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Smartphone Application: Indoor Navigation for visually challenged person.

Abhijeet Bisht
Roll No- 2014357
Enroll. No- GE-192014357
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It would also not have been possible without my family and friends for their support whenever I needed them. I came to know about a lot of things through this project and would like to thank each one of them.

Abhijeet Bisht

Roll no- 2014357

Graphic Era (Deemed University)

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Overview

The number of people with visual disabilities is around 135 million. For people with visual disabilities navigation in unfamiliar buildings is more difficult than outdoors, where mainly they rely on guide dogs and a cane. The main difficulties in the indoor navigation and orientation are : missing known landmarks, overcoming obstacles can be risky, not all the blind can read Braille tags, the price of the existing systems for indoor navigation does not match the purchasing power of the people with visual disabilities.
One of the major disadvantages of the existing indoor navigation systems for the blind is the high price of hardware part, which in most cases is not consistent with the income of blind people. The indoor navigation system for the blind is proposed, that ensures widespread use thanks to the integration of mobile phones from the middle price segments, Java technologies, and passive RFID tags.

Assisting visually impaired people in the use of the mobile device usually starts at the operating system level. Various additional features simplifying the access for users with a weaker sense of sight have been implemented. The set of system facilities is also expanded by external applications. Their developers often use the available application interface (API) in a creative way, and they come to interesting solutions. Visually disabled people who want to use mobile devices are not left without support. For many years Apple has held the first place in the challenge of the mobile accessibility. However, recent updates of the Android OS have reduced the distance between these two leading solutions.
Current mobile devices are very similar in terms of functionality, appearance, and method of control. The most popular mobile platforms (iOS and Android OS) implement innovative ideas like each other. They have almost identical set of features for visually impaired people, differing only in the quality of implementation. The user can find them in a special menu setting: Accessibility. Besides, disabled users can connect the Braille device via Bluetooth, which allows them to redirect the information from the smartphone or tablet on the device.
The support for visually disabled is much worse in the case of less popular mobile systems. High contrast mode, changing the size of icons, or zooming a part of the screen is not enough to present these systems as providing accessibility. Here, in this project I have used Android OS as a medium for creation of a separate application software which provides visually disabled person with enough power to at least have a helping hand when it comes to navigation

indoors whether it is inside a building such as a shopping complex, library, school/college building.

Motivation

Visual Impairment makes the person depend on another person for all his works and daily chores. Through the application proposed in the project, I aim to eliminate this dependency of a visually impaired person when navigating from one place to another inside a building. The main goal is to provide information regarding the current location, how much distance and time is required to reach the particular destination as well as provide the user with the directions and turns to be taken while travelling by providing continuous audio feedback in his understandable language.

Language and Version

Java JDK 15

eXtensible Markup Language v1.0

Android Studio v64

RoundMe External AR third party application for Navigation View

Goals

1. Using Android Studio to create an application that provides detailed navigation of an indoor building when entered inside it.

2. Select the space and travel through different layouts of the space when navigate through it.Also provide audio feedback of the options pressed in it.
3. Display detailed mapped clear view in Panorama form with options to navigate between views through touch or 3D gadgets.

Hardware and Software Requirements

Software Requirements-

Android Studio from https://developer.android.com/studio (Java IDE included).

AVD Manager for Device Selection

Creation of 3D view using https://www.roundme.com/

CMD (Command Prompt for Windows)

XML and Java libraries listed below-

xmlns:app="http://schemas.android.com/apk/res-auto"
xmlns:tools="http://schemas.android.com/tools"

android.content.Intent;
android.net.Uri;
android.os.Bundle;
android.widget.Button

API for URLs imposed on Buttons in the application.

Hardware Requirements-

A working online computer system.

Minimum Requirements-

Intel Core i5 or equivalent.

Minimum of 100 GB Control Drive Hard Disk free.

Data

The use of navigation apps has been extensive in the past decade. Whether it be while driving in the city or travelling through the different cities, navigation apps have been a backbone of our travelling department. One such app is this one which on the upper hand works on navigation inside a closed building(in this case inside the college campus. The app here is build to provide a mapped view of the inside of our college campus with the ability to see a detailed 360 view of the college interiors, helping avoid barriers in the way and also provide a form of audio feedback when touched a button. The following snippets are of the XML and JAVA codes that build the UI of the application.

