Smart Device for Visually Impaired People

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***Abstract*— The objective of this paper is to guide unsighted people with smart device using an Android Phone. This device is an innovative and cause effective guide system for Visually Impaired People (VIP). Blind people major problem is to navigate the outdoor region. Voice is the main of scope, allows you to control your phone using your voice. This system based on Android technology and designed for trying to solve the impossible situation that afflicts the blind people. The application helps the user to open any app as well as to call any contact through voice commands. Users can command a mobile device to do something via speech. These commands are then immediately interpreted by the Speech Recognition Engine(SRE) that converts speech into text for direct actions. This method also helps, when the VIP feels alone in a missing environment by allowing him to make a voice call to a known person. Apart from this, the system is added with a Selendroid app interface which enables the VIP to fetch the latest information from various web servers. The latest information retrieved by the Selendroid architecture includes live weather report, transport related information and news update.**

Keywords—Android; Visually Impaired People (VIP); Smart device; Indoor; Blind people; Selendroid; Speech Recognition Engine (SRE)

I. INTRODUCTION

With advances in new technology, the mobile devices have grown popularity to become one of the most usual and popular user devices. Even as these mechanisms are shrinking in size, however their capability and content is changing into more complex and device able to provide every user with a friendly interface. Voice interfaces are enough and barest method to replace the GUI for getting all content and information, since voice is the fundamental way through which the human communicate.

Selendroid drives the UI of native Android and its hybrid applications. It is written in Selenium 2 API. Web Driver API is also included in the Selendroid architecture which enables to handle various dynamic web pages in a better way. The speech recognizer is the heart of our system which is also called as the SRE. It converts audio stream into a text transcription. The build-in model of a recognizer helps in converting the acoustic speech into commands. The lexicon has a list of words, which helps in the conversion process.

VIP are the people with less or no ability to read. Voice interface will the necessary means for communication. In real time the mobile usage grows in an exponential manner, it is clear that our system provides an interactive solution for processing and memory capacity over time to become a very small and inexpensive and user friendly system. The goal of the paper is to describe how to develop and design a voice based application. This system will behave as one of the important and source means of communication tool to the technology world at the cheaper cost.

II. LITERATURE SURVEY

Jin-Hee Lee etal. [1] proposed a smart back pack system to guide the VIP to reach the home safely. The reception and transmission signal intensity are estimates using Zigbee modules. For deducting the obstacles and analyze the spatial environment, they have used an Ultrasonic sensor. Zewen Lee etal. [2] helps the VIP to reveal insight scene details using camera of a mobile device. The smart phone is used as a magnifier using digital Zoom. They have implemented an IOS mobile device by providing motion based stabilizing to overcome the jitter problem.

Varit Prudtipongpun etal. [3] has given a technique for the blind people to move across the indoor building. They also suggest a method to upload the floor plan to the Google maps. Further the Google maps help to guide for the safe environment. David Zhou [4] included a wearable module to guide the visually impaired to navigate easily the surroundings. It detects object upto 10 feet away using the smart sensors. This system gives user an audible announcement about the obstacles which is present in the front.

II Youn Chong etal. [5] presented a smart cane system which is coupled with the smart penhone to guide the blind while roaming. They have used Ultrasonic sensor to identify the obstacle and gyro sensor to prevent falls. Bluetooth v2.0 protocol is used to pair the smart phone and cane. Eduardo Ghidini etal. [6] proposed a smart electronic

calendar for VIPs. The calendar is useful in managing people, occurred in the past. Voice commands are used to open, manage and close the calendar. They have morophogical analyzer to interpret the command and to convert it into a action.

Hamza A. AlAbri etal. [7] have proposed a mobile assisted cane system, which helps the blind students to navigate from home to school and vice versa. QR code reader is used to identify the current location. Voice command is used to communicate with the system. Sagar V. Ramani etal. [8] provided an indoor navigation system to be used by the VIP in malls, hospital, museums etc.. The system leverages the sensing capabilities to 1.5 meters without any speech hardware. The RSSI values are used to find the location.

