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ROBOT APPLICATIONS:

“HOSPITAL ZENBO APPLICATION”

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1.0 INTRODUCTION

A hospital is a health care institution providing patient treatment with specialized medical and nursing staff and medical equipment. The best-known type of hospital is the general hospital, which typically has an emergency department to treat urgent health problems ranging from fire and accident victims to a sudden illness. We set An-Nur Specialist Hospital which is located in Bangi as our model or example.

There are a numerous number of departments in the hospital such as emergency department, pharmacy counter, main lobby, cafeteria and etc. Thus, we came out with a solution that can assist the user with the help of Zenbo robot to navigate them in hospital area. The application is built using android studio with Zenbo SDK implemented in it. Zenbo Hospital application is divided into 2 types of user which is Patient and Visitor. Each of the user has different access in hospital. For instance, patient users able to go to pharmacy, emergency and check-up while for visitor users can only go to lobby, ward and shop. In terms of interaction with the application, users can command using speech recognition or manually tap the button on the Zenbo display. So, the application might be a big help especially for newbie visitors around the hospital.

2.0 PROBLEM STATEMENT

1. The user has difficulties to find places in the hospital.
2. The staff in the information centre might be unavailable to ask about the direction in the hospital.
3. The information given by the staff might hard to understand by the user.

3.0 OBJECTIVE

1. To assist the user about the direction in the hospital.
2. To reduce the number of staff by using hospital application and Zenbo Robot.
3. To interact between Zenbo Robot and user interaction by using speech recognition.

4.0 TYPES OF USER

We focus on two types of user which is patient and visitor. Each of these user is able to access different kinds of places in the hospital.

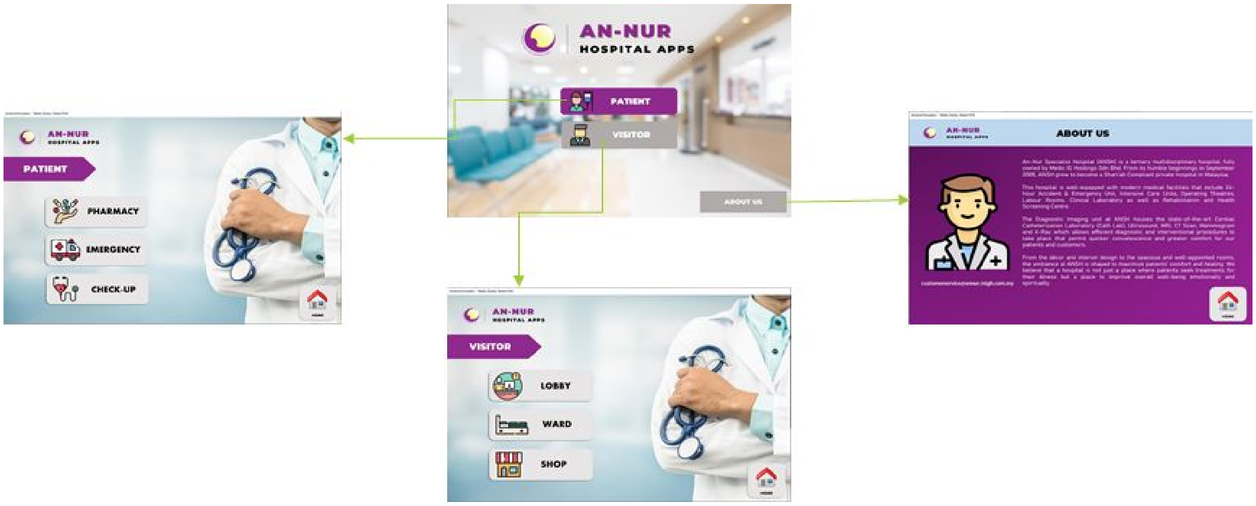
1. Patient:-
   - Pharmacy Department.
   - Emergency Department.
   - Check-Up.

2. Visitor:-
   - Main Lobby.
   - Wards.
   - Cafeteria/Shop.

5.0 INTERFACE OF HOSPITAL APPLICATION

5.1 Wireframe

Below is the overall interface of hospital application. There are 4 main screens that we design to successfully complete the Zenbo Project.



An-Nur Specialist Hospital (ANSH) is a tertiary multidisciplinary hospital, fully owned by Medic IG Holdings Sdn Bhd. From its humble beginnings in September 2008, ANSH grew to become a Shari'ah Compliant private hospital in Malaysia.

This hospital is well-equipped with modern medical facilities that include 24-hour Accident & Emergency Unit, Intensive Care Units, Operating Theatres, Labour Rooms, Clinical Laboratory as well as Rehabilitation and Health Screening Centre.

