

Design and implementation of Voice Based Path Planning System for Airborne Vehicles

*A B. Tech Project Report Submitted
in Partial Fulfillment of the Requirements
for the Degree of*

Bachelor of Technology

by

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(170101043)

under the guidance of

Prof. Pradip K. Das



to the

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
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CERTIFICATE

*This is to certify that the work contained in this thesis entitled “**Design and implementation of Voice Based Path Planning System for Airborne Vehicles**” is a bonafide work of **Partha Pratim Malakar** (**Roll No. 170101043**), carried out in the Department of Computer Science and Engineering, Indian Institute of Technology, Guwahati under my supervision and that it has not been submitted elsewhere for a degree.*

Supervisor: **Prof. Pradip K. Das**

Professor,

April, 2021

Guwahati.

Department of Computer Science & Engineering,
Indian Institute of Technology Guwahati, Assam.

Acknowledgements

I would like to show my gratitude to my supervisor, **Prof. Pradip K. Das**, and my mentors **Komal Bharti**, Ph.D. scholar Computer Science Department IIT Guwahati and **Vanshali Sharma**, Ph.D. scholar Computer Science Department IIT Guwahati, for their support throughout this project. I am very thankful to them for their guidance which helped me to learn new things and complete my BTP work. I am grateful for their valuable time and constant efforts for helping me out in some critical problems in my BTP work.

Sincerely,

Partha Pratim Malakar

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Chapter 1

Introduction

We are building a software tool to implement path planning for airborne vehicles using voice commands. This software will be used in different airborne vehicles. Our aim is to build a software which can be operated using voice command i.e handsfree, has a menu-based GUI and runs faster to make the path planning easier for pilots. My job is to design the interface of the application. This semester I implement speech recognition, speech synthesis, extracting data and coordinates from google map, placing google map in visual studio application and drawing objects on map in visual C++ language.

1.1 Organization of The Report

This chapter provides an introduction to the application and the work I did in this semester.

Chapter 2 presents the work from the previous semester.

Chapter 3 explains implementation of speech recognition and synthesis in visual studio.

Chapter 4 explains how to extract coordinates data from google map and read those data.

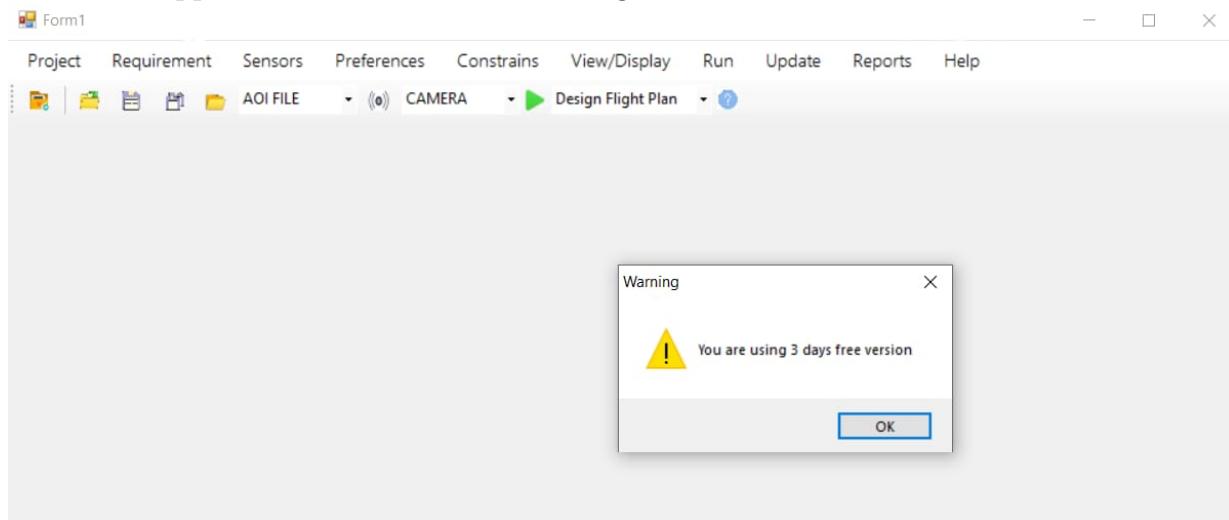
Chapter 5 explains how to scale coordinates data so that they fits in visual studio windows form application

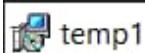
chapter 6 explain methods of placing google map in visual studio and drawing objects on it.

