DEVELOP PF MOBILE APPLICATION FOR BOTANY CATALOGUE

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A project report submitted in partial fulfilment of the requirements for the award of the degree of Bachelor of Engineering (Hons) Electronic Engineering

Faculty of Engineering and Green Technology
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DECLARATION

I hereby declare that this project report is based on my original work except for citations and quotations which have been duly acknowledged. I also declare that it has not been previously and concurrently submitted for any other degree or award at UTAR or other institutions.

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APPROVAL FOR SUBMISSION

I certify that this project report entitled "**DEVELOP OF MOBILE APPLICATION FOR BOTANY CATALOGUE**" was prepared by **LUAN SHENGYI** has met the required standard for submission in partial fulfillment of the requirements for the award of Bachelor of Engineering (Hons) Electronic Engineering at UniversitiTunku Abdul Rahman.

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DEVELOP OF MOBILE APPLICATION FOR BOTANY CATALOGUE

ABSTRACT

The mobile application is popular tool to apply in human life. If mobile application apply to botanic garden, it will convenient for botanical staffs. Because staffs did not need to record botany data in notes or store it in computer any more. They can store botany data in mobile phone and upload through internet server; also can retrieve data from internet sever. This mobile application includes four functions, first is catalogue for botany garden, users can view information and picture of plants. Second is Database for saving and editing the plant's information. Third is QR code, use it for scan QR code of botany, and then botanical staff can get information of botany. The forth is hardware, this hardware use with Arduino and LCD, users use the mobile application send short message to Arduino board through Bluetooth, then LCD will display message for taking short notes.

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CHAPTER 1

INTRODUCTION

1.1 Background

Botany is a branch of biology, which is a study of plant science. There are more than 100 types of species of living collection in the botanical garden. Just like our UTAR University, consisting of plants, fishes and birds. All the species information will be saved in database of our smart phone application. Therefore, by downloading this application and running it in our smart phone, it is able to help all the UTAR visitors to find out the information of the species of plant in a short time, by just clicking few buttons on the phone.

Furthermore, in order to make the application be more user-friendly and practical for all the mobile users, some additional functions are designed and included in this project. For example, by scanning the QR code attached on the tag of the botany, the related information, like image, name and description about the plant, will be showed in the application, easily and directly. Besides, by using this application, location of the nearby plants can be localized and showed on it and therefore, user can search for the location of plant they hope to see readily.

1.2 Problem Statements

In previous time, all the information about the living species in botanical garden are collected and recorded in a book. It is very time-consuming for botany staffs to search information of plant, by flipping every pages of the book. Besides, recoding information in a book is not environment-friendly as thousands of plant information may take up to thousands of paper for recoding. Last but not least, the information of plant which is written by pen or pencil in a book, may fade out or worn as time passes. As such, the data is hard to be kept for a long time.

1.3 Aims and Objectives

1. To record all the botany information by building a database this is accessible through mobile application.
2. To record information though Bluetooth and display on LCD.
3. To obtain the botany information through scanning of QR code.

CHAPTER 2

LITERATURE REVIEW

2.1 Botany Database Collection

Botany collections at Missouri Botanical Garden, established over 150-plus years, it has more than 17,500 documented taxa. Henry Shaw recorded the plants in MBG by handwritten records. Through evolution, plant recording is changed from Shaw's handwritten books to card system, then proceed to the computerized database system, which is developed in 1970s. However, as time passes, drawbacks of this type of computerized database system are realized by people and they may affect the maintenance of data collection and progress towards strategic goals. These threats must be solved as soon as possible, otherwise the documentation of various living collection will be affected critically. In view on this, the top priority in year 2011, is to redesign integrate the database system in order to increase the increase the scale of living collections acquisitions.

In order to obtain botany information easily and instantly, several built-in tools are designed and integrated in the living collection management system (LCMS), including the query builder. The LCMS data is accessible in anytime and anywhere, as long as the connection of internet is available. Missouri Botanical Garden (MGB) has hyperlinks which connect to the LCMS, Tropics and GIS mapping data. By using this, users can access to the associated data and location of plant in the garden and, staff of MBG can find the plant and make the comparison of database records efficiently. This application can work through mobile phone.

MBG will produce around 5000 plant tags for every year. Since the tag can be registered easily through internet, all the data users can recognize, review and produce the tag order for newly found plant species by their own. Furthermore, the conservation of plants always takes into consideration of their collection and storage. Therefore, an additional function, such as mapping of plant and storage on Tropicos, is encouraged to stabilize and strengthen the interactive platform with mobile phone. Through the mobile application, we can share the information of plant with visitors and thus make them have more understanding on the information of plant.

In fact, the botany garden is in large scale and plants are distributed widely. This is an uphill task for the staffs to collect the seed of plant through the thousands of plants. In this case, GIS mapping is a very useful tool to help locating the particular species. Also, by mapping, the researchers can discover some new species of plants quickly and bookmarking it easily on the garden. GIS staff can observe the changes of landscape around the garden the impacts on plant collection. Changes of environment data can also collected by GIS mapping system.

2.2 How Database Save Cost

There are so many researches already done in last few years to improve the performance of database. Distributed database management systems (DDBMS) are logical to collect data at different locations of computer network. Taking consideration of high-speed performance of DDBMS, the researchers focused on the design of database to keep the cost low. Since there will be a lot of distributed database, it can be said impossible to create a complex database transaction in high speed while in low cost. They summarize several techniques that can improve the database performance, by dealing with fragments, allocation and replication and network sites cluster.

Fragment can separate database into portions and it can be horizontal, vertical or mixed. The advantage of using fragment is to improve the speed of distributed database. Also the fragment can be allocated; it means the database can be allocated

in different location of network. Nevertheless, the only problem is the fragment allocation is high complexity. In order to reduce the complexity of project, it needs to solve the heuristic algorithms. In this process, it needs a node sign to fragment and node can be more than one, using the node makes database system stable and better performance.

Another technique is clustering. It is used to group the allocated date into logic clusters; normally communication time of the data allocation is high. To reduce the time, it needs optimal solution algorithms to solve this problem. This technique results in the cost between network and performance of DDNMS will be reduced.

There are some constraints about connection of network and time of transaction data, resulted by some small number of DDBMS cases. The fragment and allocation has one drawback: they need an associated algorithm to perform complexity computing. The databases are split by these techniques and thus save their communication and transaction cost, and improve the speed between database transaction processing.

2.3 How Database High Performance

In distributed DDBMS, there are various methods to describe data fragment. Sometimes, if the methods are incorporate performance, it will not to save the transaction time. In the generating disjoint fragments, it separates the database into partition with pair-wise disjoint fragments. This method is using horizontal partitioning technique. This technique can guarantee that processing and distribution of all portions of transaction precisely over DDBMS sites.

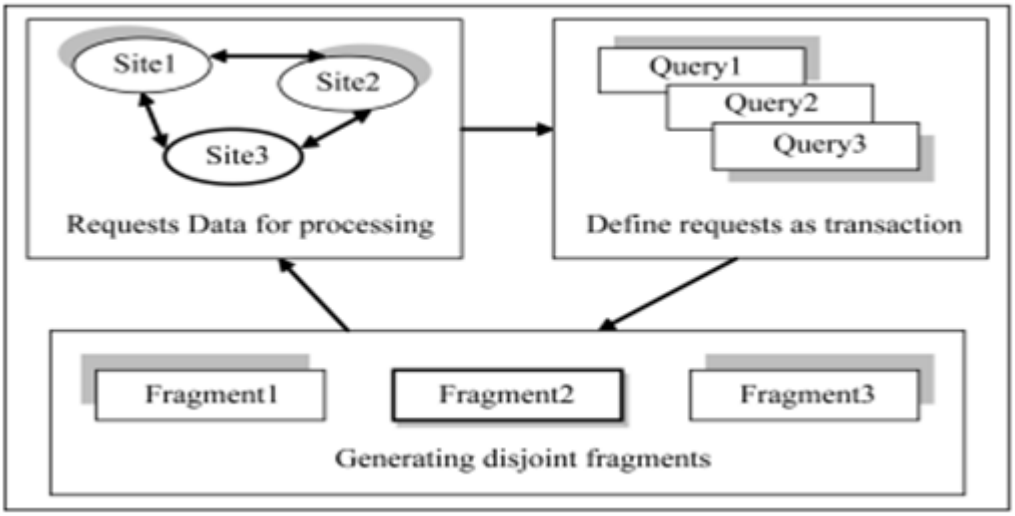


Figure 1 Generate disjoint fragments

Figure1 shows that how to process generating disjoint fragments of database. There are several processes of this technique: define the transactions, create segments and extracting disjoint fragments. Figure1 shows the initial step is to request data for processing. The site1, site2 and site3 are in DDBMS sites. Go to next query1, query2 and query3 are defined as transactions; these transactions will go to disjoint fragments, fragment1, fragment2 and fragment3. This process happens by one of fragment. Actually the database fragmentation begins with any two of fragments' intersection. Any intersection happens; three disjoint fragments will be generated:

1. Two intersections of fragments show the same record.
2. First fragment shows record but second fragment shows no record.
3. Second fragment shows record but first fragment shows no record.

Among the fragments, the intersection part will be removed from fragments list. After removing all the intersection parts, process will stop, and then from the new list of totally disjoint fragments, the new derived and non-overlapped fragments and they will not intersect with other fragments. In the partitioning method, all redundant transactions are eliminated; this will improve speed and efficiency by getting minimum number of fragments to be accessed.

