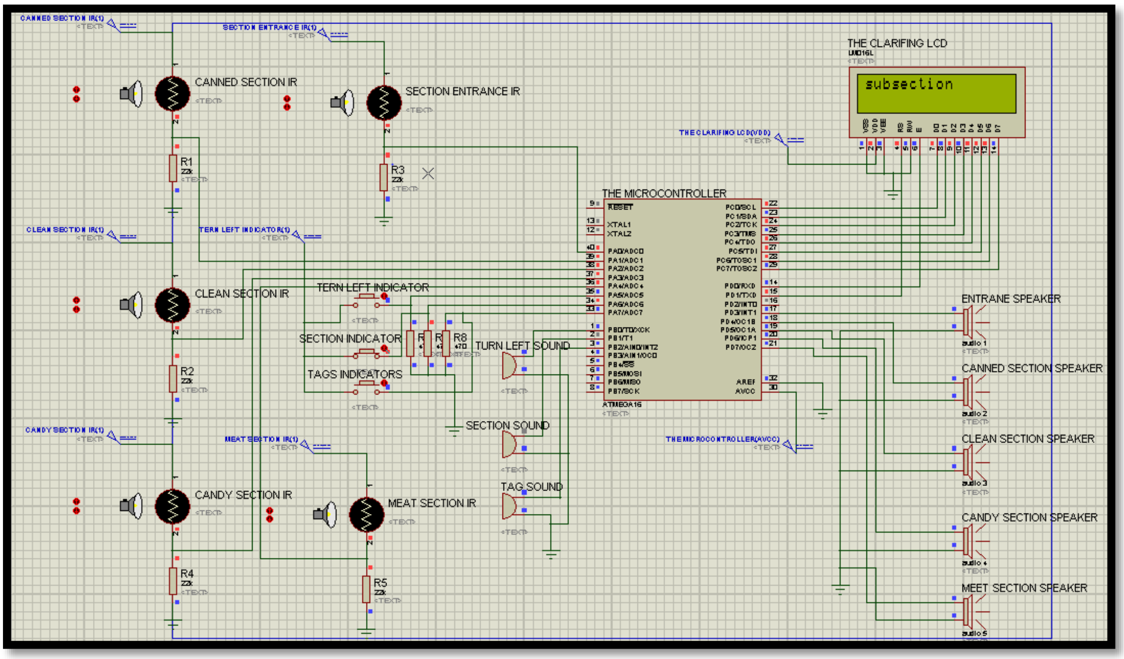


Figure 4-5-b: The Guiding System when VI stand between two subsection

Inside each subsection there are tags to different product in the intersection of where the tags placed there is sound will play when the VI reach it.

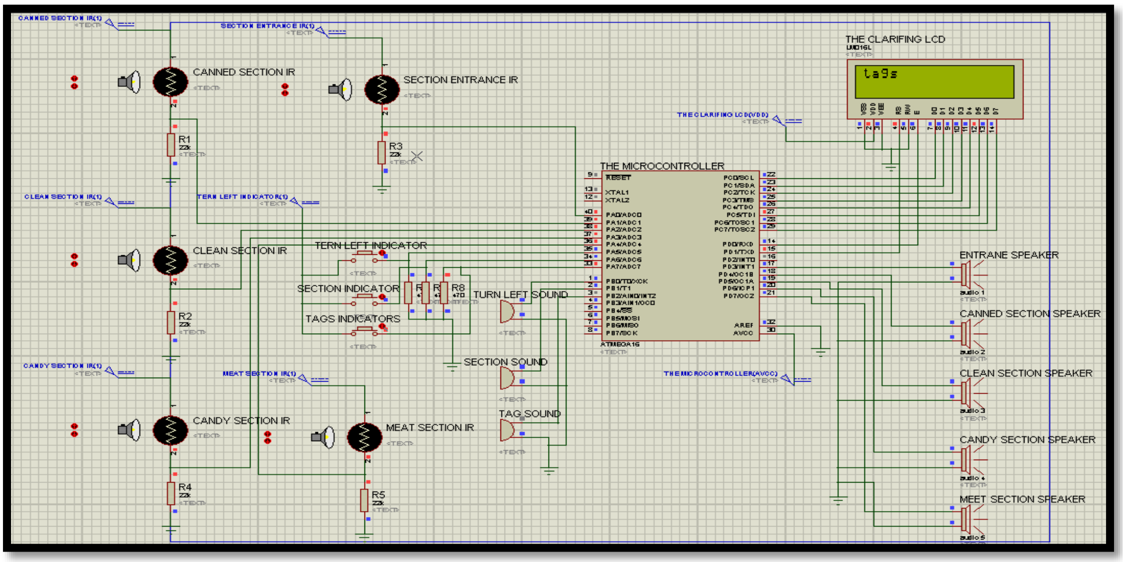
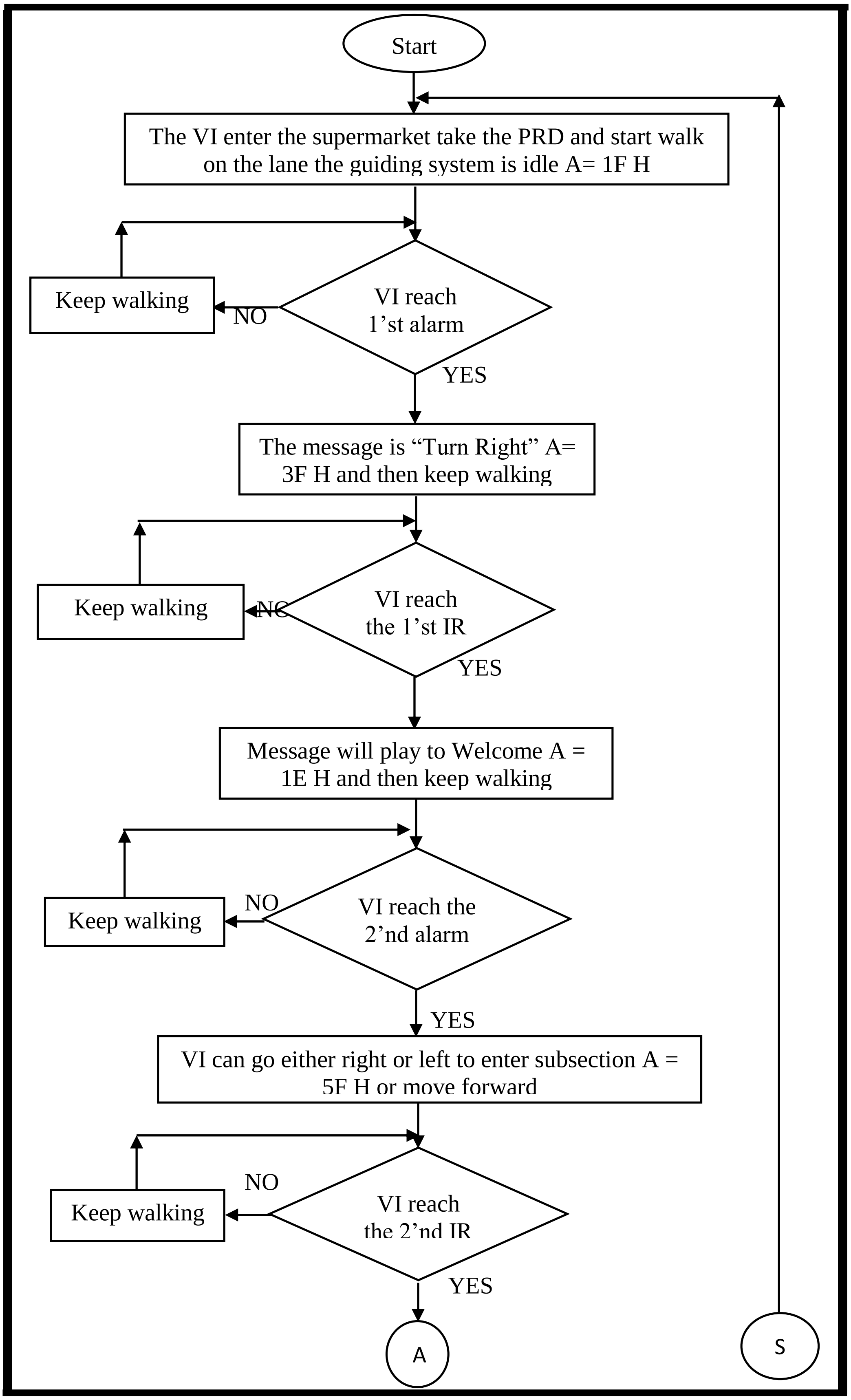