Chapter 2

Review of Prior Works

In the last semester I build the front-end GUI structure of the application in visual C++. I added all the features in list as menu and menuitems. I used ‘toolStrip’ for creating the menu and used ‘toolStripMenuItems’ for creating the menu item. I also created a setup file for the application and added a license agreement with it.





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Chapter 3

Speech Recognition and Synthesis

3.1 Implementing Speech recognition in visual studio

I implement speech recognition in visual studio windows form application in visual c++ language.

3.1.1 Issues faced while implementing voice recognition

- Voice recognition is not very accurate. Because everyone speaks differently and speech features are more recognizable for the US based english language. Therefore, for better recognition we have to do voice training in windows.
- Even after voice training, sometimes words are misrecognized. Therefore I made the application to recognize some specific words and sentences and do not recognize if anything else is spoken. This also makes the application more efficient to listen to those specific commands.
- There were few tutorials available for speech recognition in Visual C++. So, it took me a long time to implement.

3.1.2 Implementation steps

1. In visual studio right click the project, go to reference, then click add new reference and add reference to system.speech.
2. Add the following namespaces in the windows form code

```
using namespace System::Speech::Synthesis;
using namespace System::Speech::Recognition;
```

3. In the form onload function add the following code

```
SpeechRecognitionEngine^ recognizer ;
recognizer=gcnew SpeechRecognitionEngine();
/*For creating grammar for sentence1*/

String^ mysentence="Hello I am Partha";//sentence 1
Grammar^ myGrammar= gcnew Grammar(gcnew GrammarBuilder(mysentence));
recognizer->LoadGrammar(myGrammar);
/*creating grammar for sentence 2*/

String^ mysentence2="Exit the application";//sentence 2
Grammar^ myGrammar2= gcnew Grammar(gcnew GrammarBuilder(mysentence2));
recognizer->LoadGrammar(myGrammar2);

/*We can create and load Grammer for multiple sentences in the same way*/

recognizer->SetInputToDefaultAudioDevice();
recognizer->RecognizeAsync(RecognizeMode::Multiple);
recognizer->SpeechRecognized+=gcnew System::EventHandler<SpeechRecognizedEventArgs ^>(this, &Form1::GetSpeech);
```

4. Create a function GetSpeech in the same form class. When recognizer recognizes any grammar or sentence(sentence1 or sentence 2), the recognizer consider it as a event.

And when that event happens, GetSpeech function will be called

```
private: System::Void GetSpeech(System::Object^ sender, SpeechRecognizedEventArgs^ e)
{
    |
    |   textBox1->Text= e->Result->Text;
    /*e->Result->Text is the recognized text*/
    |
}
```

3.2 Implementing Speech synthesis in visual studio

I also implemented text to speech in the application. Implementing text to speech is easier than speech recognition.

3.2.1 Implementation steps

1. Add reference to system speech.
2. Add the following namespace in the windows form code

```
using namespace System::Speech::Synthesis;  
using namespace System::Speech::Recognition;
```

3. Create a SpeechSynthesizer variable inside the form class

```
private:SpeechSynthesizer^ synth;
```

4. Inside the form onload function add the following lines

```
synth=gcnew SpeechSynthesizer();
```

5. To convert text to speech add

```
synth->Speak(" Any string or String^");
```

Chapter 4

Extracting and reading data from Google map

As a need of our final product I had to extract some points and their from google map.I used google earth pro desktop application for this purpose.Besides different advanced features, google earth pro allows us to extract coordinates as collections of points, as a path or as a polygon.These datas are save in .kml or .kmz file. For creating test data, I made a path around iitg border coordinates and saved it as .kml file. The structure of kml type file is like xml. Reading kml file is hard using the common file reading technique and I only needed the data under <coordinate></coordinate>. Therefore to avoid complexities and unwanted errors, I used xml reader to read .kml type file. It reads the tag as ‘XmlNodeType::Element’ and the data between a start tag and end tag as ‘XmlNodeType::Text’. I stored the data under <coordinate></coordinate>as a string and split the string to get the X,Y coordinates of the points.