2.4 Quick Response Code

QR code is type of Matrix code, it is very popular using in market, in previous years, there is one dimensional barcode, this barcode is easy to decode, because it is made of by lines and easy to read and scan. But two dimensional barcode is very hard to decode, and more security because the amount of data for two dimensional barcode can hole 7089 numeric characters and 4296 alphanumeric characters, it can store huge information.

Now the QR code is apply in smart phone, and QR code can active some contents on the web and phone functions include email, IM and SMS, this is all process are very simple by using camera to scan the QR code and after scan QR code will quick to lead user to the webpage. The QR code only can read by the machine, it has multi-function using in business product, it can provide information on product and service.

The QR code is widely use, because it has fast reading speed, more accuracy and superior functionality characteristics. It can store more information, the store capacity can increase by increase number of bar code digits.

From this picture, we know QR code is 2-D matrix, it contain data information in horizontal and vertical direction, compare with 1-D barcode, 1-D barcode only have one direction. That is the reason 2-D barcode will store more information than 1-D barcode.

2.5 Bluetooth

Normally, Bluetooth is used for Wireless Personal Area Network. But it has a limitation; the coverage area is small like room, two Bluetooth enable share data within 10-100 meter range only radio bandwidth at 2.4GHz. Bluetooth include two types, master and slave, the master can communicate with 7 devices acting as slaves. The data can transfer amongst two devices at once. There are a lot applications include Bluetooth devices, and these device can share and send data each other, these devices can also declare own service.

Bluetooth device has two modes, discoverable or undiscoverable. During the discoverable mode, the device name, device class and list of service will be seen. In summary there are three different security modes, mode 1 the security is not active, mode 2only security one service but device and mode 3 only has device level security.

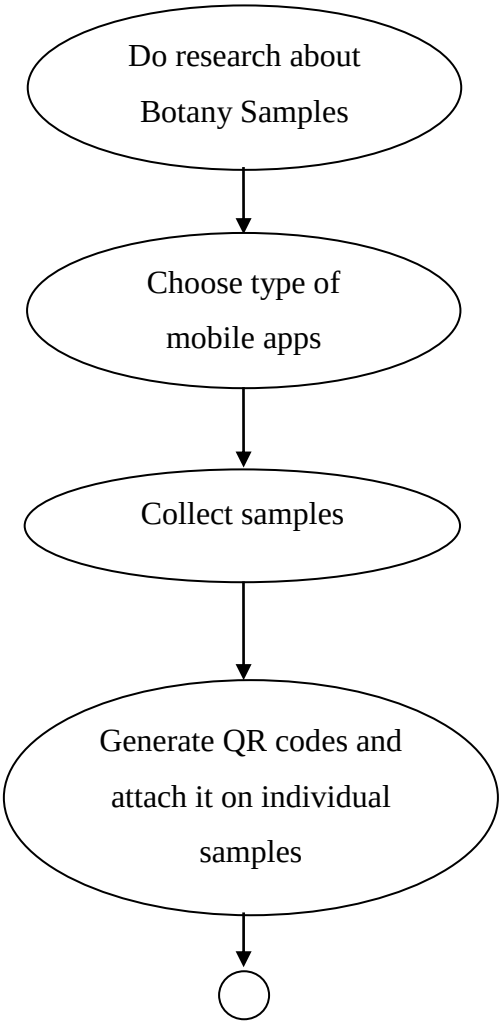
There two main architectures, HCI[3] and LZCAP[4], the HCI means Host Controller Interface and provides a command interface to the baseband controller and link manager, the configuration parameters are accessed by it. The bottom level, higher level of protocol multiplexing, packet segmentation and reassembly, and the conveying of quality of service information were supported by Logical Link Control and Application Protocol (LZCAP).

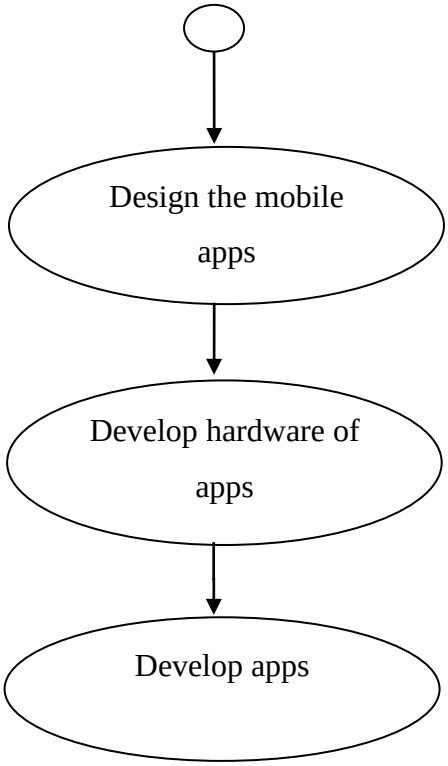
For consideration, Bluetooth also need to be secured. When the external or other device wants to connect, Bluetooth allow user to decide whether this device can connect or not. When these device paring with each other, need PIN number to identify each other.

CHAPTER 3

METHODOLOGY

3.1 Project Method




Design the mobile apps
Develop hardware of apps
Develop apps

3.2 Experimental Place for Botany Samples Collection

There are more than 100 types of species of living collections in the botanical garden. Thus, it requires a big memory space to save all data in a computer if all of these species information is collected. Also, it can be considered an uphill task for botany staffs to implement species data collection in this big land scale of botanical garden. Therefore, this Final Year Project (FYP) is carried out to investigate and create a more convenient and efficient way to collect corresponding samples. Apart from that, by taking consideration of travelling distance and time spent, instead of choosing botanical garden in Kuala Lumpur (KL), I decided to carry out this data collection of botany species in campus of UTAR Kampar which consists of a great variety of botanical species and living things. In addition, most of the plant species found in UTAR Kampar Campus are labelled with their names. Therefore, UTAR Kampar Campus will be a better choice for me to have my botanical species collection, compared to botanical garden in KL.

3.3 Mobile Applications (Apps) for Design

In this modern world, there are two main smart phone operating systems, Android and Iphone Operating System (IOS). Android-based operating system is able to operate in many types of phones, such as HTC, SAMSUNG, ASUS, Motorola and more. On the other hand, for IOS, it only allows the use of C and C+ programming to access it. Also, all of the Apple devices are not compatible with other brand of devices. For example, when Bluetooth of two mobile phones is opened, in which one is Android-based and another is IOS, they definitely will not connect or communicate with each other via Bluetooth as they are not compatible to each other, due to different operating system platform. As such, Apple devices are seen to be not so user-friendly and convenient in my project development. Besides, comparison of these two different operating systems through internet research, as shown in Figure 2 which is the feedback from smart phone users, it shows and concludes that most of the smart phone users prefer to have Android-based operating system, compared to IOS, as former can support a great variety of developed applications. Android-based

mobile phones provides a better notifications and return button and thus user can set the apps to default on Android easily. When it comes to application design, Android can be programmed by C+ and Java which helps a faster programming development process, compared to IOS. In a nutshell, Android operating system is chosen to be used in my FYP botany Apps design.

Table 1. Feedback from 64 persons.

Name of Features	Smart Phone Type	Strongly	Agree	Neutral	Disagree	Strongly Disagree
Does operating system support number of different developed applications?	Android Phone	15	14	02	01	00
	Apple iPhone	06	08	12	06	00
Does it have 4G Capability with speed up to 42 Mbps?	Android Phone	29	03	00	00	00
	Apple iPhone	28	03	01	00	00
Is it providing multi-application support?	Android Phone	14	12	04	02	00
	Apple iPhone	17	11	04	00	00
Is it capable of rapid page transfer from phone to computer?	Android Phone	13	15	01	03	00
	Apple iPhone	15	11	06	00	00
Is this multitasking?	Android Phone	26	03	03	00	00
	Apple iPhone	07	21	04	00	00
Does it have real time chatting capability?	Android Phone	25	06	01	00	00
	Apple iPhone	25	07	00	00	00
Does it provide quick response to touch screen?	Android Phone	18	10	04	00	00
	Apple iPhone	17	09	06	00	00
Does it provide striking game features?	Android Phone	25	06	01	00	00
	Apple iPhone	24	08	00	00	00
Does it have support of GPRS?	Android Phone	32	00	00	00	00
	Apple iPhone	32	00	00	00	00
Does it have its own operating system?	Android Phone	32	00	00	00	00
	Apple iPhone	30	02	00	00	00
Is it simple to set up process?	Android Phone	09	07	16	00	00
	Apple iPhone	09	09	14	00	00
Is it providing real time data security?	Android Phone	18	10	03	01	00
	Apple iPhone	24	06	02	00	00
Does it have 20 Mega pixel cameras?	Android Phone	29	02	01	00	00
	Apple iPhone	00	00	04	10	18

Figure 2 Feedback from 64 persons

3.4 Sample Collection

The botany sample collection is carried out in the UTAR Kampar Campus. First of all, the research starts from road side, from Block E to Block A. This is because, compared to other blocks of campus, there are more types of trees can be discovered in Block E and Block A. All of these trees are labelled with the tags that shows trees' name. This greatly helps me to save the time to identify the trees. The most importantly, FEGT office locates in Block E and thus it is easier for me to have my demonstration of my project. Overall, there are about 13 different types of trees along the road side from Block E to Block A.

After the tree sample collection and recording from Block E to Block A, there are total 7 types of trees will be used in my project: Hop Tree, Redneck Palm, Senegal Mahogany, Sea Putat, Hong Kong Bauhinia, Malay Cinnamon, Leopard Tree. All of these trees are found in Block E with different locations. Apart from that, trees like Benjamin Fig, Fishing- rod Bamboo, Eugenia Polyentha, Gelam andBucida are discovered around Block C and Block A. Table 1 shows the types of tree located in different blocks.