activity_main.xml | MainActivity.java

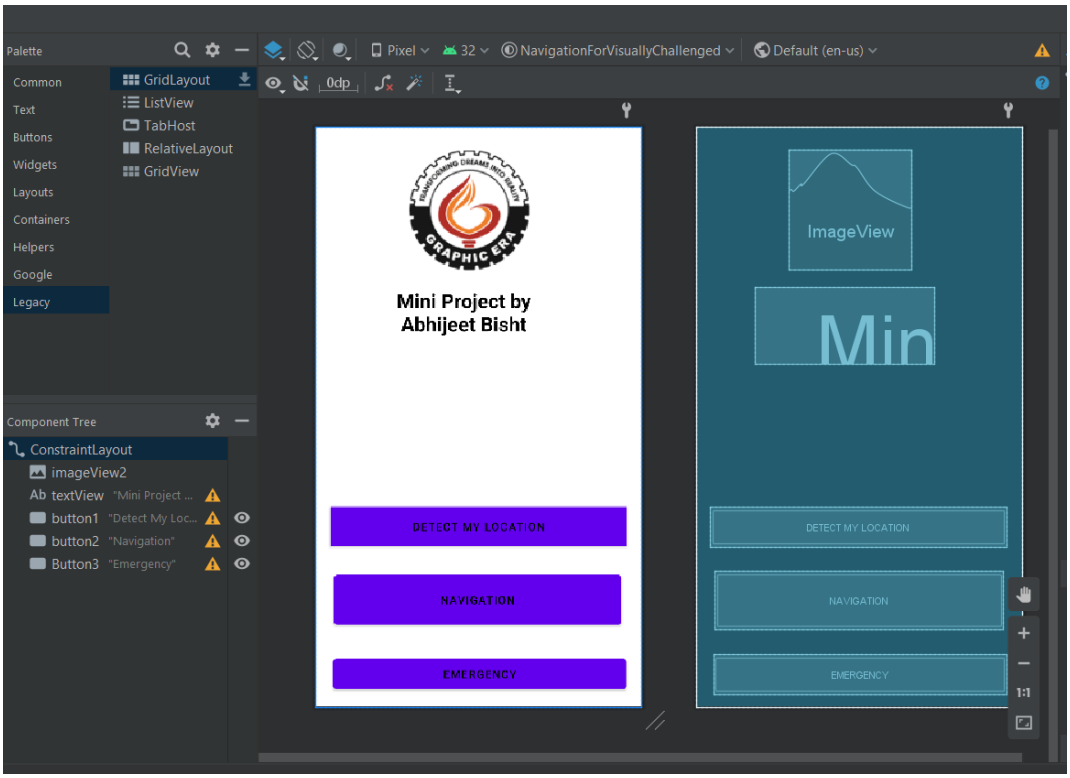
```java
package com.example.navigationforvisuallychallenged;

import ...

public class MainActivity extends AppCompatActivity {

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
    }

    public void goToUrl(View view) {
        String url = "https://roundme.com/tour/793627/edit/2504645/";
        Uri uriUrl = Uri.parse(url);
        Intent launchBrowser = new Intent(Intent.ACTION_VIEW, uriUrl);
        startActivity(launchBrowser);
    }
    public void goToUrl2(View view) {
        String url = "https://translate.google.com";
        Uri uriUrl = Uri.parse(url);
        Intent launchBrowser = new Intent(Intent.ACTION_VIEW, uriUrl);
        startActivity(launchBrowser);}
    }
```