A sample .kml file

```

<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://www.opengis.net/kml/2.2" xmlns:gx="http://www.google.com/kml/ext/2.2" xmlns:kml="http://www.opengis.net/kml/2.2" xmlns:atom="http://www.w3.org/2005/Atom">
<Document>
    <name>iitPolygon.kml</name>
    <StyleMap id="m_ylw-pushpin2">
        <Pair>
            <key>normal</key>
            <styleUrl>#s_ylw-pushpin2</styleUrl>
        </Pair>
        <Pair>
            <key>highlight</key>
            <styleUrl>#s_ylw-pushpin_hl2</styleUrl>
        </Pair>
    </StyleMap>
    <Style id="s_ylw-pushpin_hl2">
        <IconStyle>
            <scale>1.3</scale>
            <Icon>
                <href>http://maps.google.com/mapfiles/kml/pushpin/ylw-pushpin.png</href>
            </Icon>
            <hotSpot x="20" y="2" xunits="pixels" yunits="pixels"/>
        </IconStyle>
    </Style>
    <Style id="s_ylw-pushpin2">
        <IconStyle>
            <scale>1.1</scale>
            <Icon>
                <href>http://maps.google.com/mapfiles/kml/pushpin/ylw-pushpin.png</href>
            </Icon>
            <hotSpot x="20" y="2" xunits="pixels" yunits="pixels"/>
        </IconStyle>
    </Style>
</Document>
<Placemark>
    <name>iitPolygon</name>
    <styleUrl>#m_ylw-pushpin2</styleUrl>
    <LineString>
        <tesselate>1</tesselate>
        <coordinates>
            91.69224993220115,26.18404837908317,0 91.69244109712824,26.18413346042097,0
            91.69264970304681,26.18430515663465,0 91.69297334081791,26.1842814354464,0
            91.69434533439403,26.18444978359543,0 91.6947720597376,26.1844263510828,0
            91.69617399526659,26.18321718168159,0 91.69829682229999,26.18407203179709,0
            91.70101651752898,26.18509701471491,0 91.70101721802399,26.18587730951125,0
            91.70076311923131,26.18711833200602,0 91.70273130955839,26.18820646854189,0
            91.70429351758246,26.18896978641304,0 91.70382359041363,26.19055157121243,0
            91.70332925283657,26.19158962666206,0 91.70289862528375,26.19376242671766,0
            91.70267965774109,26.19788719830624,0 91.70061894560871,26.19691954181756,0
            91.69886078120744,26.19627312490485,0 91.69768216483214,26.19725515436802,0
            91.697547710859,26.19984608068036,0 91.69743950898338,26.20166320341402,0
            91.69136792958952,26.20065070105358,0 91.68947762426137,26.19871922712344,0
            91.68771152257756,26.19787163847593,0 91.68730685274595,26.19612349356576,0
            91.6883243188279,26.1954990381744,0 91.68749869083032,26.19542953324231,0
            91.68706128602967,26.19389491337337,0 91.68668361763875,26.19169860066337,0
            91.68684295935833,26.18987866108632,0 91.68746068520193,26.18894040064047,0
            91.68843482904576,26.18844833465499,0 91.68824503288381,26.1876704513493,0
            91.68880511623931,26.18749971378285,0 91.68835940548348,26.18463912466619,0
            91.6891154021298,26.18436535199852,0 91.68919859071075,26.18401810447994,0
            91.68891174784477,26.1833354739076,0 91.689382572022313,26.18287746698505,0
            91.69091539554796,26.18279002327086,0 91.69097644955265,26.18255389174641,0
            91.69214571033001,26.18257920113964,0 91.69223612949169,26.18394449103461,0
        </coordinates>
    </LineString>
</Placemark>
</Document>
</kml>