Block E until Block D	Block C until Block A
Hop Tree, Redneck Palm, Senegal Mahogany, Sea Putat, Hong Kong Bauhinia, Malay Cinnamon, Leopard Tree.	Benjamina Fig, Fishing- rod Bamboo,EugeniaPolyentha, Gelam, Bucida.

Table 1 Category of Trees Table

Nearby the west gate of UTAR, different types of herons exist there. Normally, herons gather and rest at small land in the middle of West Lake. This enhances the environment view of UTAR Kampar Campus. There are total 5 types of Herons: Grey Heron, Purple Heron, Black-crowned Night Heron, Cattle Egret, Little Egret. As such, Heron is also included and considered as the part of my project sample.

Figure 3 Herons in UTAR

Figure 4 Sample collected

Figure 3 shows the types of herons while Figure 4 shows one of the tree samples, Barringtoniaasiatica, with a name tag and locates in UTAR Kampar campus. All of these samples collection will be used in order for the development of mobile apps for botany catalogue.

3.5 QR Code of Samples

QR code, also known as quick response code, is the main tool used in this project for detecting plant identities. It is a type of matrix barcode that helps to identify the plants, just like our student card. Different tree samples will generate different QR codes that will be then attached to the tree, as a tag. Through scanning of the QR code by using mobile phone camera, it will receive the related information of the trees. This information is downloaded from the internet. Since every tree samples will have their unique QR code, thus scanning of QR codes from different tree samples will give corresponding tree information and description. QR code generating machine can be found in internet. Figure 5 shows the QR code of tree sample:

Figure 5 QR code for samples

This QR code is very famous and convenient in this modern day. A lot people like to use it for some business purpose or anything else, and thus there are a lot

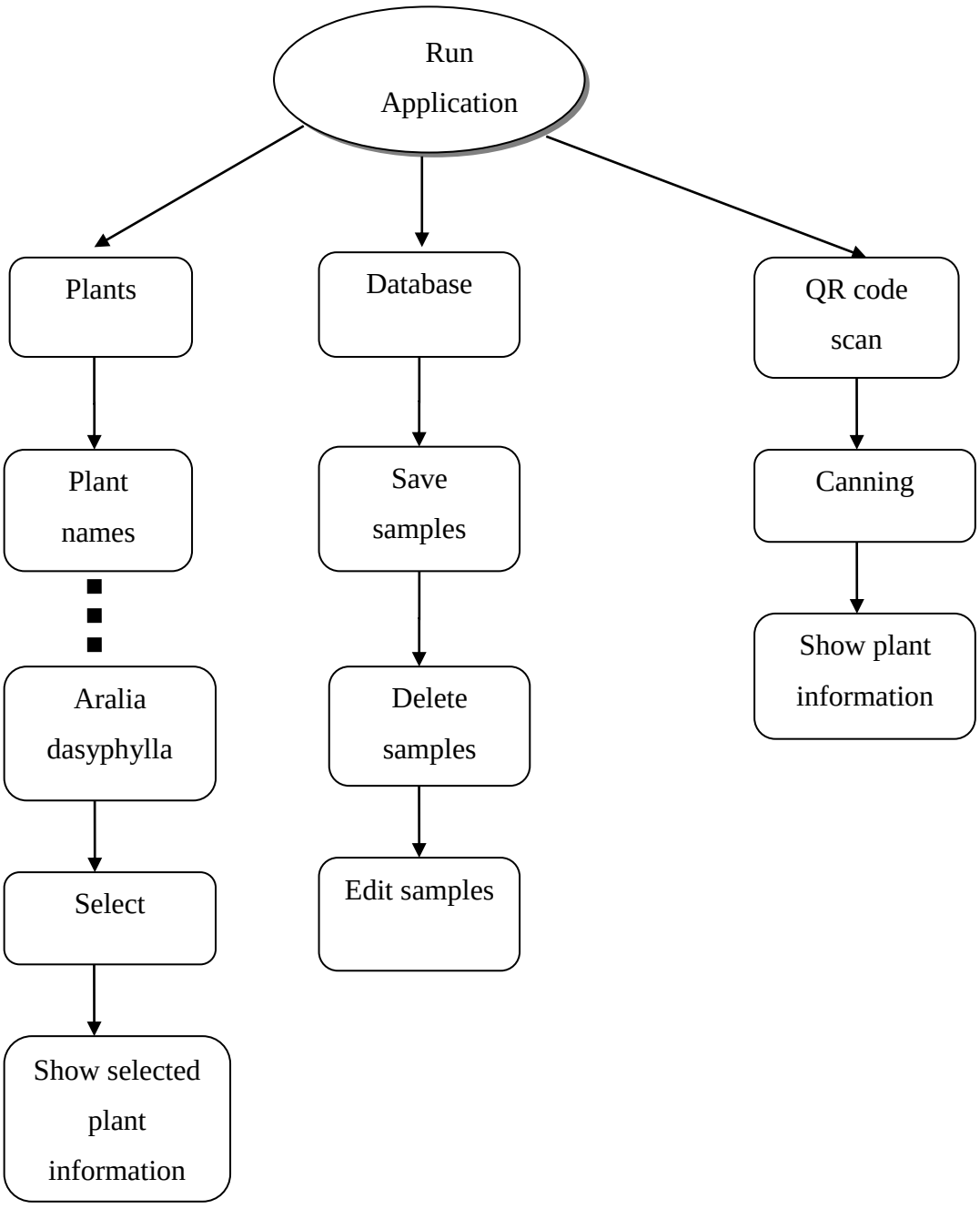
mobile phones have the built-in QR code scanning apps. This will greatly help the mobile user access to the information of tree from tags easily.

Figure 6 QR code attach on tag

Figure 6 shows the attachment of QR code on the tree tag. All of the UTAR visitors, who interest and hope to know more about the information of the trees, can just take out the mobile phone and scan on the QR code in order to retrieve the Indian Rosewood tree's information and further description.

3.6 Development and Design of the Apps

The flow chart for the applications design:



Software Design:

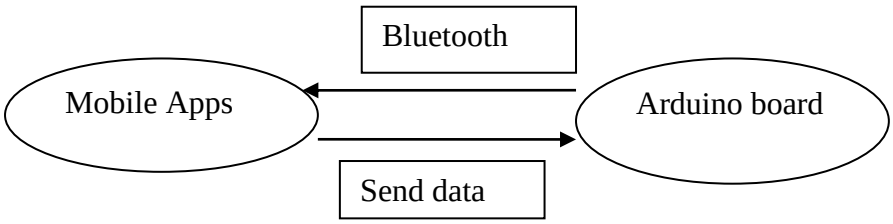
Eclipse is one of the software used to design the mobile applications. It includes the design of interfaces and functions, through Java coding. Eclipse has integrated development environment (IDE) which contains workspace and software development kit (SDK). All the coding will work in workspace and SDK contains Android system versions and emulators. Following the Android system update, there are lot different types of operating system, from old version until newest version. This is the main reason that we need SDK to fulfil different type of version for design that is compatible with user mobile phone. The emulator will only run in laptop after debugging the written coding and show your design to work and operate in emulator.

In order to obtain the information of the plants, mobile phone users must install this application in their phone and when opening it, the first interface activity will be noticed. This interface activity includes three main functions: plants' information, database and QR code scanner.

For plants' information part, when user presses on it, it will display all the plants' information to users. This step is followed by choosing chose the trees' name from list they want, and then the app will show the specific information of tree and pictures. The second function is database which helps user to save trees' name and corresponding description. Users are allowed to delete or edit trees' data. In addition, QR code is scanned through and the apps will show you a website. When user clicks on this website, the mobile phone will go to this website to retrieve the plants' data.

3.7 Hardware Design:

Design Method:



The device:

Figure 7 Arduino board MEGA 2560

Figure 8 Bluetooth module HC 05

Figure 9 LCD JHD 162A

This is hardware method design, connecting the apps with Arduino board via Bluetooth and then the user can send the message to Arduino board, and display the message in LCD. Arduino board is an individual processor; it does not have screen

and any receiver, so it needs external device to connect with it. This project needs one LCD and one Bluetooth.

3.8 Gantt Chart:

Semester 1:

Week	1	2	3	4	5	6	7	8	9	10	11	12
Prject Selection												
Research for Project												
Interface Design for Project												
Write FYP Report												

Semester 2:

Week	1	2	3	4	5	6	7	8	9	10	11	12
Database Design												
QR code Design												
Bluetooth Design												
Hardware Design												
Write Final Report												

CHAPTER 4

RESULT AND DISCUSSION

4.1 API(Application Programming Interface)

There are 21 APIs in Eclipse software, according to the Android phone versions, will choose different type APIs, here choose the API version 16 as the project interface.

```
<uses-sdk
    android:minSdkVersion="16"
    android:targetSdkVersion="16" />
```

Figure 10 API

This coding isset in AndroidManifest.xml file. This file is main interface function working file, every activities and build-in functions need to be defined in this file. When opening Eclipse to create project, the default coding for AndroidManifest.xml file is shown as below:

```
<application
    android:allowBackup="true"
    android:icon="@drawable/botany_p_icon"
    android:label="@string/app_name"
    android:theme="@style/AppTheme" >
    <activity
        android:name=".MainActivity"
        android:label="@string/app_name" >
        <intent-filter>
            <action android:name="android.intent.action.MAIN" />
```

Figure 11 Define activity by default

Define build-in function coding like this:

```
<uses-permission android:name="android.permission.CAMERA" />
```

Figure 12 User permission use build-in functions

4.2 Interface Design:

Interface design uses Eclipse and all Android application interfaces will be designed in main.xml file under folder layout. There are two ways to design the interface: one way is direct drag custom and library views from the palette then edit in graphical layout, while another way is type coding to edit and move the custom views in .xml files. In this project only two type of layout is required for interface, they are linear layout and relative layout. The difference is linear layout can arrange the views in a single column or a single row, but relative layout can specify how views are positioned relative to each other.

```
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
<RelativeLayout xmlns:android="http://schemas.android.com/apk/res/android"
```

Figure 13 LinearLayout and RelativeLayout

Since there are three functions, trees view, database and scan QR code, it needs to design a button view to trigger any of these three functions.

```
<Button
    android:id="@+id/button3"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_alignParentLeft="true"
    android:layout_alignParentRight="true"
    android:layout_alignParentTop="true"
    android:layout_marginTop="30dp"
    android:onClick="onClick4"
    android:text="Trees" />
```

Figure 14 Button View

From Figure 14, the button view can be edited by coding, android: id. It will indicate the id of button and change the button size, text and distance from top by coding android: layout_width, android: layout_marginTop, android: text. The button needs to trigger, so need it become clickable, therefore android: onClick make button can be clicked.