Figure 4-5-c: The Guiding System when VI stand in front of tag

4.1.3 The Guiding System Flowchart:



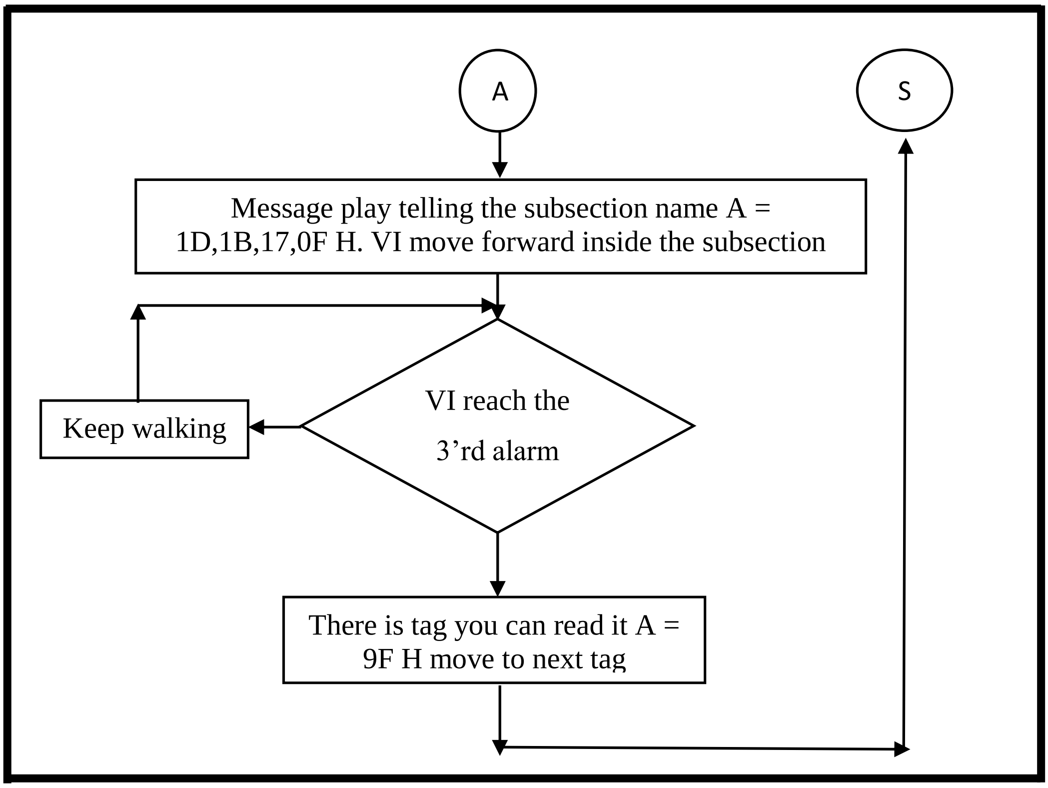


Figure 4-6: The Guiding System Flow chart

4.2 The PRD:

The recognition subsystem contain the passive tags, which placed on the shelves with the products and the reader, which carried by the VI. The system start when the VI arrive to tag place and operate the reader then the reader send signal to energize the passive tag. Then the tag will send code back to the reader, after the reader receive the code it sent to the microcontroller. The microcontroller will use the code to compare it with set of code saved in it and when it found it, the audio file which attached to the code will sent to the APR9600. The APR9600 will play the audio file to the VI who will heard it throw headphone attached to the device.