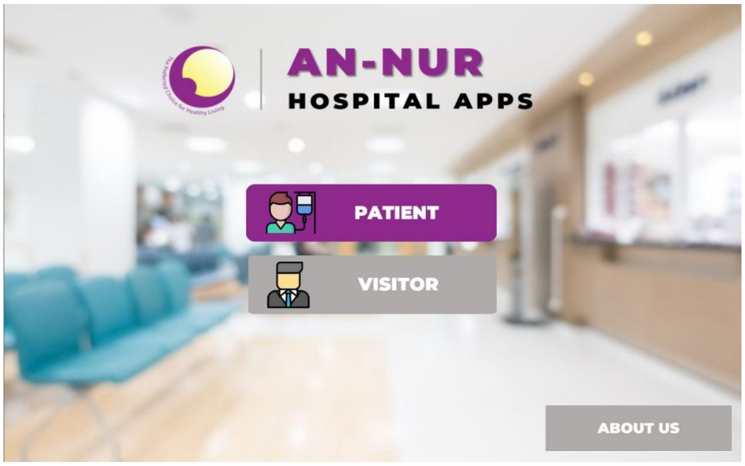
The Diagnostic Imaging unit at ANSH houses the state-of-the-art Cardiac Catheterization Laboratory (Cath Lab), Ultrasound, MRI, CT Scan, Mammogram and X-Ray which allows efficient diagnostic and interventional procedures to take place that permit quicker convalescence and greater comfort for our patients and customers.

From the décor and interior design to the spacious and well-appointed rooms, the ambience at ANSH is shaped to maximize patients' comfort and healing. We believe that a hospital is not just a place where patients seek treatments for their illness but a place to improve overall well-being emotionally and spiritually.

customerservice@annur.imigh.com.my

5.2 User Interface Components

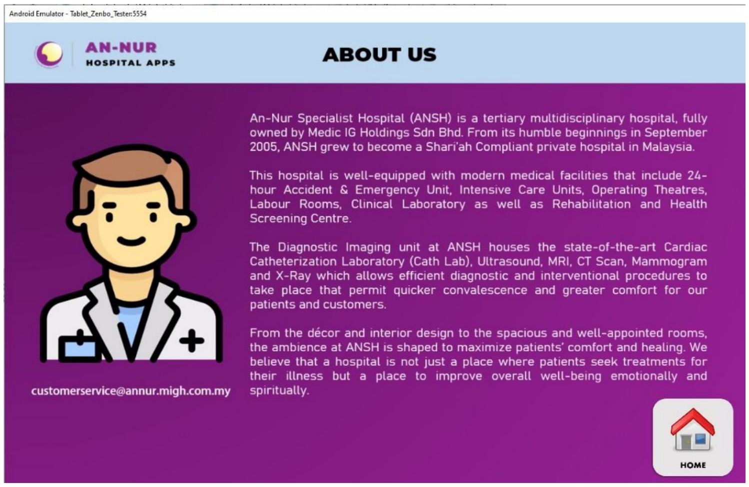
5.2.1 Main Menu



In this main menu screen, the user has to tell the Zenbo which kind of user are the user belongs to. Two main users that we provide here which is patient and visitor. For the components, there are three image buttons in the main menu screen.

- ImageButton : Patient
- ImageButton : Visitor
- ImageButton : About Us

5.2.2 About Us



ABOUT US

An-Nur Specialist Hospital (ANSH) is a tertiary multidisciplinary hospital, fully owned by Medic IG Holdings Sdn Bhd. From its humble beginnings in September 2005, ANSH grew to become a Shari'ah Compliant private hospital in Malaysia.

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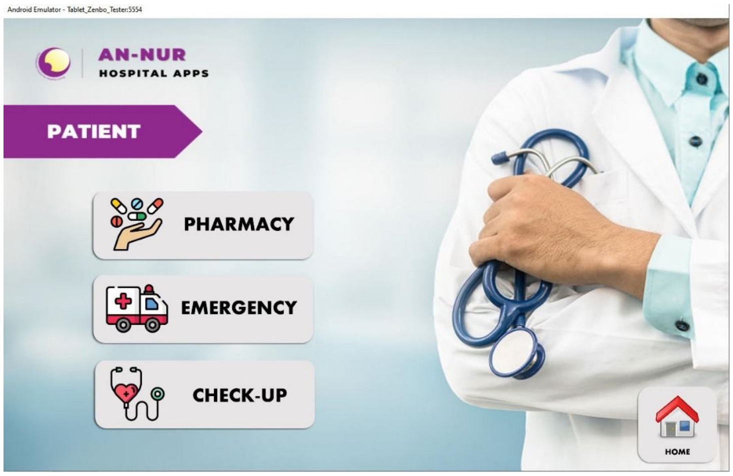
customerservice@annur.migh.com.my

In this about us screen, it only displays the explanation about the hospital application. It also gives you the hospital's customer service email if you have any trouble with the robot. For the components, there is only one image button on screen which is Home button (ImageButton).