III. PROPOSED SYSTEM

Our proposed system enables blind people to handle the Android phone effectively. The blind people wanted to make use of the services like calling, getting notification of battery level, hearing music and to get latest updates on the Android phone. The proposed system in fig. 1. enables to obtain all the services through their voice command. The Selendroid enables the communication between smart phone and the various web servers.

It has the ability to identify the spoken languages and convert into machine understandable format. This is done by the SRE. The individual speaker input is read and isolated into vocabulary. This system performs an action that is usually performed by a normal person. The VIPs who need to use Android phone have to give their input through voice to the SRE through microphone or headset. The SRE converts the speech into text. The text is given as input to the command recognition module. The command is recognized and identified by using morphological analyzer. SRE output controls the dialler, music player, Selendroid architecture (SA) and Google maps.

The dialer manager gives the option of dial, hold, disconnect. The music manager include play, stop, pause, forward and rewind the music tracks. The battery notification is given when it indicates battery level is low to certain range i.e., 20%. Google maps are used by the system to retrieve the longitude and latitude of the VIPs and given to the concern person. The concern person is the known person of VIP. By making use of the coordinates, the concern person can easily identify the accurate position where the user will be present. Thus, it overcomes the scenario of missing situation to a minimal extent. After knowing the location, the concern person makes a call to the user to acknowledge the situation of missing scenario.

The services included the audio manager is list below

- Converts the battery level indication into speech,
- Connects the conern person to the VIP through dialler,
- Converts all Selendroid latest updates into speech and
- Helps in conveying dialler manager and music player status to VIP.

A. Working principles of selendroid

Selendroid in fig. 2. is framework to automate the test and also a testing tool. This server part runs on the device and is implementing the JSON Wire protocol for Android hybrid and native contexts. The framework to interact with the app under test is the Android Instrumentation framework. Characteristics of Selendroid are :

- It has the full adaptable with the JSON Protocol.
- Selendroid has no modified APP
- Using android drive app mobile web can be tested
- Same concepts are used for automating hybrid or native apps
- Gestures are supported: Advanced User Interactions API

The services provided by the SA are weather report, bus report and daily news. The weather report support given by the SA is temperature, relative humidity, dew point, atmospheric pressure, rainfall, wind speed and wind direction (http://59.99.240.81:8085 /liveweather/index.php). The MTC bus services provided by SA are fare list, no. of routes available, luggage list, concession fares, bus route timings etc.. (http://mtcbus.org/). The newspaper service includes current affairs, historical news, employment news, sciences news, political news, sports news, cinema news, etc…(http://www.thehindu.com/).

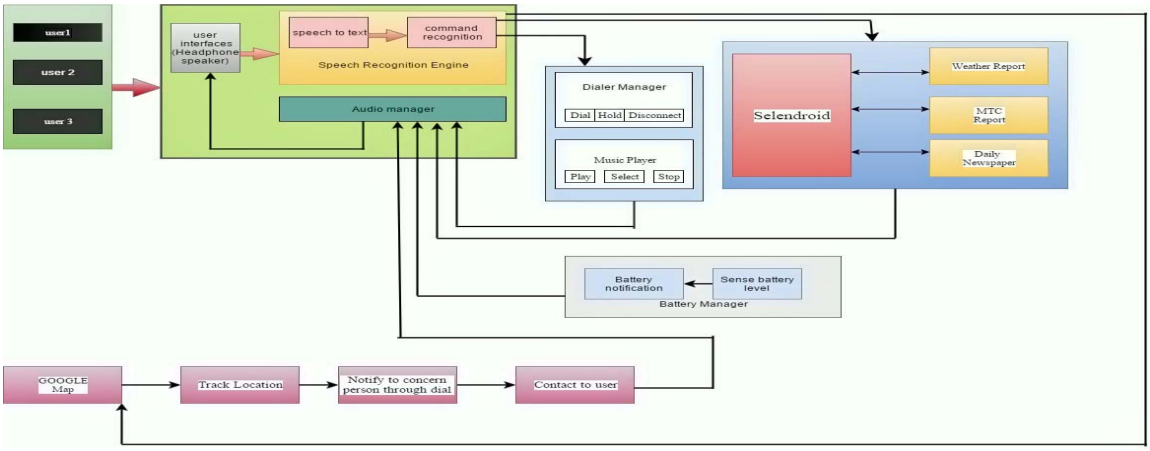

Fig. 1. Block diagram of Smart device.