The component of the device not available in the protues simulation environment and replacement used to do the simulation.

4.2.1Simulation version one:

In this version the tags represented by switches and there was a transmitter to send the signal to the reader, which represented by receiver connected wirily with the transmitter. The microcontroller receive the code from the reader and send it to the LCD, which represent the APR.

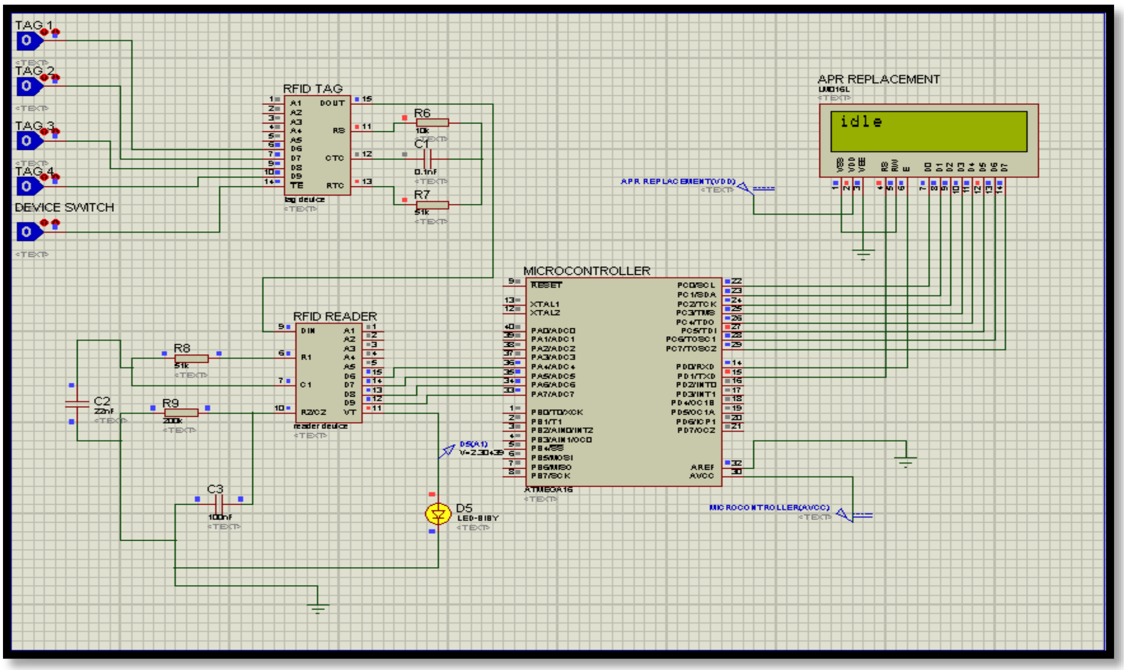