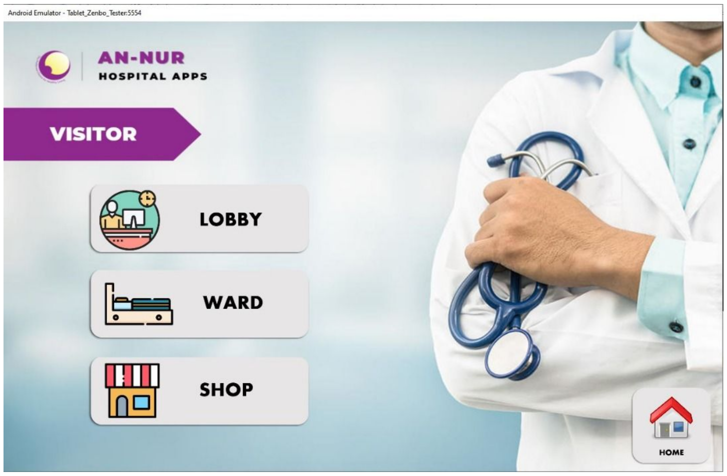
5.2.3 Patient



In this patient screen, it shows the user where they can able to go to. So, there are four buttons which are pharmacy, emergency, check-up and home button.

- ImageButton : Pharmacy
- ImageButton : Emergency
- ImageButton : Check-Up
- ImageButton : Home

5.2.4 Visitor



In this visitor screen, it shows the user where they can able to go to. So, there are four buttons which are lobby, ward, shop and home button.

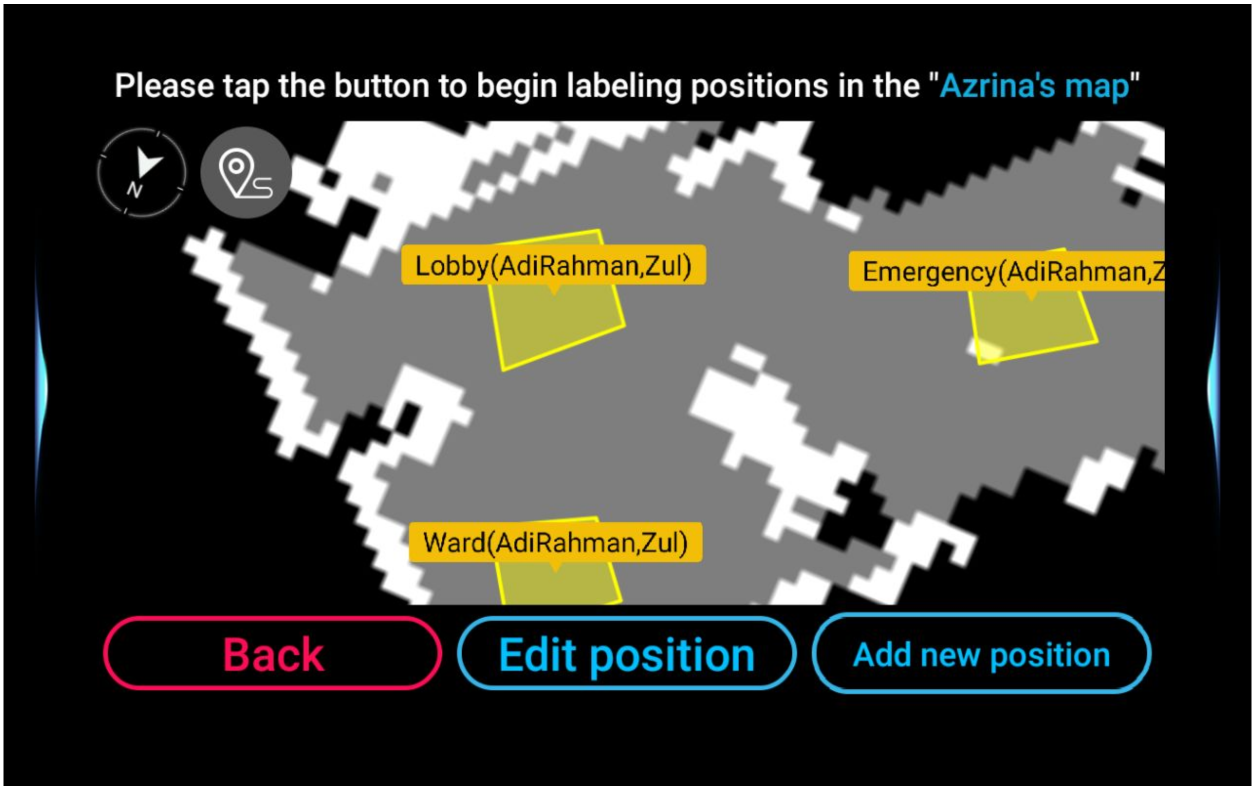
- ImageButton : Lobby
- ImageButton : Ward
- ImageButton : Shop
- ImageButton : Home

6.0 SOURCE CODE

This app is developed using Android Studio. ZenboSDK module has been added to this project to make the API usable. The language that has been used in this development is Java.

Firstly, we combined the code from ZenboDialogSample and GoToLocation to make Zenbo able to listen and speak as well as able to navigate on places.