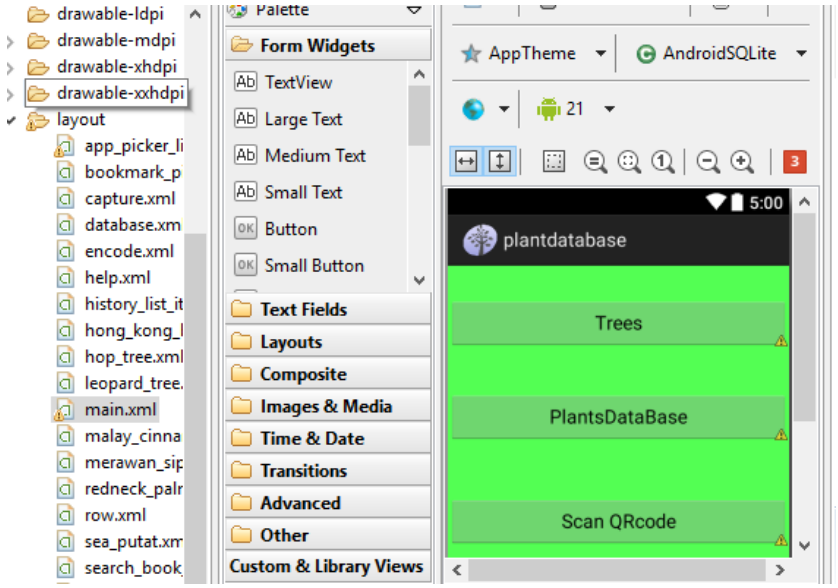


Figure 15 The interface for three functions

In total, there are eight types of trees will be chosen as design, because these trees nearby Block E, then can make demo become convenient. These eight trees' names can scroll by scroll view. The scroll view is similar with button view, it has id and also can change location.

```
<ScrollView
    android:id="@+id/scrollView1"
    android:layout_width="fill_parent"
    android:layout_height="wrap_content"
    android:layout_alignParentLeft="true"
    android:layout_alignParentRight="true" >
```

Figure 16 Scroll view

Since there are a lot of the tree name number and design, button view is used to control it. Also, in order to make sure that user is able to view all of the options built in the mobile application, a scroll view is built in this case. Scroll view uses the linear layout to make the button view arrange in order.

For trees' information designing part, it includes pictures and descriptions. The collected plant pictures from research can be changed size to fulfil the phone resolution. There are some drawable folders under res folder. This drawable folder is used for making nicer interface. The pictures need to be copied into drawable folder. Since pictures belong to images, it needs image view for the picture design.

```
<ImageView
    android:id="@+id/imageView1"
    android:layout_width="match_parent"
    android:layout_height="171dp"
    android:src="@drawable/malay_cinnamon"
    android:scaleType="fitXY" />
```

Figure 17 Image view

There is one thing need to notice, android: src. This coding tells us, if want to use the picture, it needs to code the path of picture to enable the system to recognize the location of it and display it. For android: scaleType, this coding is used to change picture scale to display on phone screen, fitXY means the x and y of picture will reach the edge of screen.

For text view, the description put inside double notation android: text="", the text can change text size by android: text size.

```
<TextView
    android:id="@+id/textView1"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:textSize="20sp"
    android:text="      It is a spice obtained from the in
```

Figure 18 Text view

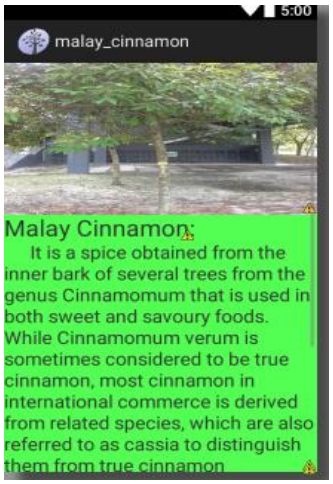


Figure 19 Graphical layout

4.3 Database Design

There are two important parts for database design; one of it is SQLiteAdapter, this class created under src folder. Android uses SQLite database system because Android with build-in SQLite database implementation, then the SQLite is code with Java coding. But this database for an application is only can access to itself and other application unable.

This database include trees name and description, and also include save, delete and edit functions. Design database table like this way:

id	Plant names	Description
1	Hop tree	Follower look like reddish
2	Redneck palm	Medium size 1-2ft
3	Senegal mahogany	Medium size 30-35m

Table 2 Database Table

So the first thing need to define is database name, table name, id and contents, these all things need inside class SQLiteAdapter. After this need to design the database table, the table with three columns and few rows, so design will be easy.

```
public class SQLiteAdapter {

    public static final String MYDATABASE_NAME = "MY_DATABASE";
    public static final String MYDATABASE_TABLE = "MY_TABLE";
    public static final int MYDATABASE_VERSION = 1;
    public static final String KEY_ID = "_id";
    public static final String KEY_CONTENT1 = "Content1";
    public static final String KEY_CONTENT2 = "Content2";

    //create table MY_DATABASE (ID integer primary key, Content text not null);
    private static final String SCRIPT_CREATE_DATABASE =
        "create table " + MYDATABASE_TABLE + " ("
        + KEY_ID + " integer primary key autoincrement, "
        + KEY_CONTENT1 + " text not null, "
        + KEY_CONTENT2 + " text not null);";

    private SQLiteHelper sqLiteHelper;
    private SQLiteDatabase sqLiteDatabase;
```

Figure 20 Database naming and design

sqLiteHelper.getReadableDatabase() and sqLiteHelper.getWritableDatabase(),these two coding are for read and write database. sqLiteDatabase.insert() is for inserting database contents.

```
public SQLiteAdapter openToRead() throws android.database.SQLException {
    sqLiteHelper = new SQLiteHelper(context, MYDATABASE_NAME, null, MYDATAB
    sqLiteDatabase = sqLiteHelper.getReadableDatabase();
    return this;
}

public SQLiteAdapter openToWrite() throws android.database.SQLException {
    sqLiteHelper = new SQLiteHelper(context, MYDATABASE_NAME, null, MYDATAB
    sqLiteDatabase = sqLiteHelper.getWritableDatabase();
    return this;
}

public void close(){
    sqLiteHelper.close();
}

public long insert(String content1, String content2){

    ContentValues contentValues = new ContentValues();
    contentValues.put(KEY_CONTENT1, content1);
    contentValues.put(KEY_CONTENT2, content2);
    return sqLiteDatabase.insert(MYDATABASE_TABLE, null, contentValues);
}
```

Figure 21 Read and Write and Insert content

Also there are three functions deal with the content of database. sqLiteDatabase.delete(), sqLiteDatabase.update() and sqLiteDatabase.query(), they can delete, save and move the contents.

```
public void delete_byID(int id){
    sqLiteDatabase.delete(MYDATABASE_TABLE, KEY_ID+"="+id, null);
}

public void update_byID(int id, String v1, String v2){
    ContentValues values = new ContentValues();
    values.put(KEY_CONTENT1, v1);
    values.put(KEY_CONTENT2, v2);
    sqLiteDatabase.update(MYDATABASE_TABLE, values, KEY_ID+"="+id, null);
}

public Cursor queueAll(){
    String[] columns = new String[]{KEY_ID, KEY_CONTENT1, KEY_CONTENT2};
    Cursor cursor = sqLiteDatabase.query(MYDATABASE_TABLE, columns,
            null, null, null, null, null);
```

Figure 22 Delete and Save and Query content

Table 3 The main command to design database

sqLiteHelper.getReadableDatabase()	sqLiteDatabase.delete()
sqLiteHelper.getWritableDatabase()	sqLiteDatabase.update()
sqLiteDatabase.insert()	sqLiteDatabase.query()

Database SQLite cannot function without the import library file, so there are three important library file need import, they are android.databae.sqlite.SQLiteDatabase,android.databae.sqlite.SQLiteOpenHelper,android.databae.sqlite.SQLiteDatabase.CursorFactory.

The SQLiteAdapter can be direct use in class AndroidSQLite, just need define in AndroidSQLitecalss.

```
private SQLiteAdapter mySQLiteAdapter;
```

Figure 23 Define SQLiteAdapter

Define SQLiteAdapter as mySQLiteAdapter, the class AndroidSQLite can operate database function through this adapter. Database will store a huge data, to make users easy to view the data they save, use a list view in database below the delete all button.