Figure 4-7: Version one simulation idle mode

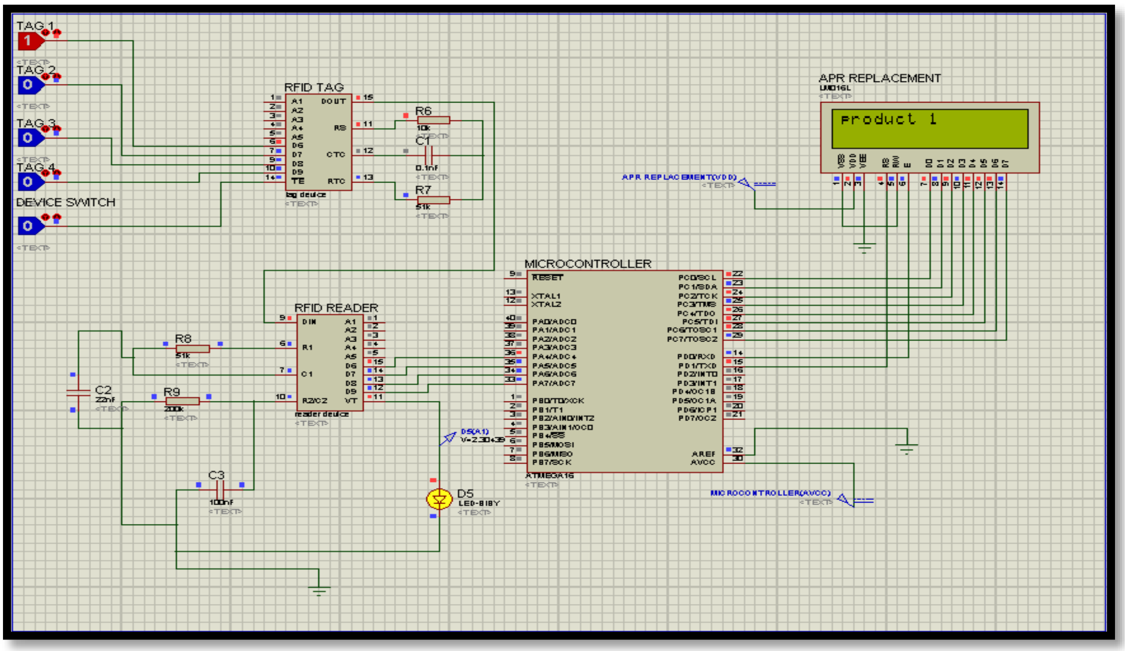


Figure 4-8-a: Version one simulation show product one

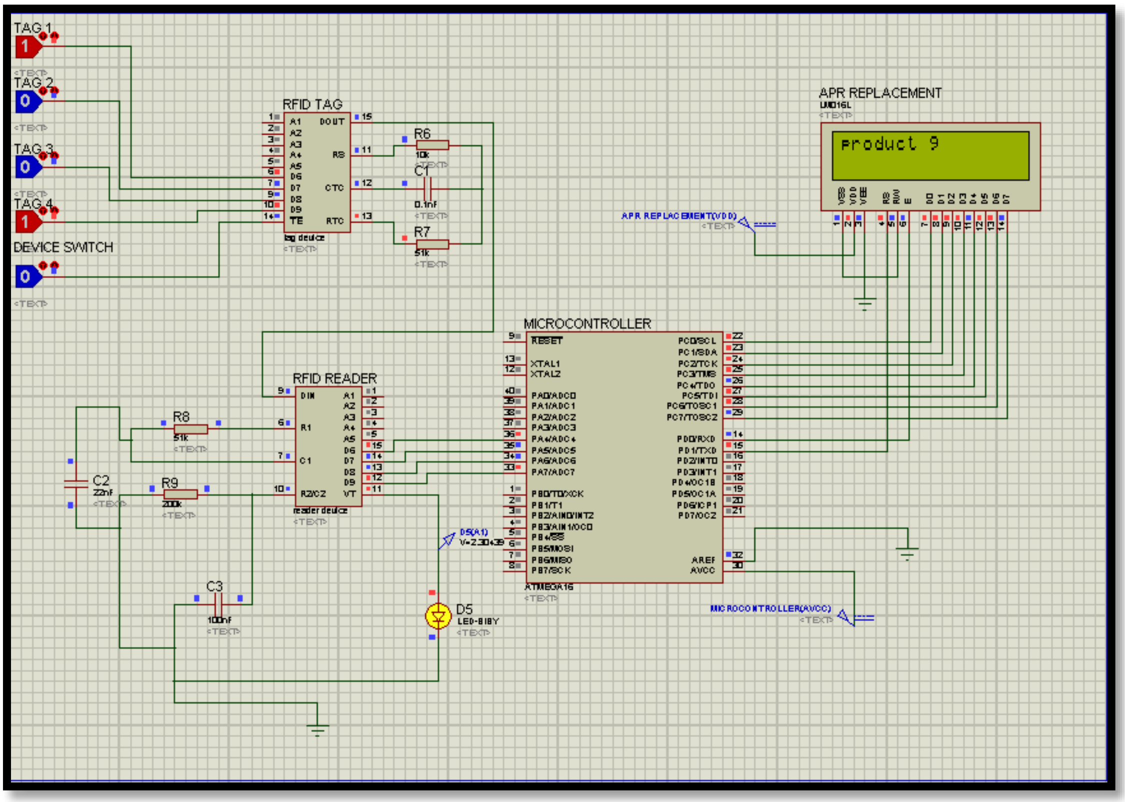


Figure 4-8-b: Version one simulation show product nine

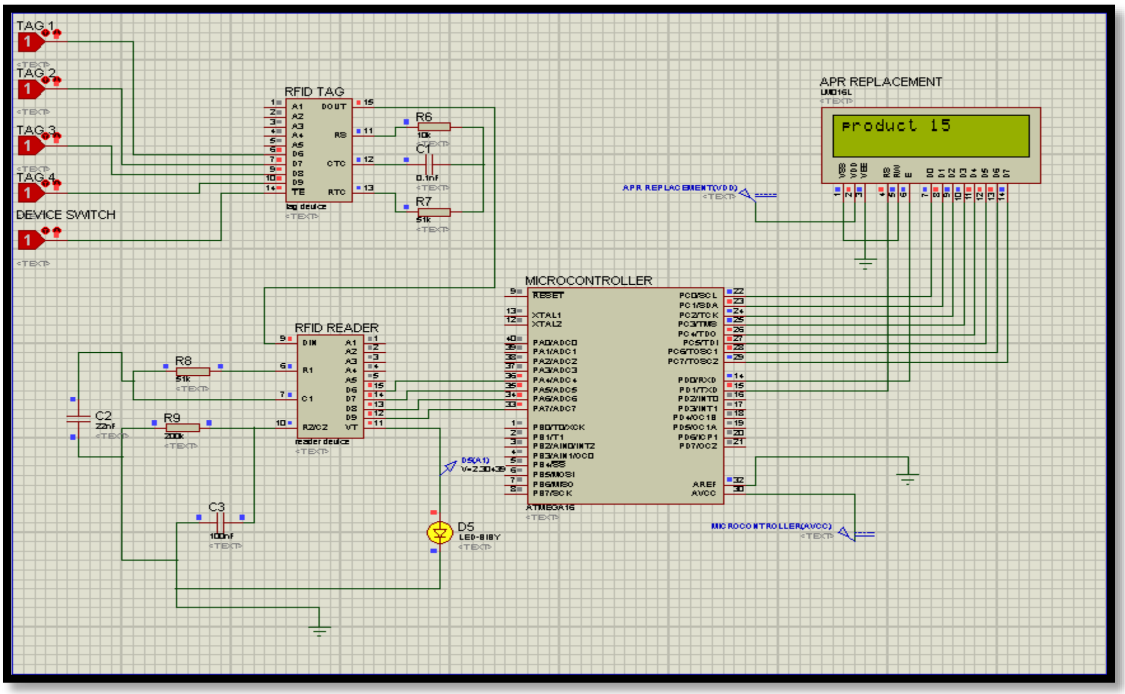


Figure 4-8-c: Version one simulation show product fifteen

4.2.2 Simulation Version two:

In this version the APR simulate by LCD, the virtual terminal represent the reader, and the tags represented by key board.