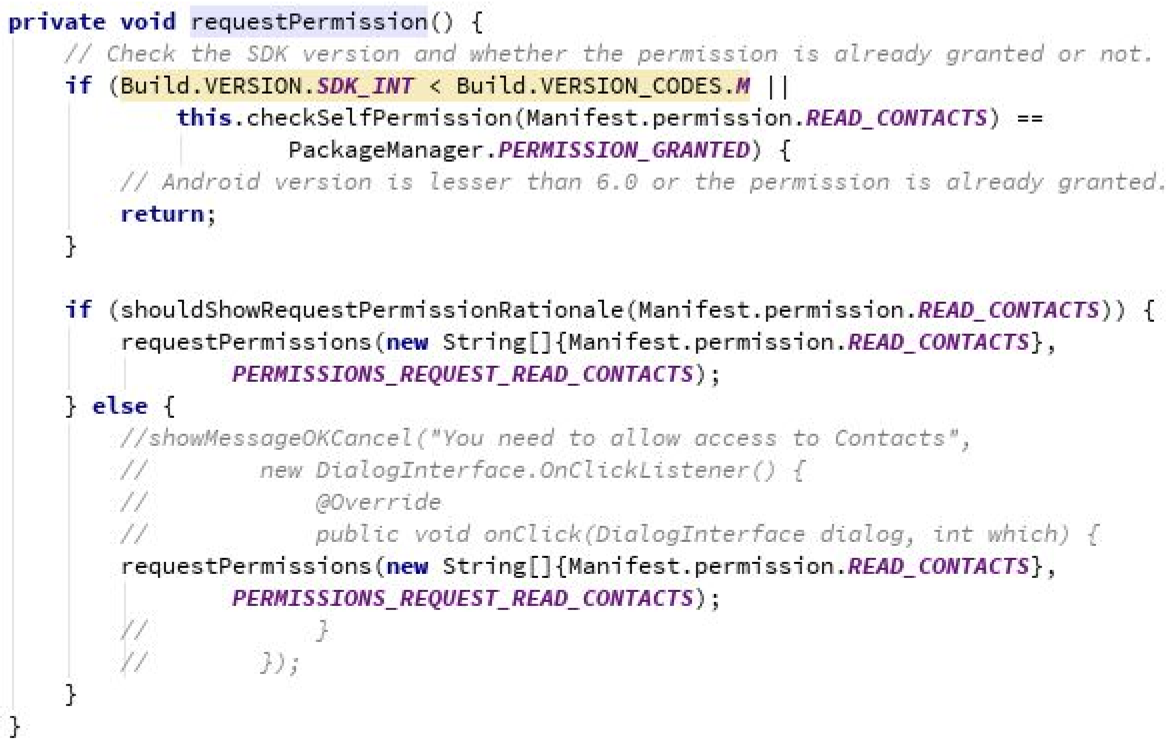
The map has been scanned through the lab. We label it as 'ward', 'emergency' and 'lobby'



Please tap the button to begin labeling positions in the "Azrina's map"

Figure 6.1 : Home Mapping page on Zenbo

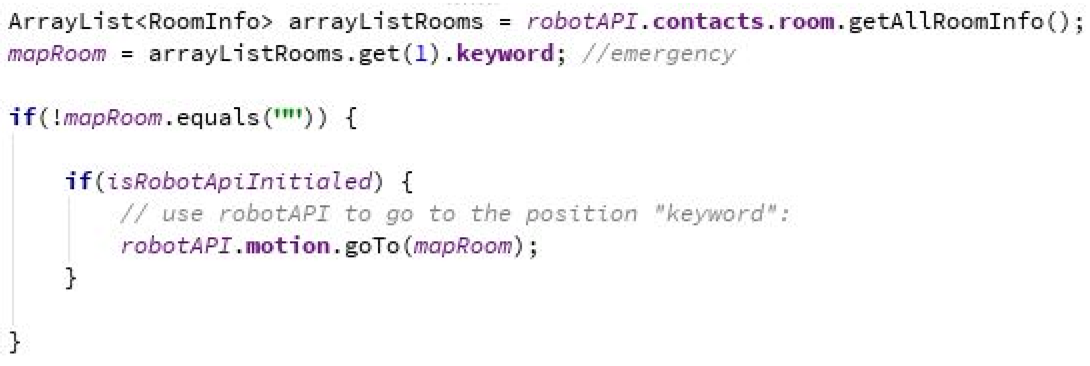
In order to retrieve room's name on Android Studio, we need to ask CONTACTS permission from the Zenbo. Here's the code to request permission.



```
private void requestPermission() {
    // Check the SDK version and whether the permission is already granted or not.
    if (Build.VERSION.SDK_INT < Build.VERSION_CODES.M ||
            this.checkSelfPermission(Manifest.permission.READ_CONTACTS) ==
                    PackageManager.PERMISSION_GRANTED) {
        // Android version is lesser than 6.0 or the permission is already granted.
        return;
    }

    if (shouldShowRequestPermissionRationale(Manifest.permission.READ_CONTACTS)) {
        requestPermissions(new String[]{Manifest.permission.READ_CONTACTS},
                PERMISSIONS_REQUEST_READ_CONTACTS);
    } else {
        //showMessageOKCancel("You need to allow access to Contacts",
        //        new DialogInterface.OnClickListener() {
        //            @Override
        //            public void onClick(DialogInterface dialog, int which) {
        requestPermissions(new String[]{Manifest.permission.READ_CONTACTS},
                PERMISSIONS_REQUEST_READ_CONTACTS);
        //            }
        //        });
    }
}
```

Figure 6.2 : requestPermission() function on Android Studio

Then we can retrieve and save the room's information into ArrayList. So let's say if we want to go to the 'Emergency' room, we can call the index 1 of the ArrayList and save the String data into variable `mapRoom`. Then we can use `robotAPI.motion.goTo(mapRoom)` to navigate the Zenbo.