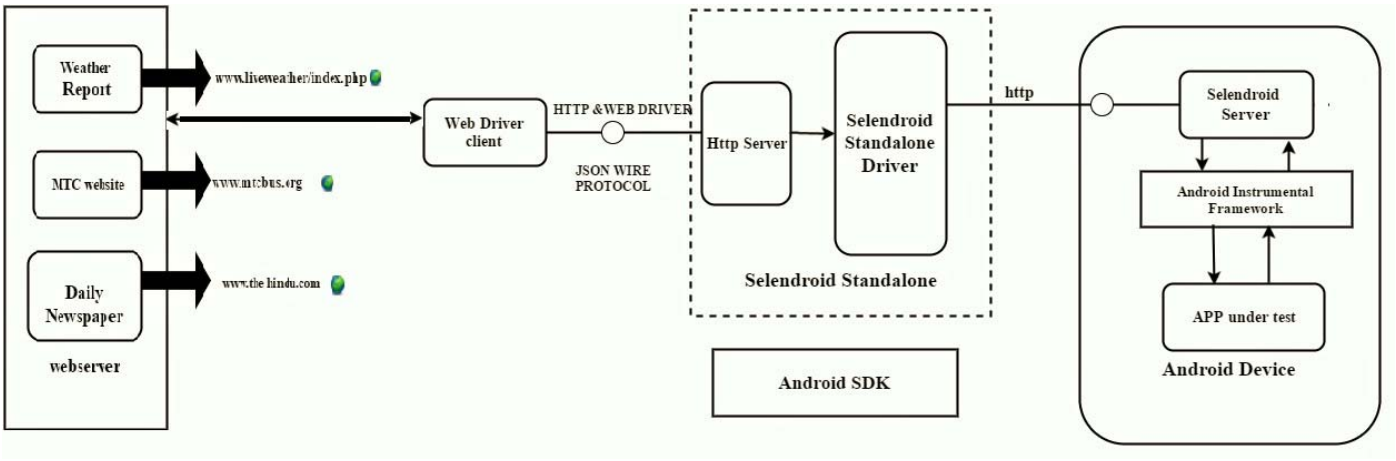

Fig. 2. Block diagram of Selendroid interfacing with various web servers.

IV. FLOWCHART

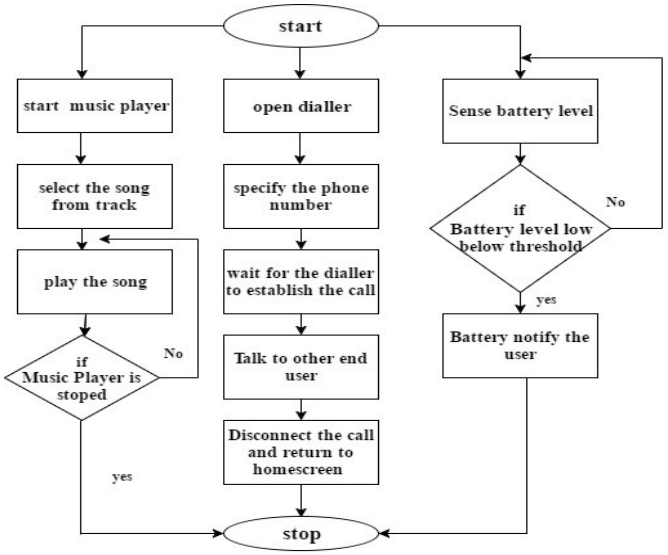

Fig. 3. Flow chart for work of smart device.