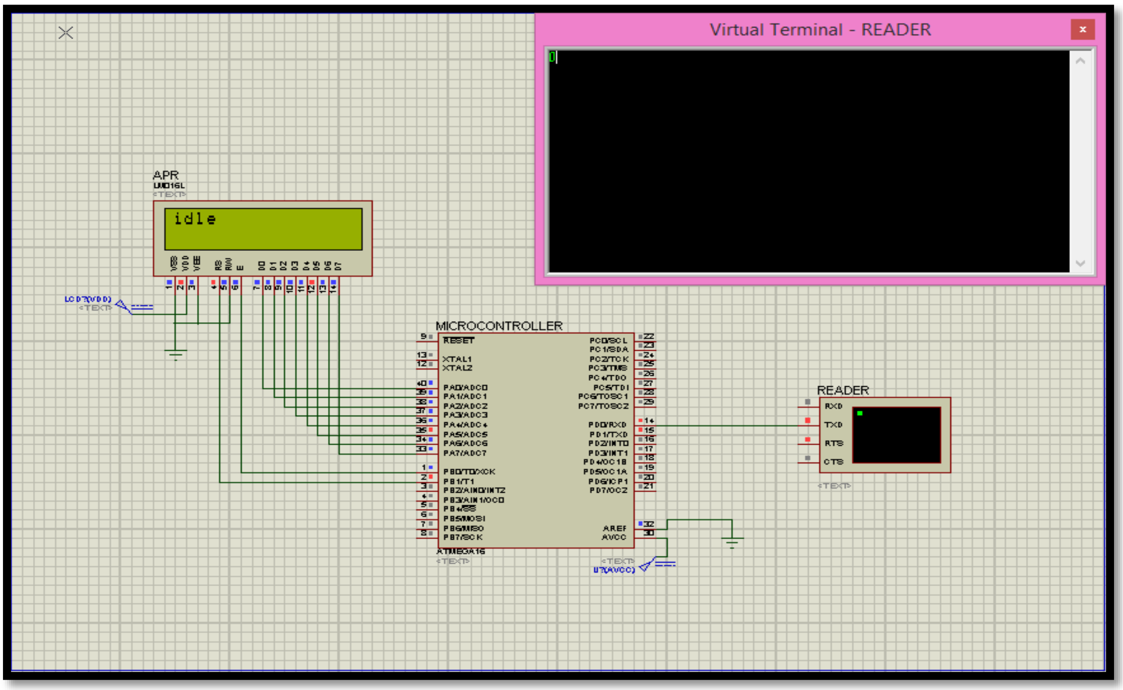


Figure 4-9: Version two simulation idle mode

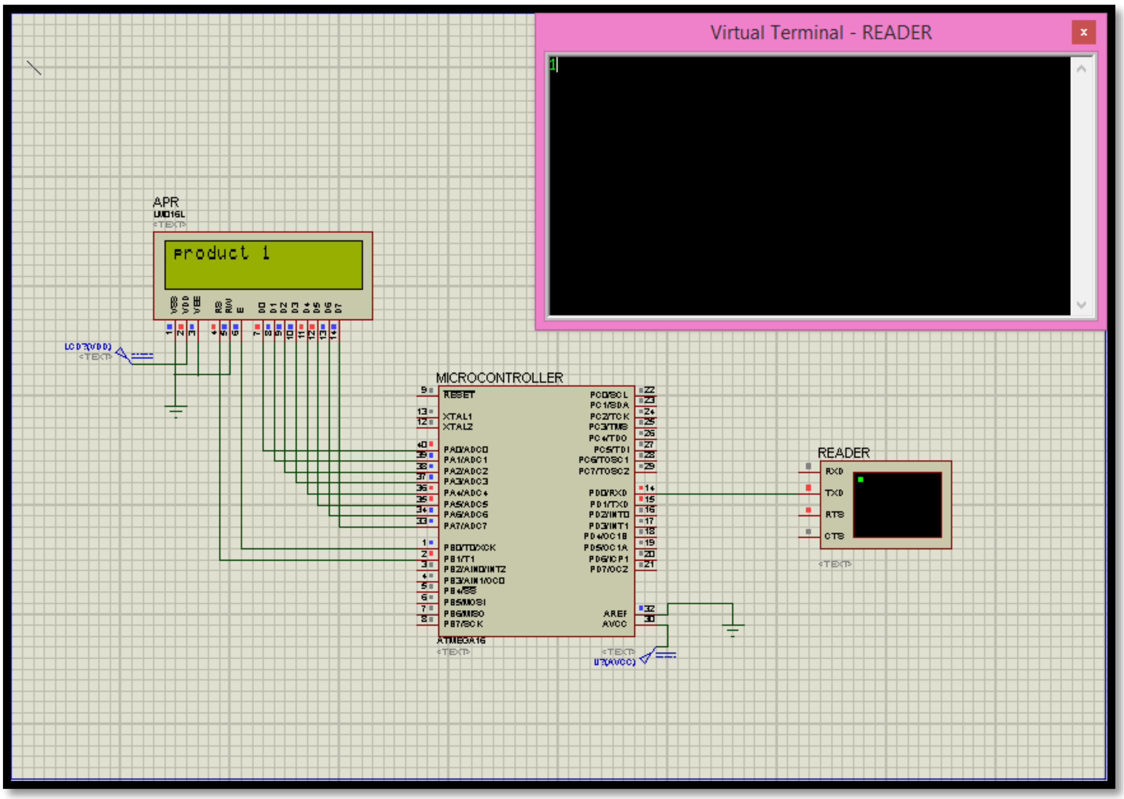


Figure 4-10-a: Version two simulation show product one

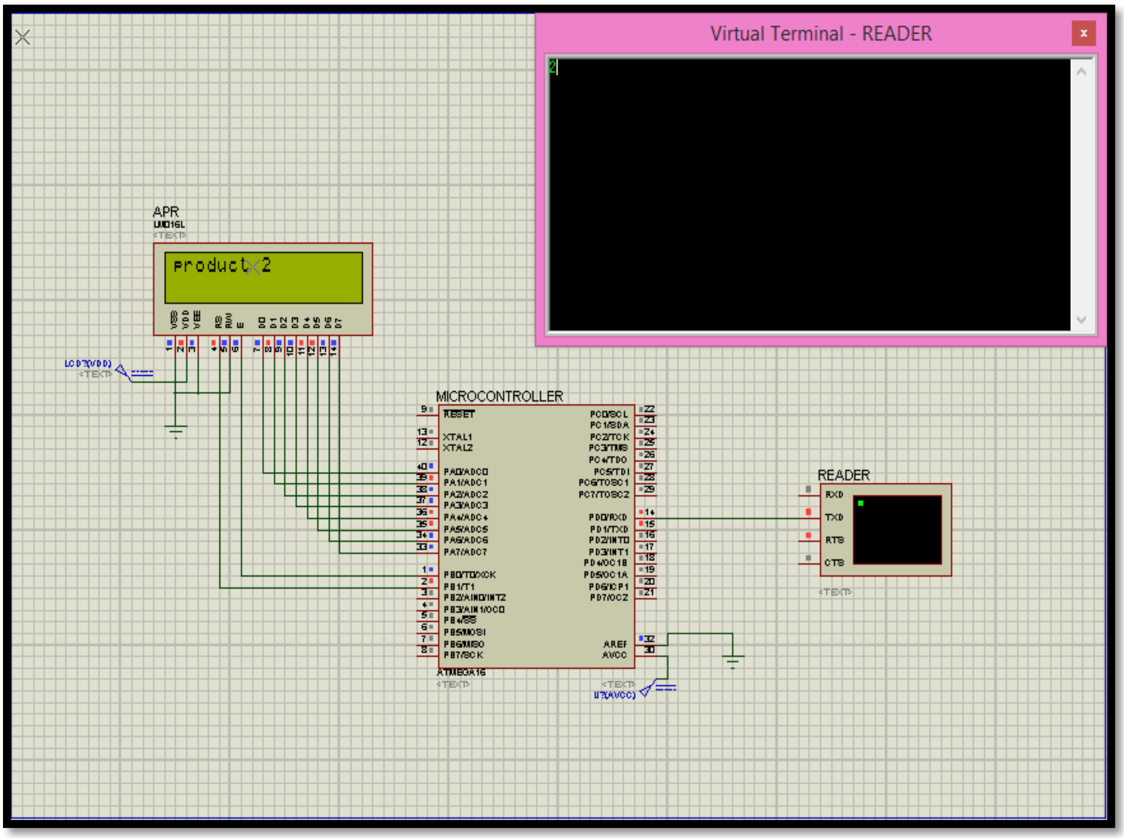


Figure 4-10-b: Version two simulation show product two

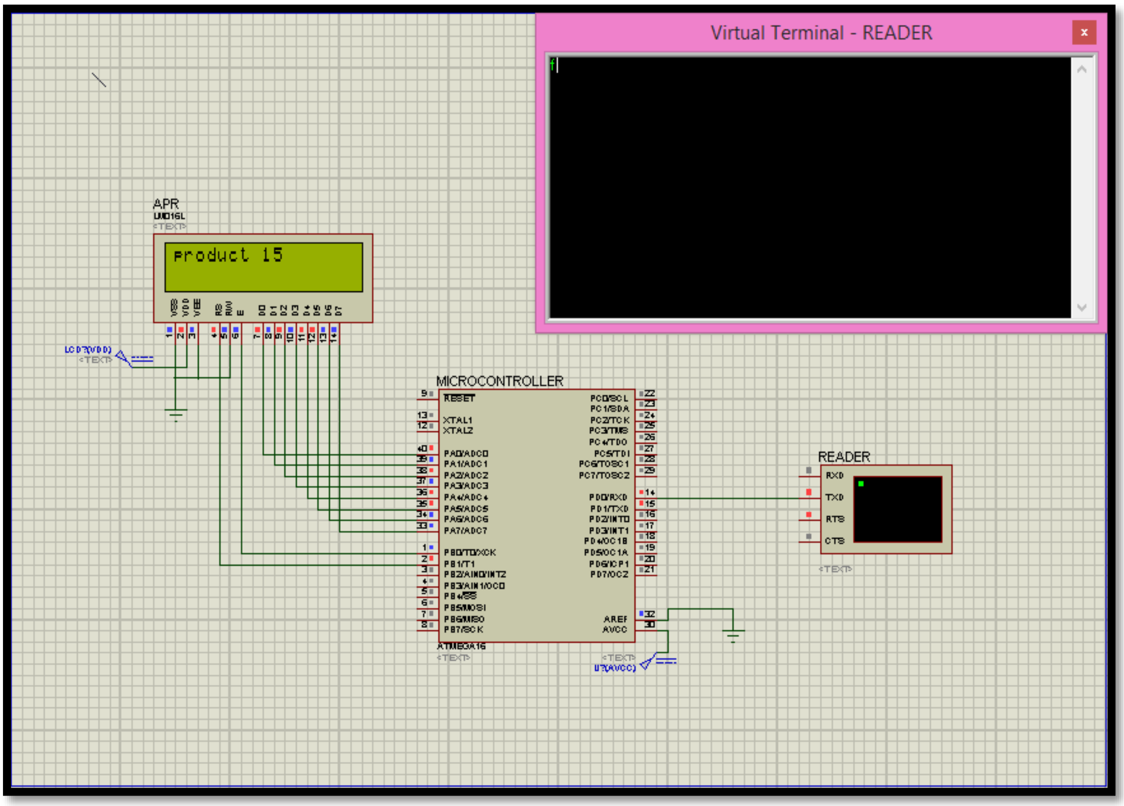


Figure 4-10-c: Version two simulation show product fifteen

4.3 The Hardware Prototype Implementation:

In the hardware prototype implementation, used RFID RDM6300 reader, card tags, Arduino Uno instead of the AVR ATmega16, ISD1932 voice chip instead of the APR9600, speaker, capacitor, resistor and wire.