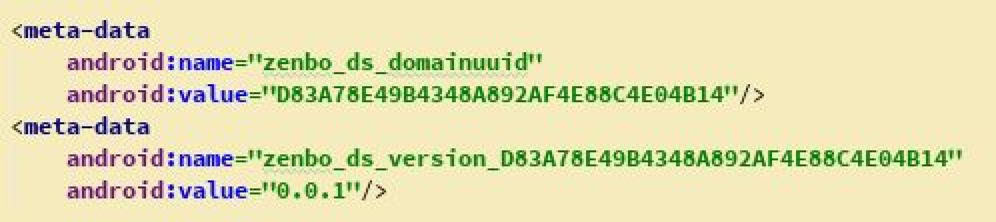


```
ArrayList<RoomInfo> arrayListRooms = robotAPI.contacts.room.getAllRoomInfo();
mapRoom = arrayListRooms.get(1).keyword; //emergency

if(!mapRoom.equals("")) {

    if(isRobotApiInitialed) {
        // use robotAPI to go to the position "keyword":
        robotAPI.motion.goTo(mapRoom);
    }

}
```

Figure 6.3 : GoToLocation codes

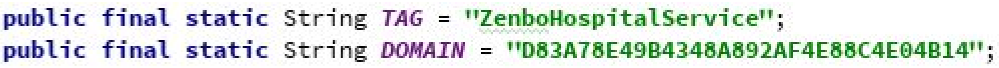
For the speech part, we use all the existing code from ZenboDialogSample. First, we need to place the domain version and UUID of the DDE Server into AndroidManifest.xml and MainActivity.java .

Domain UUID : D83A78E49B4348A892AF4E88C4E04B14
Domain version : 0.0.1



```
<meta-data
    android:name="zenbo_ds_domainuuid"
    android:value="D83A78E49B4348A892AF4E88C4E04B14"/>
<meta-data
    android:name="zenbo_ds_version_D83A78E49B4348A892AF4E88C4E04B14"
    android:value="0.0.1"/>
```

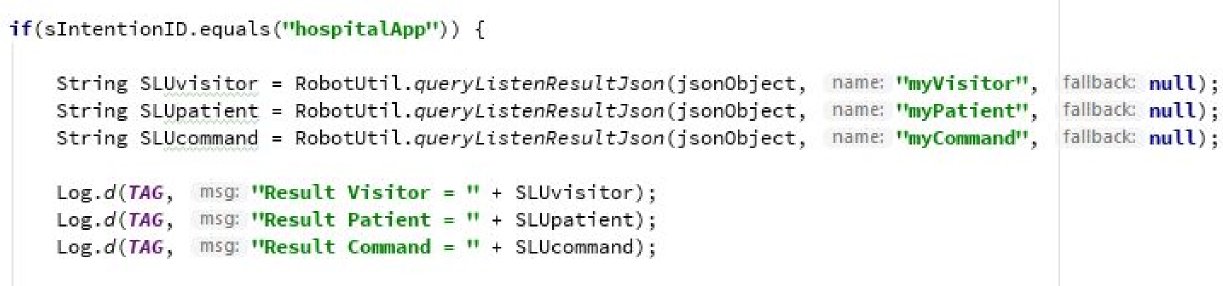
Figure 6.4 : Domain UUID and version in AndroidManifest.xml



```
public final static String TAG = "ZenboHospitalService";
public final static String DOMAIN = "D83A78E49B4348A892AF4E88C4E04B14";
```

Figure 6.5 : Domain UUID in MainActivity.java

Then we declared the belief we've made on DDE Server into Android Studio.

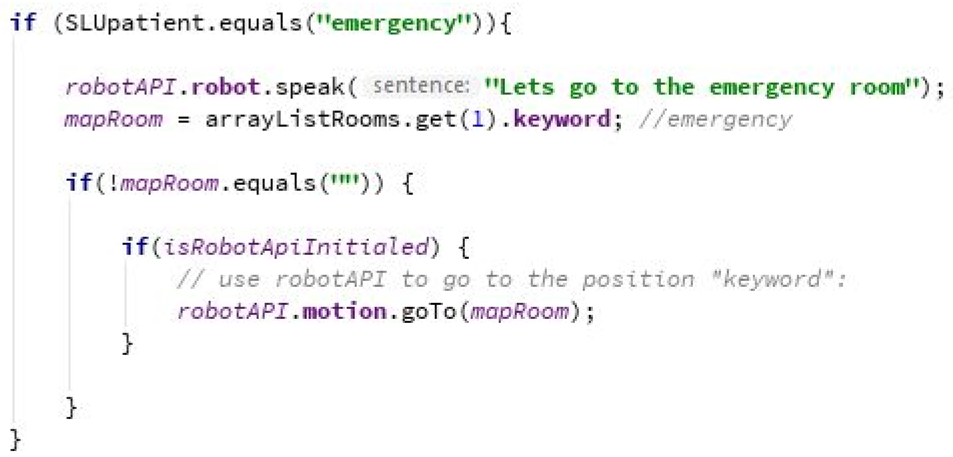


```
if(sIntentionID.equals("hospitalApp")) {

    String SLUvisitor = RobotUtil.queryListenResultJson(jsonObject,  name: "myVisitor",  fallback: null);
    String SLUpatient = RobotUtil.queryListenResultJson(jsonObject,  name: "myPatient",  fallback: null);
    String SLUcommand = RobotUtil.queryListenResultJson(jsonObject,  name: "myCommand",  fallback: null);

    Log.d(TAG,  msg: "Result Visitor = " + SLUvisitor);
    Log.d(TAG,  msg: "Result Patient = " + SLUpatient);
    Log.d(TAG,  msg: "Result Command = " + SLUcommand);
```