The above flow chart in fig. 3. represent about the flow of every step given by various apps installed in the smart phone of the VIP. First the user needs to give the command to open phone dialler. Next phone number is given to open a call. After the successful establishment of the connection, the conversation takes place. Once the conversation is over, the dialler disconnects the call. Second, the user has the option to hear the songs and musics. The VIP opens the media player to play the song through voice command. The next flow is battery notification, if the battery level goes below 20%, then notify the user as the battery is low. Then the user connects the charger to the power supply for recharge.

The below flow chart in fig. 4. represent about the flow of every step in location tracker. The user feels he is lost in an unknown situation and intimates to the concern person through SER over mobile phone voice command. It specifies the notification of the VIP situation to the concern person. The system notifies the concern person and also also acknowledge the VIP about the notification. The concern person makes a call to understand the situation.

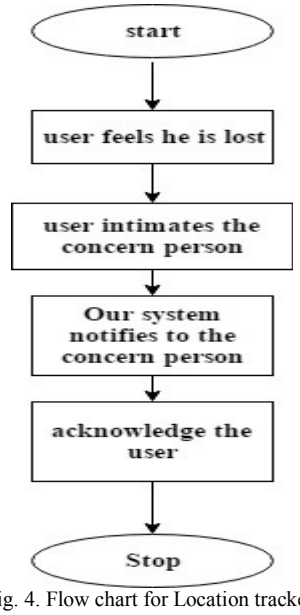

Fig. 4. Flow chart for Location tracker.

V. SOURCE CODE

A. Source code of Android APP

```
package com.batterycheck.Android;
import android.os.Bundle;
import android.app.Activity;
import android.content.BroadcastReceiver;
import android.content.Context;
import android.content.Intent;
import android.content.IntentFilter;
import android.widget.ProgressBar;
import android.widget.TextView;
public class BatteryCheckIndicatorActivity extends Activity
{
        private BroadcastReceiver mBatInfoRec1 = new
        BroadcastReceiver()
        {
                public void onReceive(Context c, Intent i)
                {
                        int lev1 = i.getIntExtra("level", 0);
                        ProgressBar pb1 = (ProgressBar)
                        findViewById(R.id.progressbar);
                         pb1.setProgress(lev1);
                        TextView tv1 = (TextView)
                        findViewById(R.id.textfield);
                        tv1.setText("Battery Level: " +
                        Integer.toString(lev1) + "%");
                }
          };
        public void onCreate(Bundle savedInstanceSt)
        {
                super.onCreate(savedInstanceSt);
                setContentView(R.layout.main);
                registerReceiver(mBatInfoReceiver, new
                IntentFilter(Intent.ACTION_BATTERY
                _CHANGED));
        }
}
```

A *BroadcastReceiver* it actually means as receiver. It allows you to register for application system or events. For example, applications can record for the *ACTION_BOOT_COMPLETED*. Due to his registration, a system related event which is triggered once the Android OS has completed the boot process. The function *startActivity( )* is used to launch an Activity, *bindService(Intent, ServiceConnection, int)* helps in communication between processes that runs in background or *broadcastIntent* to send it to any interested, *startService(Intent)* and *BroadcastReceiver* components.

Intent is a component that renders a facility to perform late runtime binding among the source codes in various applications. Its helps in launching of activities and acts a bridge between the activities. Intent holds the abstract description of an action in the form of passive data structure. *OnCreate( )* is used to start an activity. The keyword *super* is used to call the parent class constructor. The function *setContentView( )* is used to set the xml.