```

Coordinate of a single Point

4.1 Implementation

1. Declare the following variables in the form class

```
/*variable to store no of coordinate points*/
int point_count;
/*arrays to store x and y coordinate*/
array<double> ^ Arrx;
array<double> ^ Arry;
```

2. Code to read and store data from .kml file

```
1 XmlTextReader ^ reader = gcnew XmlTextReader("Path to .kml file");
2 while (reader->Read())
3 {
4     String ^ s1;
5     switch (reader->NodeType)
6     {
7
8         case XmlNodeType::Element: // The node is an element of tag.
9             s1 = reader->Name;      //save the tag name
10            break;
11        case XmlNodeType::Text:    //Text between start tag and end tag
12            if (s1 == "coordinates") //if the tag is coordinate
13            {
14                String ^ str = reader->Value; //then get the data and store in string
15                /*Coordinates of differnt points are separated by a space
16                 so split the string into string array*/
17                array<String ^> ^ StringArray = str->Split(' ');
18                for each (String ^ temp in StringArray)
19                {
20                    if (temp[0] == ' ' || temp == "" || temp[0] == '\t') //If the data is empty,then break;
21                        break;
22                    if (sizeof(temp) == 0)
23                        break;
24                    array<String ^> ^ StringArray1 = temp->Split(',');
25                    int count = 0;
26                    for each (String ^ temp1 in StringArray1) //check 3 values (x,y,z) are present in a coordinate
27                    {
28                        count++;
29                    }
30                    if (count < 3)
31                        break;
32                    double dub;
```

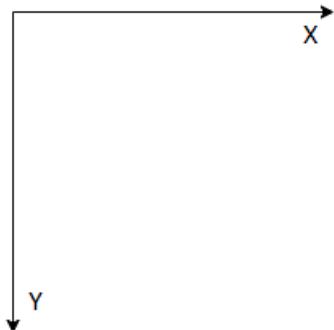
```
33     /*
34      StringArray1[0]=X coordinate
35      StringArray[1]=Y coordinate
36      */
37      dub = Convert::.ToDouble(StringArray1[0]); /*converting to double andd stroing x coordinate*/
38      /*Arrx is a double array to store x coordinate of points*/
39      /*point_count is a integer variable to store no of points*/
40      Arrx[point_count] = dub;
41      /*converting to double andd stroing y coordinate*/
42      dub = Convert::.ToDouble(StringArray1[1]);
43      /*Arrx is a double array to store x coordinate of points*/
44      Arry[point_count] = dub;
45      point_count += 1;
46    }
47  }
48 break;
49 }
50 }
```

Chapter 5

Scaling coordinates and drawing

5.1 Conversion from cartesian coordinate system

Google map and visual studio uses the following coordinate system:



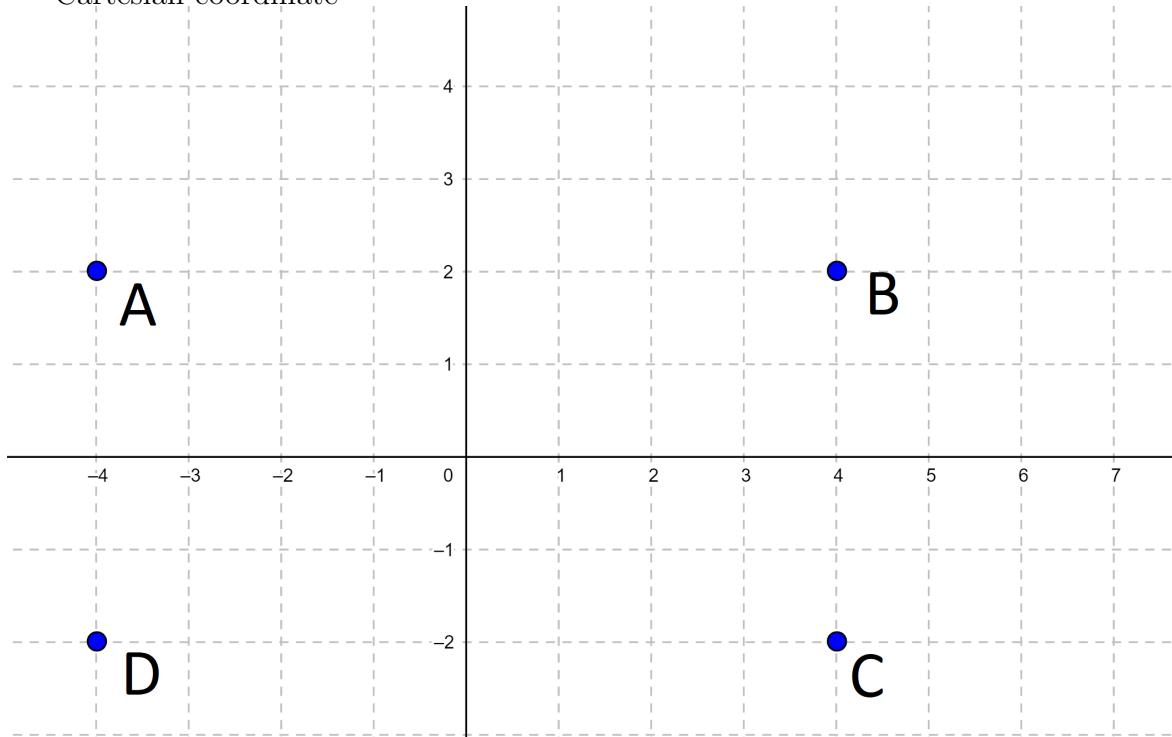
So points given in the cartesian coordinate system should be converted to this coordinate system.

Let $P(x,y)$ is a point in cartesian plane then in visual studio window the point will be $Q(X_{new},Y_{new})$ where

$$X_{new} = ()windowsformwidth + x$$

$$Y_{new} = ()windowsformheight - y$$

Cartesian coordinate



Visual studio window (assuming windows form width=10, windows form height=10)



5.2 Scaling coordinates to windows from size limlit

For points from google map. X coordinate ranges from -180 to 180 and y coordinate ranges from -180 to 180. So to scale a set of points to visual studio window range I used the following formulas —

$$xdiff = \text{maximum value of } x\text{ coordinate} - \text{minimum value of } x\text{ coordinate}$$

$$ydiff = \text{maximum value of } y\text{ coordinate} - \text{minimum value of } y\text{ coordinate}$$

$P(x,y)$ is a given point. In visual studio window coordinate of P will be,
 $P'(X_{\text{new}}, Y_{\text{new}})$ where

$$X_{\text{new}} = \frac{(x - \text{minimum value of } x\text{ coordinate}) \times \text{formwidth}}{xdiff}$$

$$Y_{\text{new}} = \frac{(y - \text{minimum value of } y\text{ coordinate}) \times \text{formheight}}{ydiff}$$

5.3 Drawing in visual studio

To draw in visual studio windows form:

1. Add the following variables in the windows form class

```
private:  
array<Point>^ local;  
Graphics^ pg;  
Pen^ pen1;
```

2. Initialize the variables in form onload function

```
pg = CreateGraphics();  
pen1 = gcnew Pen(Color::Red);  
local = gcnew array<Point>(point_count);
```

3. Read data, count the number of points and store the points in the point (local) array.
4. Draw objects using the following code

```
/*To draw polygon*/
pg->DrawPolygon(pen1, local); //local is array<Point>^
/*To draw rectangle*/
pg->DrawRectangle(pen1, x_coordinate_of_top_left_point, y_coordinate_of_topleft_point, width, height);
/*To draw a circle in vs*/
pg->DrawEllipse(pen1, x_coordinate_of_center, y_coordinate_of_center, diameter, diameter);
```

Chapter 6

Placing google map in visual studio and drawing on it

I used google map in my visual studio application. Visual studio uses ‘webbrowser’ from toolbox to open urls or HTML files. By default ,visual studio ‘webbrowser’ uses Internet Explorer.