Figure 6.6 : Belief declaration in Android Studio

Next, when user says something to Zenbo, Zenbo will send the voice to the DDE Server and it will reply the value to Android Studio. The value received will be used to execute function on Zenbo. Example here is when DDE Server replied value 'emergency', it will execute the code in it which is navigate the user to the Emergency Room.

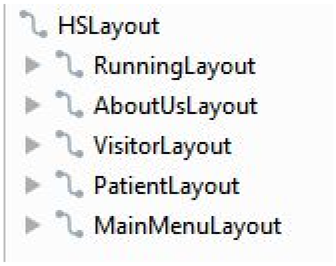
Zenbo will says "Let's go to the emergency room" and then Zenbo will start localization. He will scan the surrounding then go to the desired location which is an emergency room.



```
if (SLUpatient.equals("emergency")){

    robotAPI.robot.speak( sentence: "Lets go to the emergency room");
    mapRoom = arrayListRooms.get(1).keyword; //emergency

    if(!mapRoom.equals("")) {

        if(isRobotApiInitialed) {
            // use robotAPI to go to the position "keyword":
            robotAPI.motion.goTo(mapRoom);
        }

    }
}
```

Figure 6.7 : Emergency’s code snippet

Lastly, the layout of this app based on ConstraintLayout. The layout has 5 sub-layout. Here is the sub-layout of the Hospital Zenbo App.



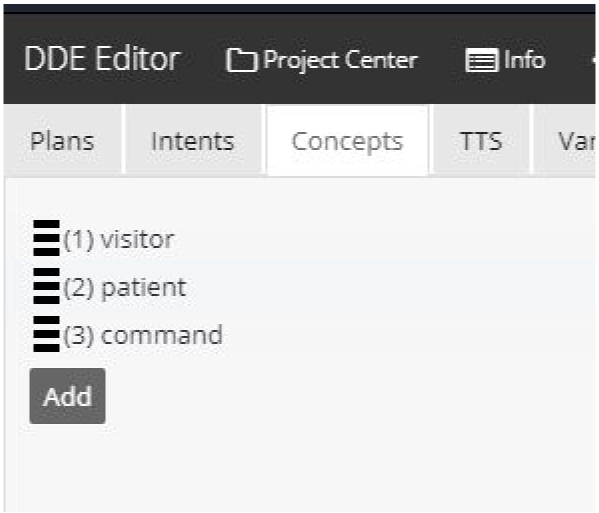
```
HSLayout
▶ RunningLayout
▶ AboutUsLayout
▶ VisitorLayout
▶ PatientLayout
▶ MainMenuLayout
```

Figure 6.8 : List of sub-layout

7.0 DDE DIALOG

This application has three concepts which is :