4.3.1 The Arduino Uno with RFID reader:

Table 4-2: Arduino and RFID RDM 6300 pin layout:

RDM6300	**Arduino Uno**
Data0	Digital 2
+5V	+5V
GND	GND
ANT1	Wire
ANT2	Wire

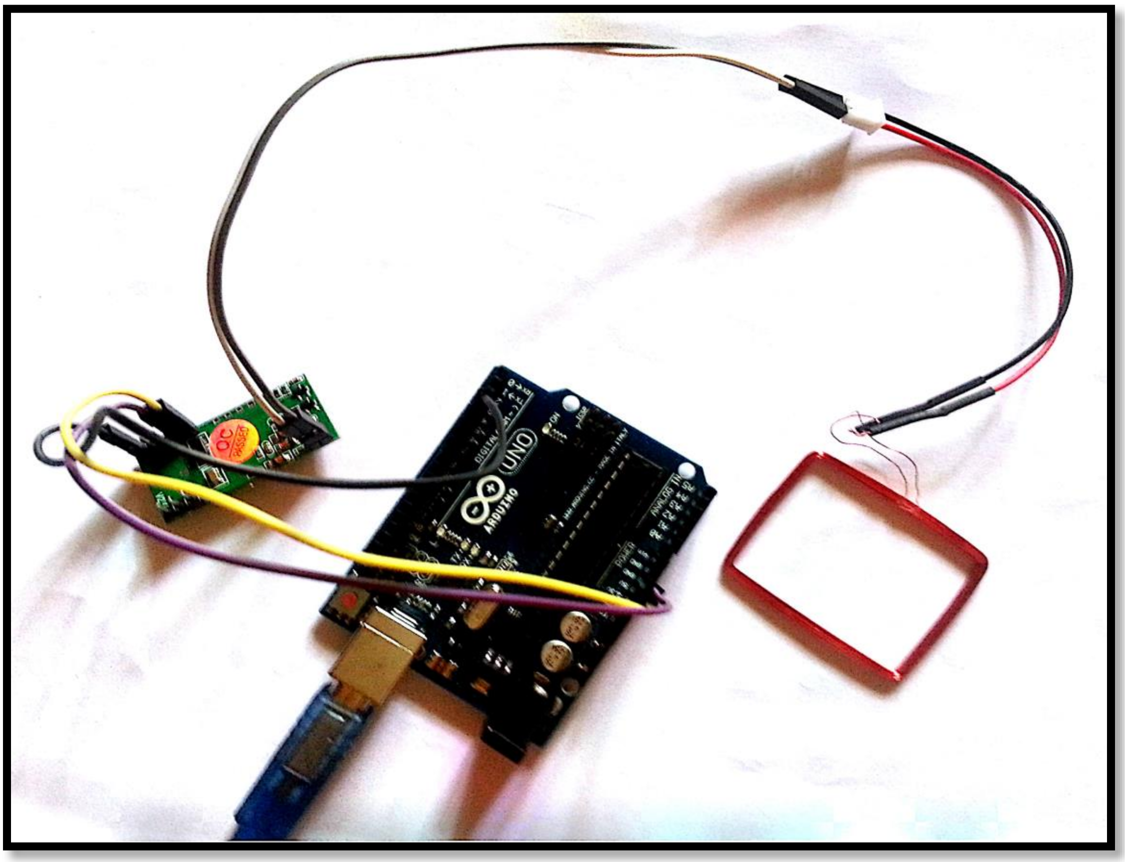


Figure 4-11: Arduino with RFID RDM6300 Reader

4.3.2 The Arduino Uno with ISD1932:

Table 4-3: Arduino and ISD1932 pin layout:

ISD1932	Arduino Uno
S0	Digital 6
S1	Digital 7
S2	Digital 8
S3	Digital 9
SP -	Speaker
SP +	Speaker
5 V	5 V
GND	GND
XCLK	5 V
FMC1	GND
FMC2	5 V
REC	5 V
ROSC	Resistor
AGC	Capacitor