B. Source code of Selendroid

```
 Void  setUp( ) throws Exception
{
        SelendroidConfiguration conf1 = new
        SelendroidConfiguration( );
        config.addSupportedApp("WeatherApp.apk");
        SelendroidLauncher selendroidServer1 = new
                SelendroidLauncher(conf1);
        selendroidServer1.launchSelendroid( );
        SelendroidCapabilities cap1 = new
                SelendroidCapabilities(          );
        cap1.setAut("com.weatherapp:1.3");
        cap1.setPlatformVersion(DeviceTargetPlatform.
                ANDROID19);
        cap1.setEmulator(false);
        driver1 = new SelendroidDriver(cap);
        WebElement inputField1 =
                driver1.findElement(By.id("edtText"));
        Assert.assertEquals("true",
                inputField1.getAttribute("enabled"));
}
```

In Android phone, the Selendroid requires a permission to access the internet in the manifest file.

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

The command to run the selendroid standalone in command prompt is *java -jar selendroid-standalone-0.17.0-with-dependencies.jar -app selendroid-test-app-0.17.0.apk*. This starts the http server on the 444 port and scans all Android

Virtual Device (AVD) that is available. The constructor *SelendroidConfiguration( )* starts the Selendroid standalone for testing the app. The method *addSupportedApp( )* is used to contribute the test app to the standalone server. It is started after configuration using the method *launchSelendroid( )*. The method *setAut( )* is used to specify the test app. The Android device API version is specified by the method *setPlatformVersion( )*. The method *setEmulator(false)* turnoff the simulator and uses the real device. An instance of Selendroid driver is created using SelendroidDriver( ) constructor. The *inputField1* object retrieves the object of *edtText* field in the app page. The *getAttribute( )* is used to find whether the *edtText* field is enabled or disabled.

VI. INPUT AND OUTPUT

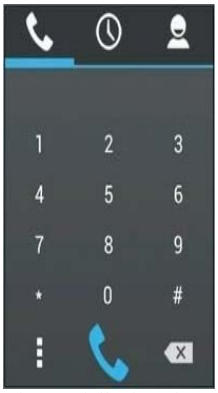

Fig. 6. Dialler interface.

Fig. 7. Music player interface.

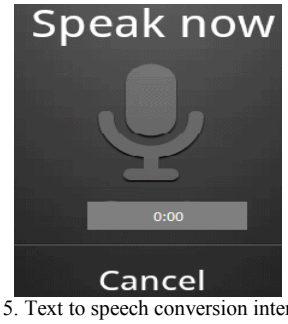

Fig. 5. Text to speech conversion interface.

The VIPs speech to text transformation interface is shown the figure. 5. The dialler interface enables the VIPs to make a call, pause a call and disconnect a call. Figure. 6. shows the dialler interface. The music player allows the user to play, stop and pause the music. Figure. 7. shows the music player interface. The current temperature, dew point, humidity, etc… are displayed in the weather report interface. Figure. 8. shows the weather report interface.

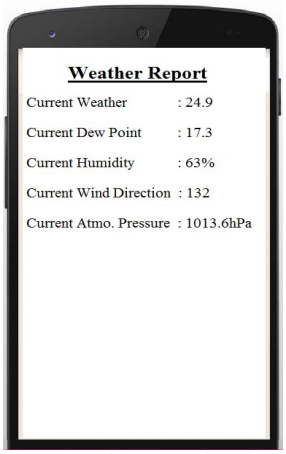

Fig. 8. Weather Report interface.

VII. CONCLUSION

By practically implementing smart device for VIP it provides a low expensive Android mobile to get recent information through Selendroid architecture. It is the effective way to know the latest news, bus routes and weather report. Using voice application the normal human can reveal themselves in various domains and so breadth of application will be an impressive tool in a Ubiquitous environment. The system also intimates the low level of the battery to the VIP, so that recharge can be done immediately. It also supplies a better way of handling the situation, when a person got lost in an unknown environment.

In future, when the mobile battery of VIP goes down below 10% i.e., critical level, the server must make an automatic voice call to the VIP known person to overcome the missing situation. Further, the system can be enhanced with Selendroid to support various e-services like Calendar, E-mail, Booking of Tickets etc..

VII. REFERENCES

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