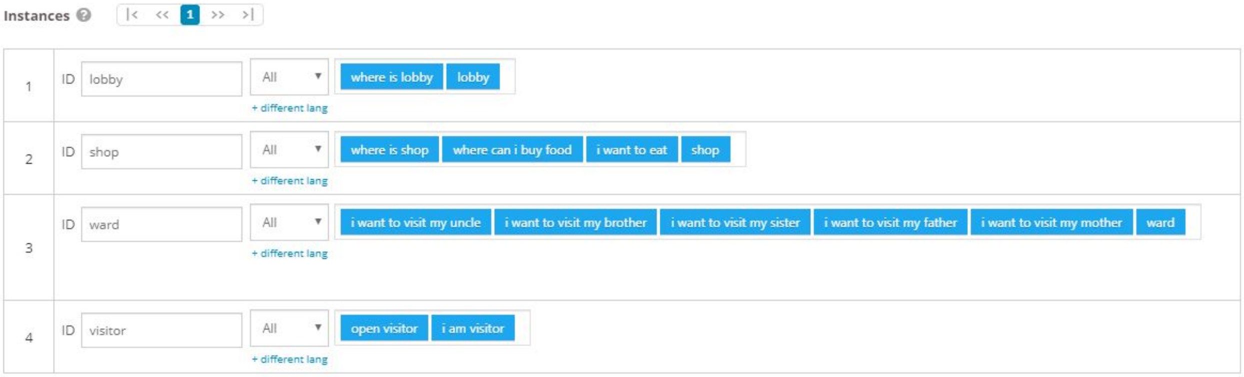
1. visitor
2. patient
3. command



(1) visitor
(2) patient
(3) command

Figure 7.1 : List of concepts

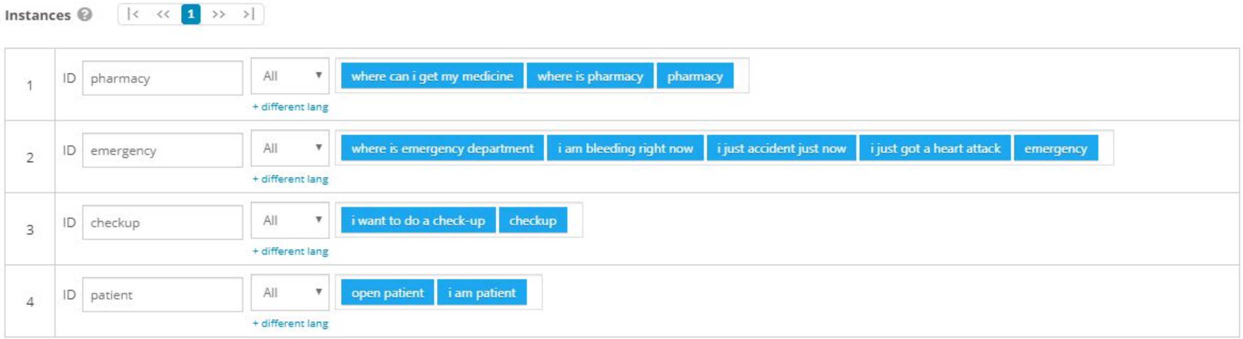
Here is the phrase (instance) available in 'visitor' concepts.



1	ID lobby	All + different lang	where is lobby lobby
2	ID shop	All + different lang	where is shop where can i buy food i want to eat shop
3	ID ward	All + different lang	i want to visit my uncle i want to visit my brother i want to visit my sister i want to visit my father i want to visit my mother ward
4	ID visitor	All + different lang	open visitor i am visitor

Figure 7.2 : List of visitor's instances

Here is for ‘patient’ concepts.

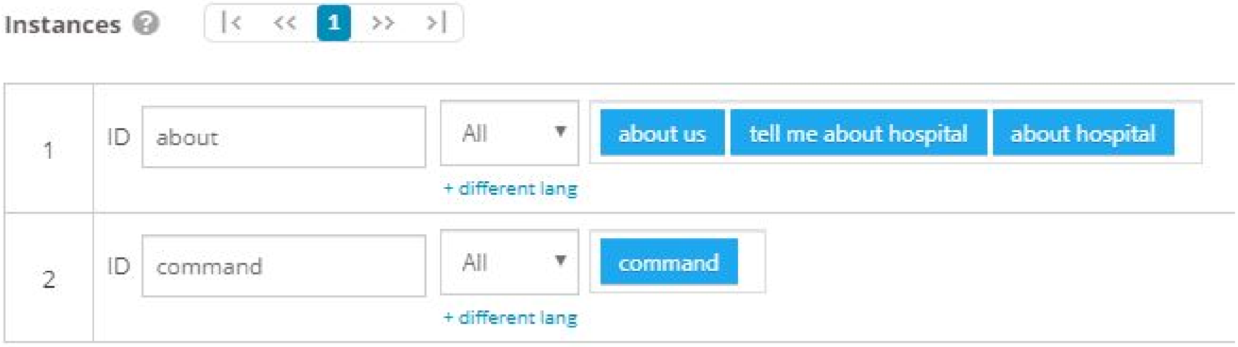


Instances ? |< << 1 >> >|

1	ID pharmacy	All + different lang	where can i get my medicine where is pharmacy pharmacy
2	ID emergency	All + different lang	where is emergency department i am bleeding right now i just accident just now i just got a heart attack emergency
3	ID checkup	All + different lang	i want to do a check-up checkup
4	ID patient	All + different lang	open patient i am patient

Figure 7.3 : List of patient’s instances

And the last is for ‘command’ concepts.

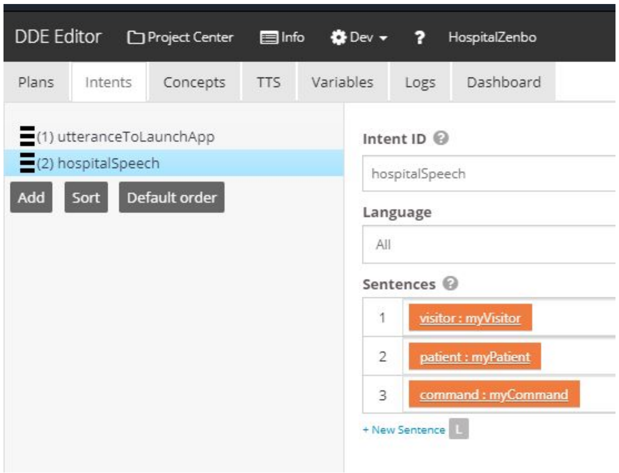


Instances ? |< << 1 >> >|

1	ID about	All + different lang	about us tell me about hospital about hospital
2	ID command	All + different lang	command

Figure 7.4 : List of command’s instances

All the three concepts linked to the 'hospitalSpeech' intents. This intents make sure all the concept is separated into single intents, to make code in Android Studio easier.