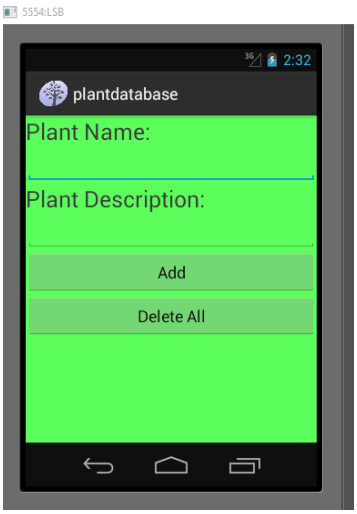


Figure 24 Run database with emulator

.

Figure 24 shows interface for database in emulator, the users can type name and description of trees to save and delete.

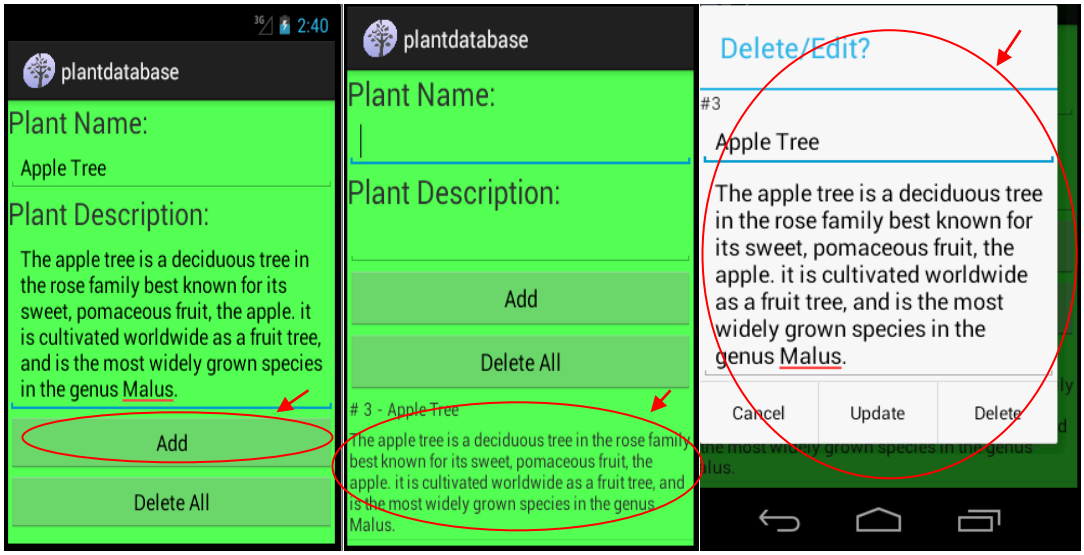


Figure 25 Database functions

The user puts apple trees as the example, type in name and description of apple tree, then click Add it, the apple trees' information will store below delete all button, actually below delete all button, there is a list view, list view will make all the data that user save become a list, user can scroll it to view. Also this list view is clickable, if user want to edit it click it and will pop up an edit interface, users can edit the data can update it from this interface.

4.4 QR code scanner design

QR code scanner design is a huge project and google will offer open source for designer, the open source call zxing, this zxing is offered on website. The users can download it and apply it in Eclipse.

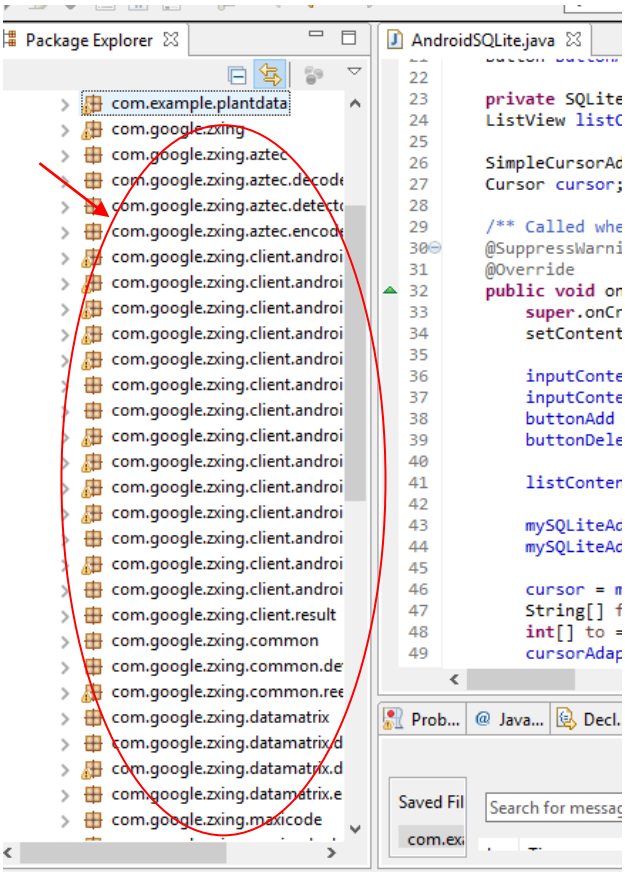


Figure 26 Zxing classes in Eclipse

There are more than twenty zxing classes in Eclipse, but there are three main function classeszxing.camera, zxing.qrcode and zxing.decode. inside class zxing.qrcode, there are two activities, one is QRCodeReader and another is QRCodeWriter. QRCodeReader is to open phone camera to detect QR code format and locate and decode it in image. Then QRCodeWriter renders a QR code as a bit matrix 2D array of grescale values. However zxing.decode will decode QR code then covert it to content. Zxing.camera will control camera of phone to open can scan.

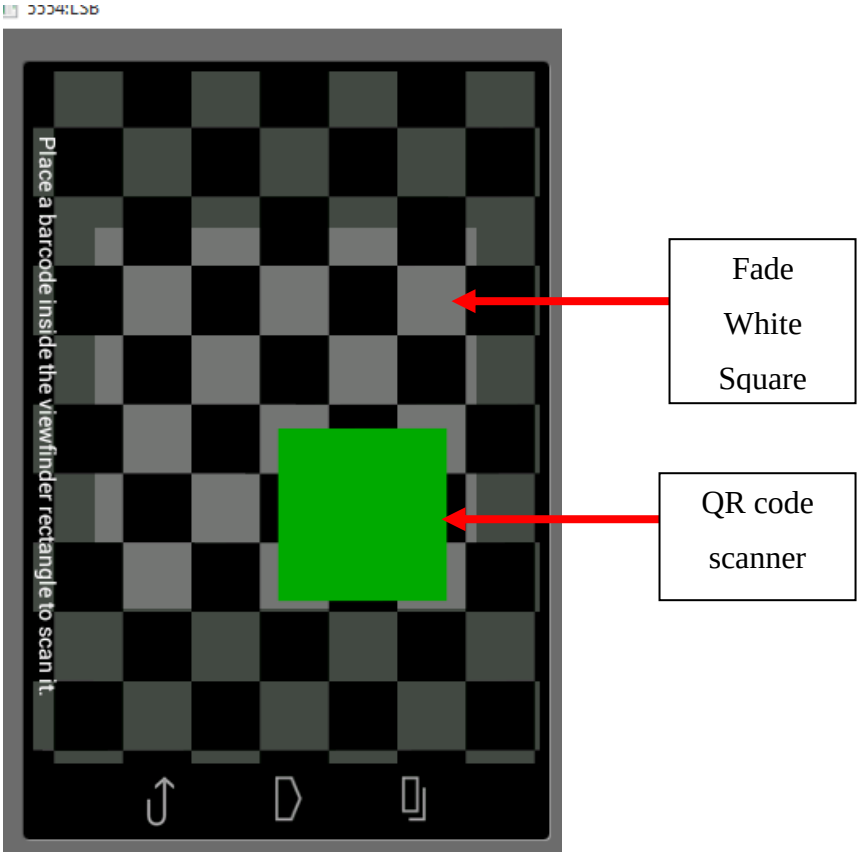


Figure 27 QR code scanner in emulator

When using an emulator to open the QR code scanner, it looks like Figure 27, the QR code only detect inside the fade white square. Mean the QR code image need inside fade white square, the green color square is QR code scanner, it will scan the QR code and decode it to get the content.

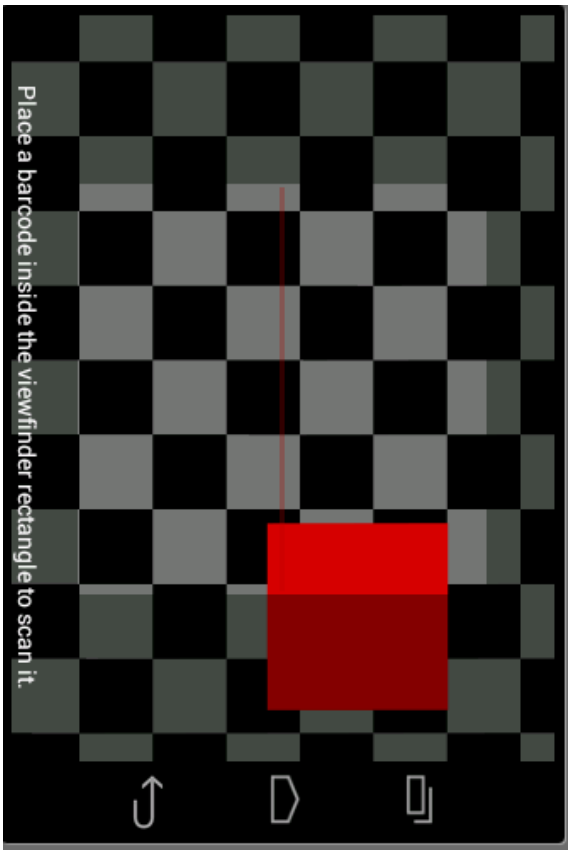


Figure 28 Detect nothing

The red square indicates the camera did not detect any QR code image after scan few time, it will keep scanning until detected QR code image, then red color square become green color. The small squares black and white, actually they indicate camera, because this QR code scanner run as emulator, this emulator did not connect with any camera device, so will see black and white small squares.