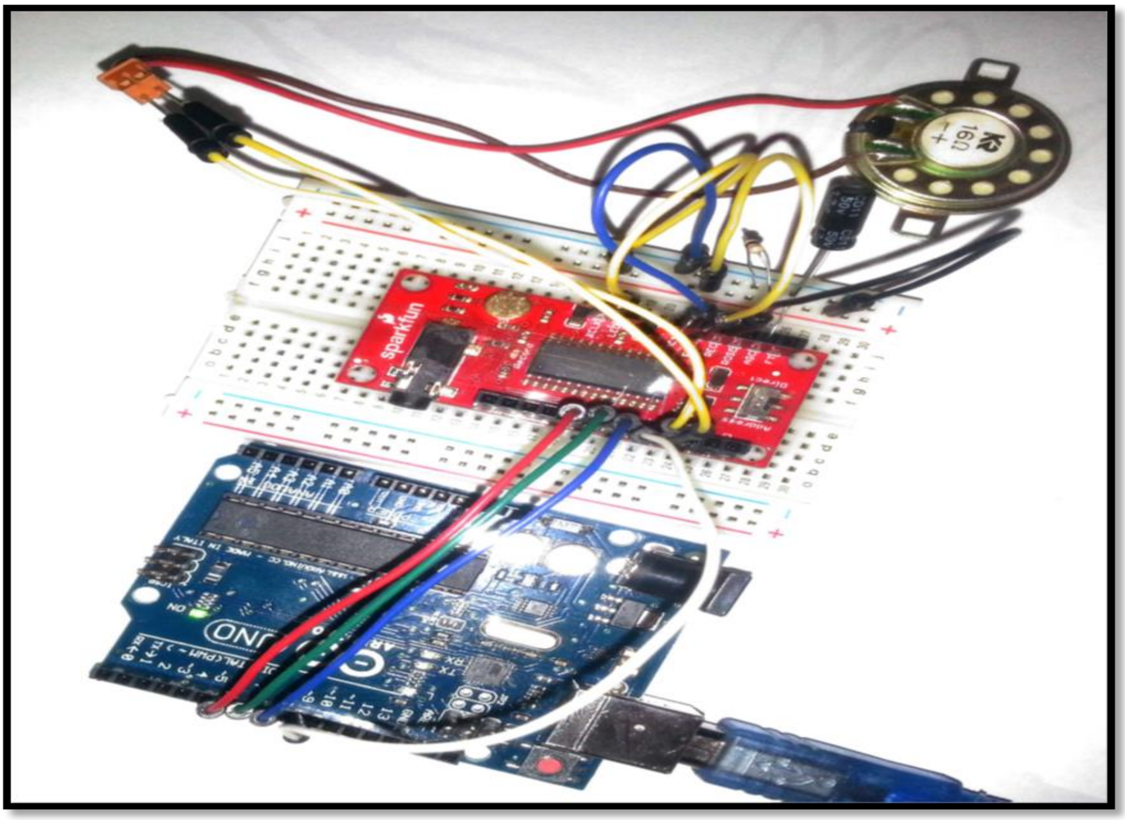


Figure 4-12: Arduino with ISD1932

Chapter Five

Conclusion and Recommendation

Chapter Five

Conclusion and Recommendation

5.1 Conclusion:

The system is very innovative, practically useful for the visually impaired people and realized as a prototype. By using this fully automated product, they can stand on their own at the time of shopping. It does not need more skills to operate, overcomes the hesitation and giving confidence for purchasing their shopping needs. With the help of RFID readers and tags, visually impaired people can get to know the product information easily. The proposed system effectively implemented by using Arduino Uno for providing simplicity and efficiency. It makes the better use of RFID and ISD1932 technologies for providing the smart environment for visually impaired. To avoid collision among the blind people and for obstacle detection, pressing sensors (guiding system) will be mounted in the lane of the supermarket ground. This system is implementing with affordable cost. On implementing this system the shopping dream of visually impaired people becomes true.

5.2 Recommendation:

This project discusses the design and implementation of smart super market system for visually impaired. To increase the efficiency of this project. It’s recommended to consider the following points:

- For more efficiency it's recommended to integrate GPS system to this project or make it including the scenario of guiding the visually impaired to supermarket reception again.
- For large supermarkets it's recommended to use a voice module with larger memory or use external memory.
- To minimize the size of the circuit and somehow the cost it's recommended to use At mega 16 microcontroller, small RFID reader and small voice chip.
- To develop the design and implementation of a product recognize device for visually impaired its recommended to integrate the device with the Electronic Blind Stick.

- **Reference:**

[1] Kulyukin, Vladimir, and Aliasgar Kutiyanawala. "Accessible shopping systems for blind and visually impaired individuals: Design requirements and the state of the art." The Open Rehabilitation Journal 3 (2010): 158-168.

[2]http://pdf1.alldatasheet.com/datasheetpdf/view/55771/APLUS/APR9600.html 10/2/2015 3:31pm

[3] http://www.dontscrapit.com/Arkansas-/960012-APR9600-voice-recording-playback-LM386-kit.php5 15/9/ 2015 5:49 pm

[4] Barry, John R. Wireless infrared communications. Vol. 280 Springer Science & Business Media, 2012.

[5] http://www.instructables.com/id/How-to-use-IR-Sensor-using-Op-amp-and-Arduino/ 16/9/2015 1:40 pm

[6] Dhananjay, VGadre. "Programming and customizing the AVR Microcontroller" The Mchill-Graw co (2001).

[7] http://presentingthefuture.blogspot.com/2014/04/running-stepper-motor-through-atmega16.html 16/9/2015 1:50 pm

[8]http://www.bayt.com/en/specialties/q/90835/what-are-the-differences-between-microprocessor-microcontroller-and-plc/ 10/2/2015 12:00 pm

[9]https://www.futureelectronics.com/en/memory/eeprom.aspx 15/2/2015 1:34pm

[10] Weis, Stephen A. "Rfid (radio frequency identification): Principles and applications." System 2 (2007): 3Principles.

[11] https://www.parallax.com/product/32390 15/9/ 2015 5:51

[12] Kulyukin, Vladimir, et al. "A robotic wayfinding system for the visually impaired." Proceedings of the National Conference on Artificial Intelligence, Menlo Park, CA; Cambridge, MA; London; AAAI Press; MIT Press; 1999, 2004.

[13] Krishna, Sreekar, et al. "A wearable wireless RFID system for accessible shopping environments" Proceedings of the ICST 3rd international conference on Body area networks. ICST (Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering), 2008.

[14] Merler, Michele, Carolina Galleguillos, and Serge Belongie. "Recognizing groceries in situ using in vitro training data" Computer Vision and Pattern Recognition, 2007. CVPR'07, IEEE Conference on. IEEE, 2007.

[15] López-de-Ipiña, Diego, Tania Lorido, and Unai López. "Blindshopping: enabling accessible shopping for visually impaired people through mobile technologies" Toward Useful Services for Elderly and People with Disabilities. Springer Berlin Heidelberg, 2011,266-270.

Appendices