Intent ID: hospitalSpeech

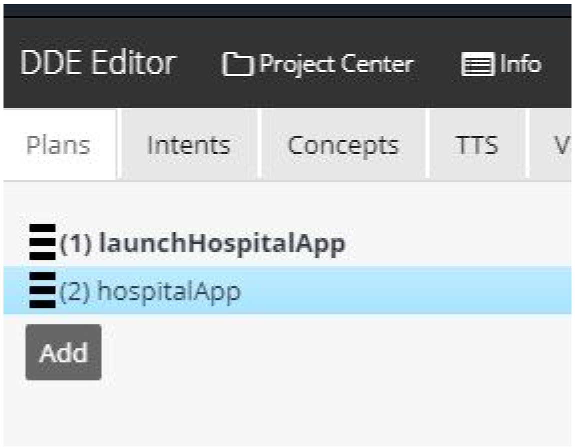
Language: All

Sentences:

1 visitor : myVisitor
2 patient : myPatient
3 command : myCommand

Figure 7.5 : hospitalSpeech's intents

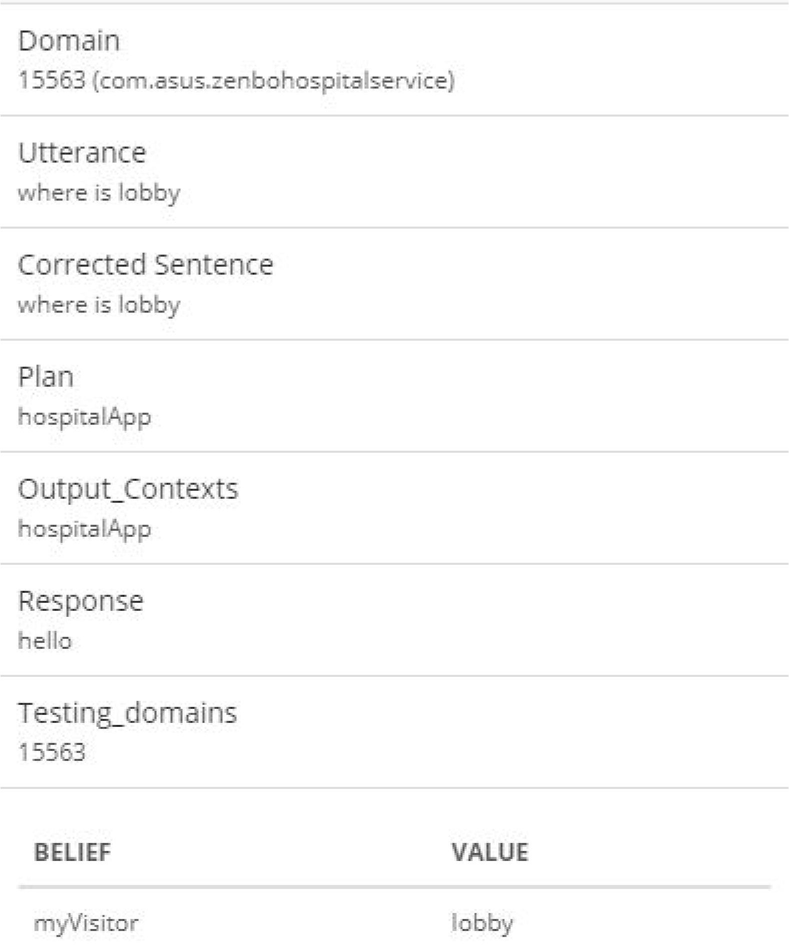
Then, the intents is assigned to a plan which is called 'hospitalApp'.



(1) launchHospitalApp
(2) hospitalApp

Figure 7.6 : List of plans

Here is the sample phrase that triggered the plan. Let’s say a user asked ‘where is lobby’, the system should reply the value ‘lobby’ under myVisitor’s belief to Android Studio.



Domain
15563 (com.asus.zenbohospitalservice)

Utterance
where is lobby

Corrected Sentence
where is lobby

Plan
hospitalApp

Output_Contexts
hospitalApp

Response
hello

Testing_domains
15563

BELIEF	VALUE
myVisitor	lobby

Figure 7.7 : DDE tester

7.0 CONCLUSION

In a nutshell, this Zenbo Hospital Application makes task easier for the user and the worker itself. It is relevant with our objectives, to assist the user about the direction in the hospital and to reduce the number of staff by using this application. This application is a user-friendly, which it provides two types of interaction by using speech recognition and buttons. Users can choose which type of interactions they are comfortable with. We also come out with simple interfaces so that it is easier for users to understand and make decisions. This application is defined to give more benefits to the users and the workers especially in giving directions.