Figure 29 Result for QR code scan

After QR code scan, the blue color content of code will display as website format in Figure 4.2.4. Click it, the phone will jump to the website and download this content. Design whole QR code scanner, need some android permissions.

```
<uses-permission android:name="android.permission.CAMERA" />
<uses-permission android:name="android.permission.INTERNET" />
```

Figure 30 Users permission need in QR code scanner

Because design QR code scanner, need internet and camera. The user need permission from android, so define the permission in AndroidManifest.xml file is very important.

4.5 Hardware Design

The Bluetooth module HC05 have four pins, RXD and TXD for transmit and receive data, and then another two pins are GND and VCC, this Bluetooth module use 5V voltage to support. The Arduino board pin 0(RX) connect with Bluetooth module TXD and pin1(TX) connect with Bluetooth module RXD. The data transmit between Arduino board and Bluetooth module.

The schematic diagram:

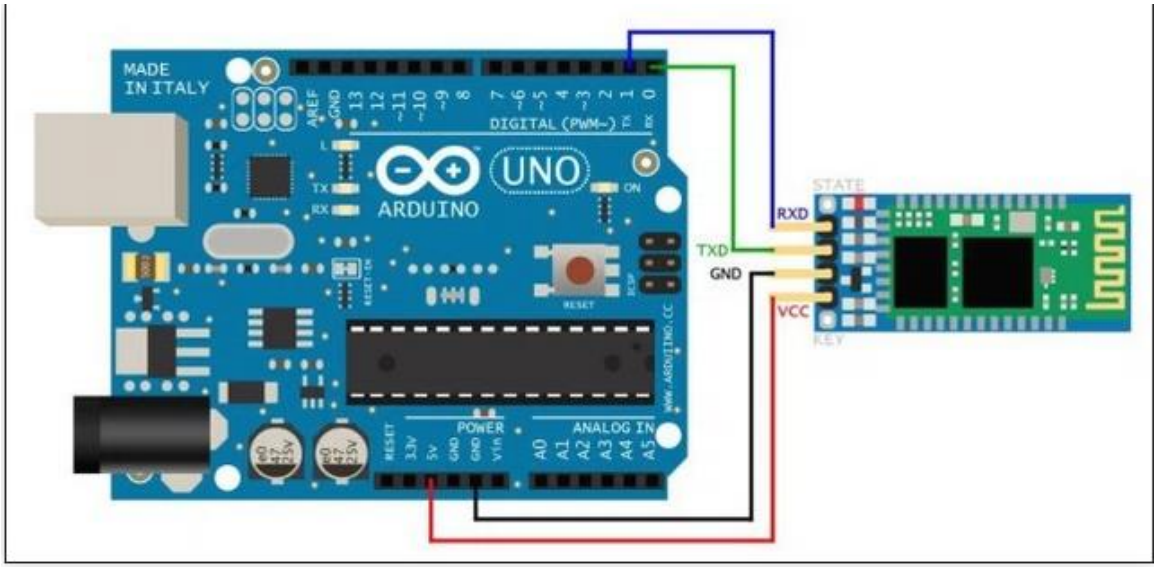


Figure 31 Schematic diagram Arduino board connect with Bluetooth module

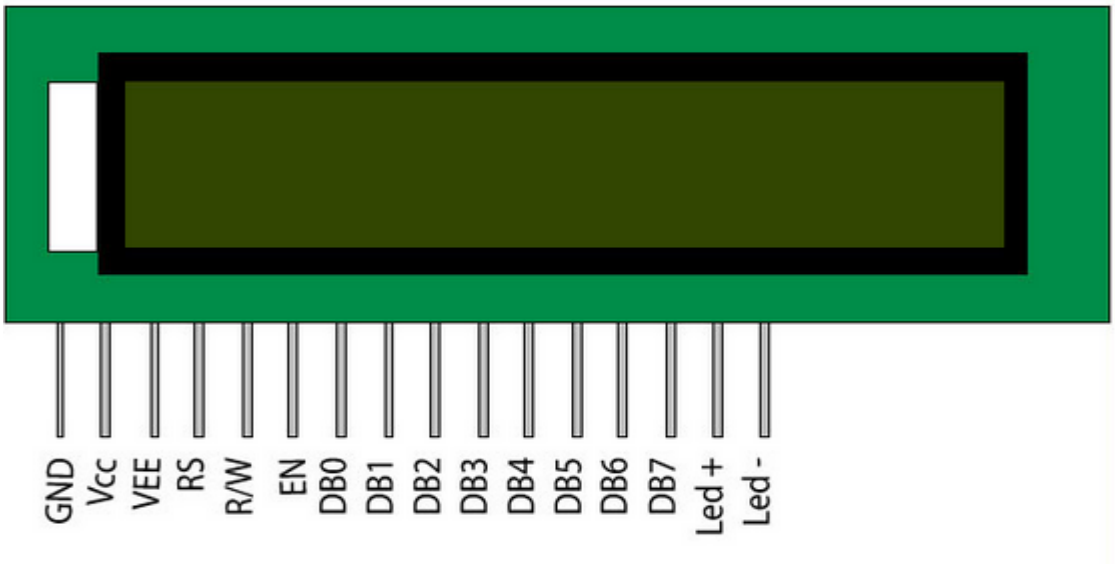


Figure 32 LCD

In this hardware design, LCD use 4 pins for data display, DB4 to DB7, and GND VCC and VEE connect with potential meter, potential meter use for protecting LCD and adjust LCD lightning. Through potential meter connect with Arduino board VCC and GND. R/W command LCD to read and write data. EN pin let LCD enable to display, RS pin is register select signal.

LCD connects with Arduino board:

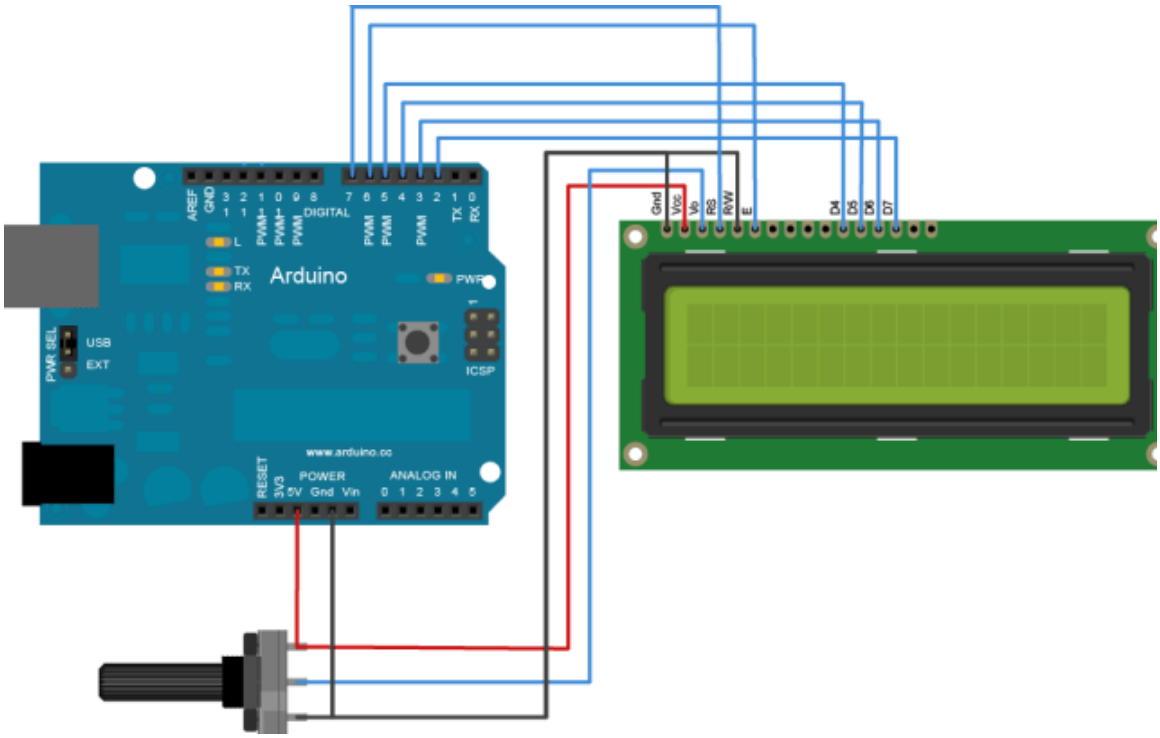


Figure 33 Schematic diagram connect Arduino board with LCD

Mobile phone paring with external Bluetooth module, the password for HC05 Bluetooth default is 1234. After paring, mobile phone sends data to Arduino, this process need to program Arduino and mobile phone, for mobile phone, design a easy mobile apps to connect with HC Bluetooth module.

Design mobile apps, there is one website for Android app design, MIT App Inventor. Mobile apps can be designed by MIT App Inventor by using module block, this can make apps design become easy.