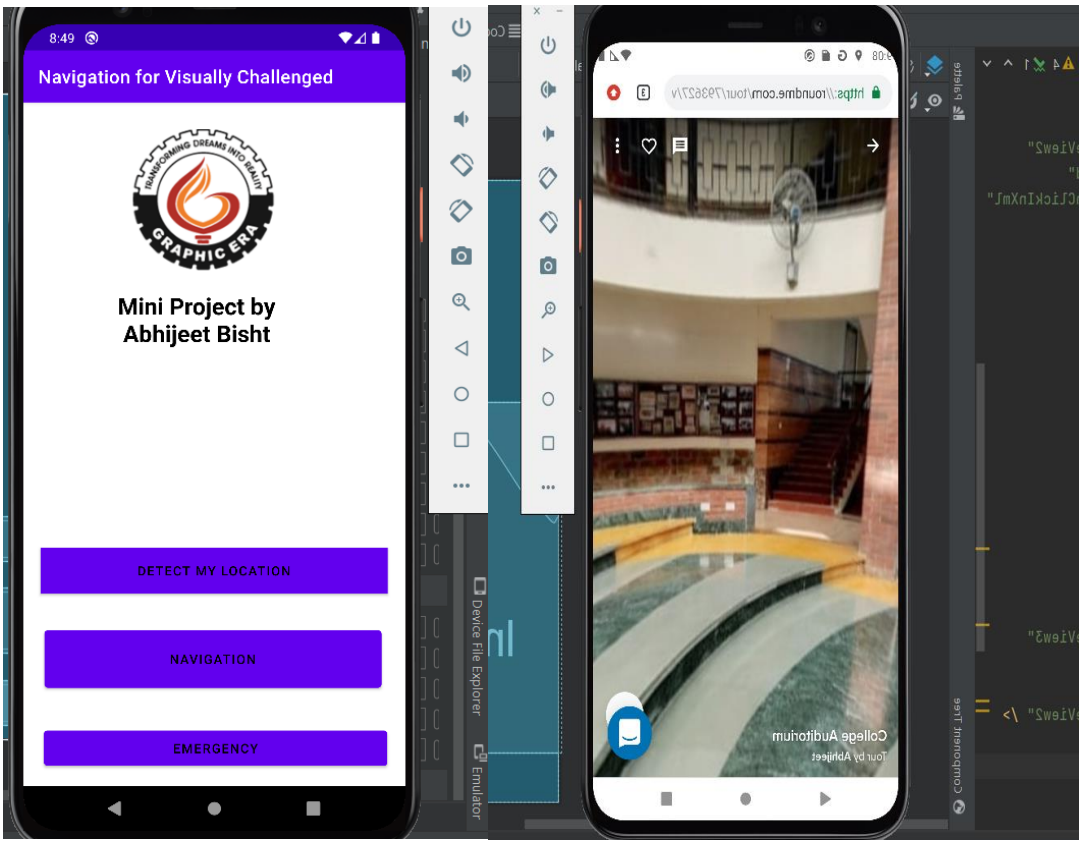
XML Input

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".MainActivity">
    <ImageView
        android:id="@+id/imageView2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="117dp"
        android:layout_marginTop="29dp"
        android:layout_marginEnd="139dp"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:srcCompat="@drawable/geu"
        android:contentDescription="TODO"
        tools:ignore="ContentDescription,HardcodedText" />
    <ImageView
        android:id="@+id/imageView3"
        android:layout_width="421dp"
        android:layout_height="413dp"
        android:layout_marginTop="80dp"
        android:layout_marginBottom="57dp"
        android:clickable="true"
        android:onClick="goToUrl"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/imageView2"
        app:srcCompat="@drawable/ic_launcher_background"
        tools:ignore="SpeakableTextPresentCheck,UsingOnClickInXml"
        android:focusable="true"
        android:contentDescription="@string/todo" />
    <TextView
        android:id="@+id/textView"
        android:layout_width="138dp"
        android:layout_height="40dp"
```

```
android:layout_marginStart="158dp"
android:layout_marginTop="21dp"
android:layout_marginEnd="141dp"
android:layout_marginBottom="26dp"
android:linksClickable="true"
android:text="Abhijeet Bisht"
android:textColor="@color/black"
android:textStyle="bold"
app:layout_constraintBottom_toTopOf="@+id/imageView3"
app:layout_constraintEnd_toEndOf="parent"
app:layout_constraintStart_toStartOf="parent"
app:layout_constraintTop_toBottomOf="@+id/imageView2" />
```

Results





Conclusion

The project shows the importance of navigation inside the building for a person with visual complexities and lack of help can often leave the person unattended, confused and in fear to step inside a building. The following application software helps the person to at least get a 3D view of where the person is stepping in and providing the person with enough help to travel solely on their basis. This application also demonstrates the use of Android Studio and third party 3D view providing software and how a combination of them can create an application like this to help people travel inside the building easily.

Disadvantages

The application is still under construction, so it lacks few features like Haptic feedback, motion tracking through 3D model and variety of spaced for travelling.

It lacks creating a hotspot model and uploading different paid services which I will improve the app and make it a fully functional application.

Resources

These are the different resources that helped me for the completion of the project.

[1] Bigham, JP; Cavender, AC; Brudvik, JT; Wobbrock, JO; Ladner, RE.

[2] Mankoff, Jennifer; Fait, Holly; Tran, Tu. Is your web page accessible? A comparative study of methods for assessing web page accessibility for the Computing Systems, 41-50, 2005.

[3] An Android GPS Based Navigation Application For Blind.

[4] http://disabilityaffairs.gov.in/content/

[5] Working with RoundMe Panorama Viewer for 3D viewing or for VR Headsets.

[6] College website's 360 degree feature for photo credit