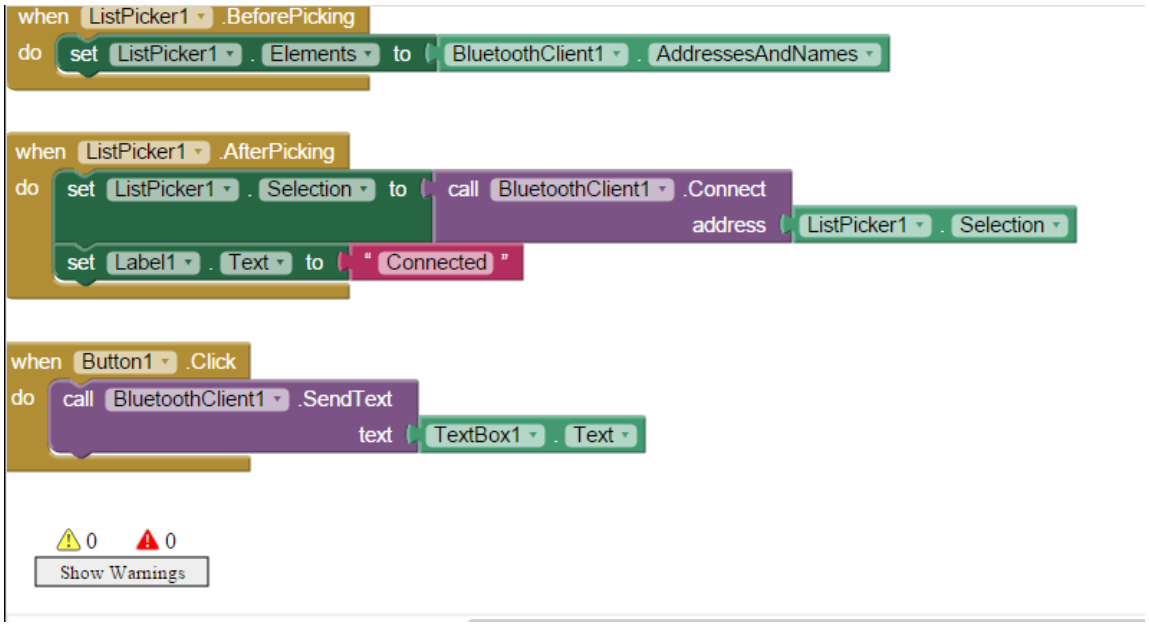


Figure 34 Design App for HC 05 Bluetooth module by MIT App Inventor

There are three main blocks, Bluetooth searching, Bluetooth paring and Send text. Design these blocks, just need to drag the event blocks into viewer workplace. Between blocks and blocks, there few function blocks need to insert into previous block, function blocks happen depend on previous block condition happens.

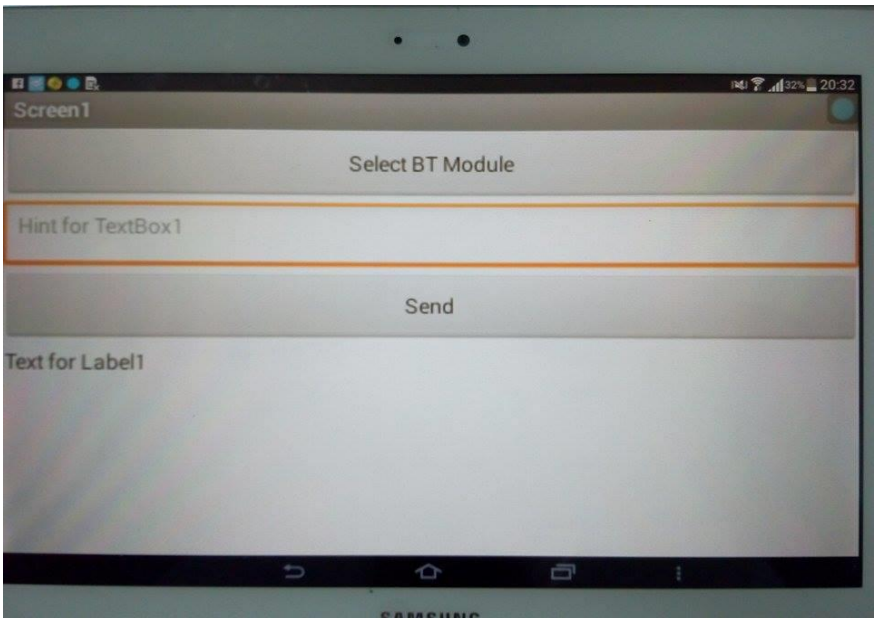


Figure 35 The App install in SamSung Tablet

When the user text message and click send, the text will display on LCD. Apply this small project on the trees, the user paring their phone to Bluetooth, then users can send message and take notes on this tree. For example, this can using in botanical garden, the botanical staff will take note on this tree, if the tree got disease, then he will call the botanical doctor to see this message can cure it.

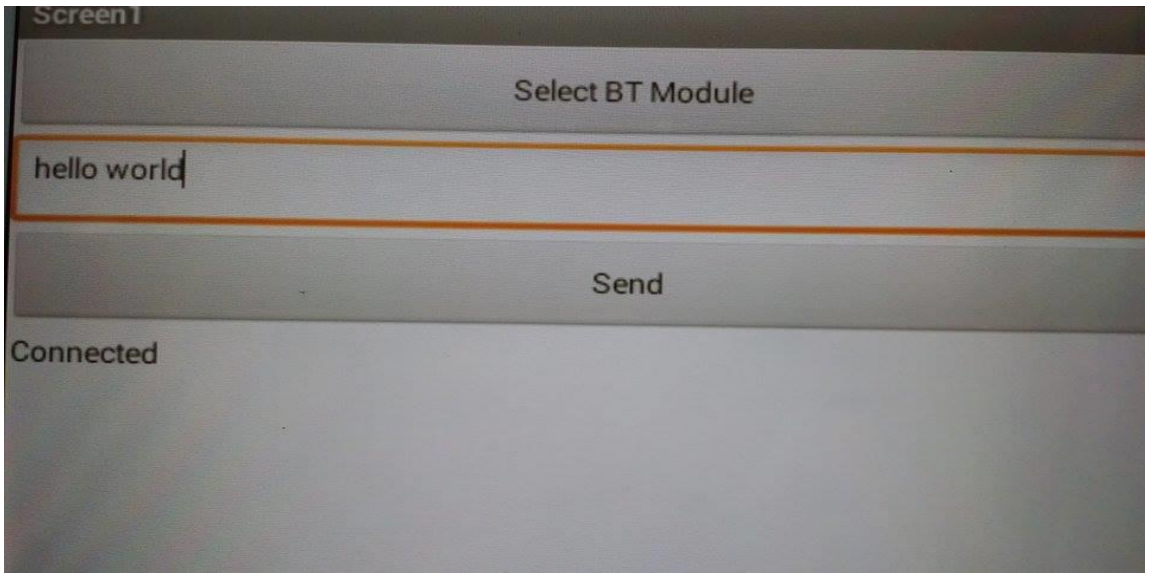


Figure 36 Send hello world message to Arduino

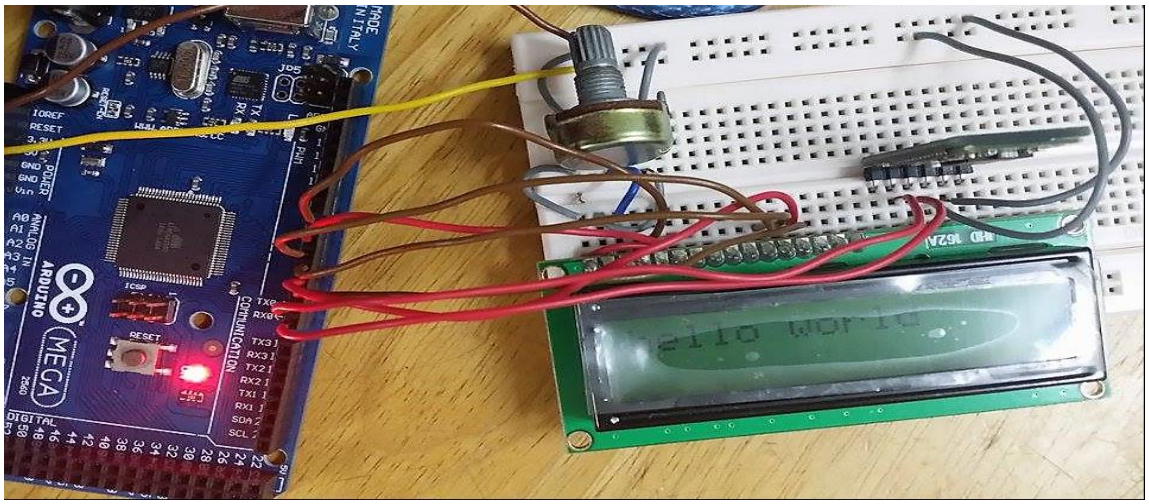


Figure 37 LCD display message ‘hello world’

CHAPTER 5

CONCLUSION

Botanical garden has a lot data about plants.By using the mobile phone software and hardware development, mobile phone also can act like a computer to store data. The main purpose of this Final Year Project is tocreate a more convenient and productive way for the botanical staff to collect plant data.

This project is including the hardware and software design. The software part is about design of database for the plants and the plants' data can be saved and edited. Database is very popular in mobile phone apps design; it can make the data become tidy in order and can fast searching for data. Also databases is portable and flexible. Thus, database is very helpful for huge data storage in mobile phone.

The QR code is one of the functions included in this project. QR codes is popular in mobile apps, and it is being used everywhere, like supermarket, mostly use in business. In this project, QR code scanning on the tag of trees helps to get the trees' information. The trees data will save in server. After scanning, the data will retrieve from the server. It will be very useful for botanical staff in garden to get trees information in a short instant.

The hardware design for this project, it just for botanical staff to easy take notes by mobile phone to send message through Bluetooth, then display in LCD, this function can be used for some botanical staffs take label or small notes for it. For example, if tree got some diseases, staff can take note about diseases name display LCD, and next time the botanical doctor will know the disease and cure trees.

In this modern technology, there is a lot device will be using with mobile phone apps; this is very big challenge for electronic engineering. Design mobile phone apps by using Java and C+ coding and then applying these mobile apps to electronic device. It will make a human life easy in the future.

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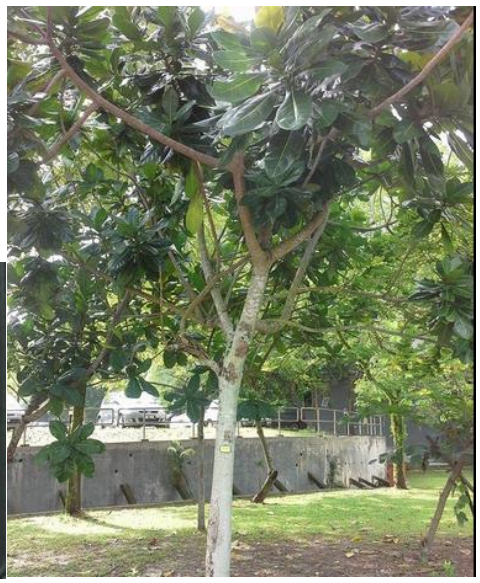
APPENDIX

Samples Collect:


Senegal
Mahogany
Khaya senegalensis


Sea Putat
Barringtonia asiatica



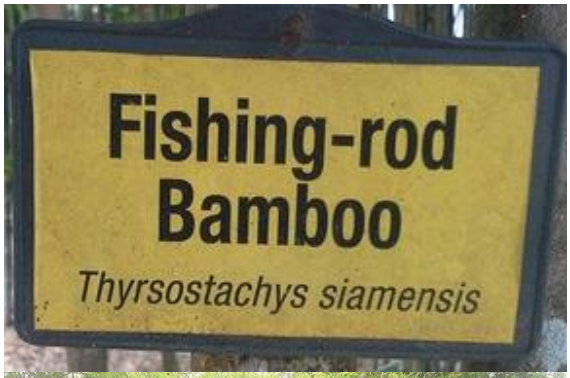

Hong Kong
Bauhinia
Bauhinia blakeana


Malay
Cinnamon
Cinnamomum iners


Leopard Tree
Caesalpinia ferrea


Merawan
Siput-Jantan
Hopea odorata


Benjamina Fig
Ficus benjamina


Fishing-rod
Bamboo
Thyrsostachys siamensis

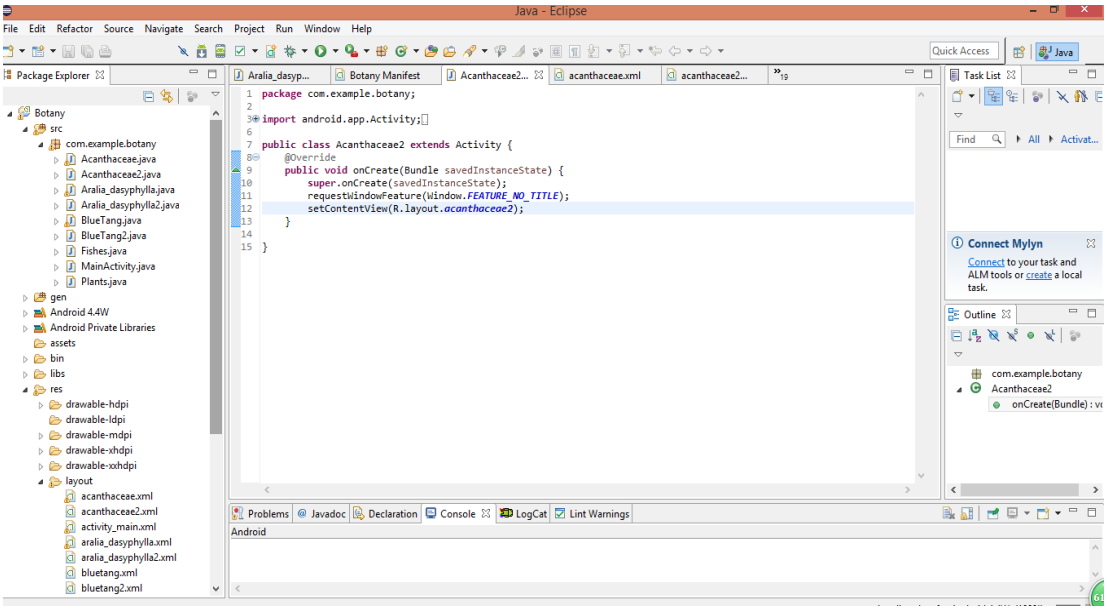

Eugenia
Polyentha
Syzygium polyanthum


Gelam
Melaleuca cajuputi

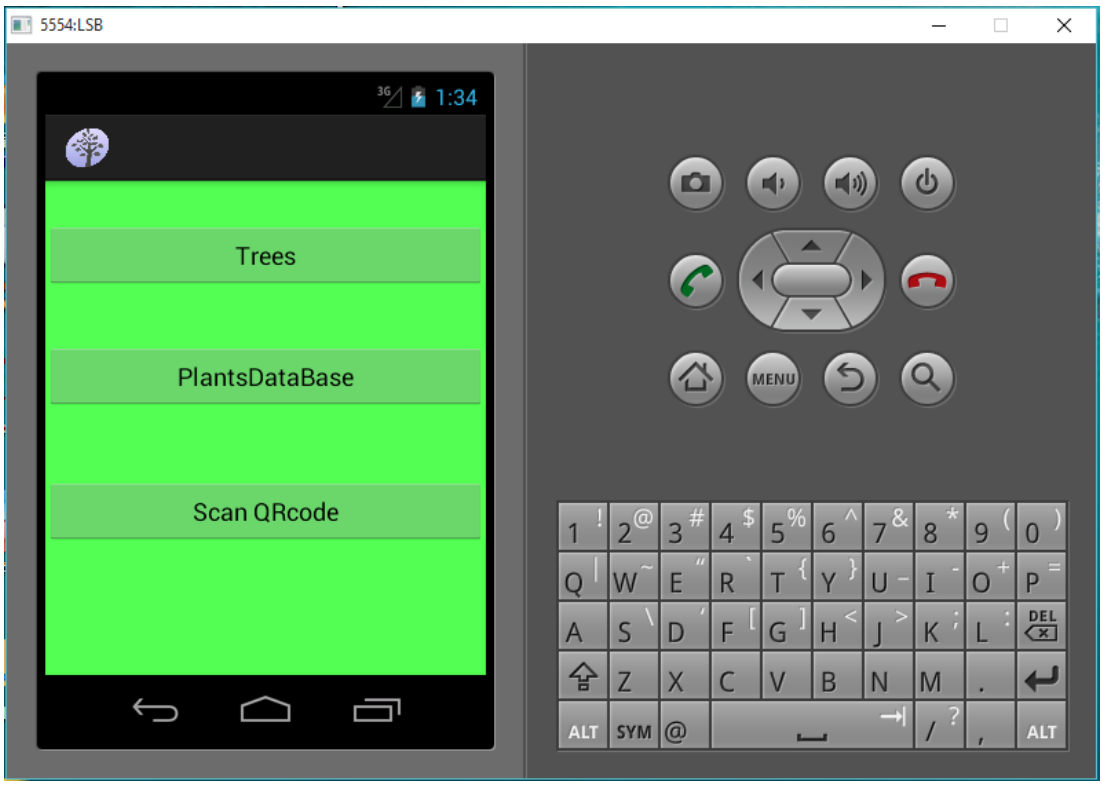

Bucida
Buccida buceras


UTAR Bird Sanctuary
拉曼大学鸟类保护区

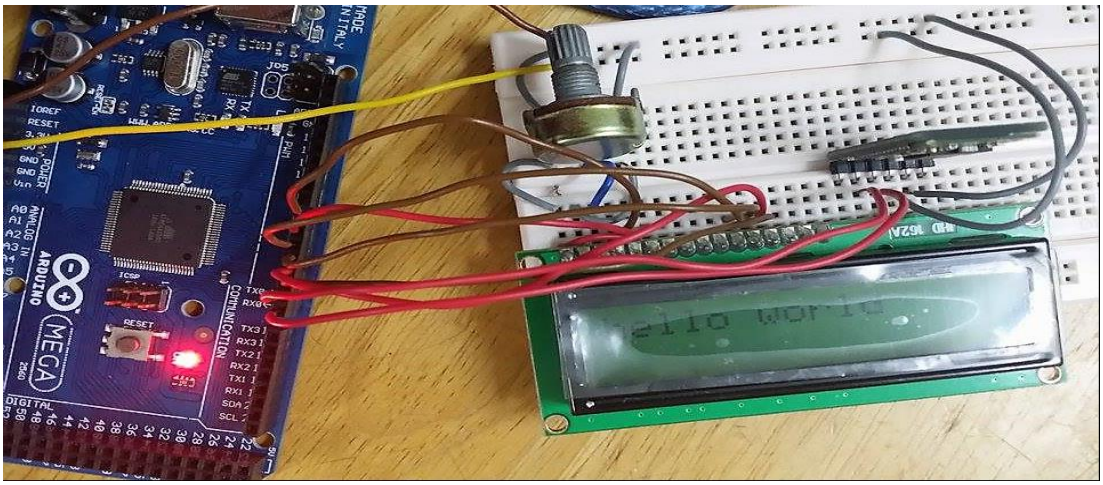
Eclipse:



Emulator:



Hardware:


ARDUINO
MEGA
RESET
DIGITAL
ANALOG IN
COMMUNICATION
Hello World