6.1 Implementation Steps

We can open google map in visual studio in the following ways.

6.1.1 Using google map url directly in webbrowser

```
webbrowser->Navigate(google map url)
```

Here webbrowser open the url in Internet Explorer.But the Google map does not work properly with IE. So,the map appears with 2 errors—

- Script error –a window pop up automatically with some error message time to time.
- IE compatibility view error.

Also sometimes the map does not load properly.

The only solution I found till now is just close the error window and ignore the error.

6.1.2 using HTML files

Place the google map url in a separate html file and open the html file in ‘webbrowser’.

By using another html file, we can open microsoft edge in ‘webbrowser’.(By default ,visual studio webbrowser uses IE). This can be done in 2 ways —

- Using api key

I tried this approach by making a api key and adding the map url in html file with the api key, but the api key didn’t work properly. I also tried by opening the html file in other browser (chrome and firefox) but the same api key error appears. Code sample—

```
<!DOCTYPE html>
<html>
<head>
<title>Simple Map</title>
<meta http-equiv="X-UA-Compatible" content="IE=edge" >
<script src="https://polyfill.io/v3/polyfill.min.js?features=default"></script>
<style type="text/css">
    /* Always set the map height explicitly to define the size of the div
     * element that contains the map. */
    #map {
        height: 100%;
    }

    /* Optional: Makes the sample page fill the window. */
    html,
    body {
        height: 100%;
        margin: 0;
        padding: 0;
    }
</style>
<script>
    let map;

    function initMap() {
        map = new google.maps.Map(document.getElementById("map"), {
            center: { lat: -34.397, lng: 150.644 },
            zoom: 8,
        });
    }
</script>
</head>
<body>
    <div id="map"></div>

    <!-- Async script executes immediately and must be after any DOM elements used in callback. -->
    <script
        src="https://maps.googleapis.com/maps/api/js?key=Your_api_key&callback=initMap&libraries=&v=weekly"
        async defer
    ></script>
</body>
</html>
```

- Without api key

Search for any location in google map. Click the share option ,then embed the location html code in the html file. The only problem with this approach is, a red marked appears on that location. Sample code

```
<!DOCTYPE html>
<html>
<head>
    <meta charset="utf-8">
    <title>Customize the scroll-bar</title>
    <meta http-equiv="X-UA-Compatible" content="IE=edge" >
    <style media="screen">
        .container {
            position: relative;
            width: 100%;
            height: 0;
            padding-bottom: 56.25%;
        }
        .map {
            position: absolute;
            top: 0;
            left: 0;
            width: 100%;
            height: 100%;
        }
    </style>
</head>

<body>
    <div class="container">
        <!-- Google Map Copied Code -->
        <iframe src="https://www.google.com/maps/embed?pb=!1m18!1m12!1m3!1d1475.0149239952907!2d91.69559362336979!3d26.183953939411385!2m3!1f0!2m3!1e0!3f0!3m2!1i1000!2i500!4f13.1!3m1!1s0x30aef3a0a000000:0x1c45a3a0a000000!4m5!3m4!1s0x30aef3a0a000000:0x1c45a3a0a000000!8m2!3d26.183953939411385!4d91.69559362336979" allowfullscreen class="map" loading="lazy"></iframe>
    </div>
</body>
</html>
```

6.2 drawing above google map

To draw over google map, I used 2 windows form. In one windows form I showed the google map. In the other one, I drew the objects and made the windows form transparent. Then I placed it over the windows form that has google map.

Chapter 7

Conclusion and Future Work

7.1 Conclusion

In this report, implementation some features of our application ”a voiced based path planning system for aerial vehicle” is given. My work in this project is to design the GUI and interface. I implemented the voice recognition feature and therefore now the application can be run handsfree. I also placed the google map in the application and implemented drawing on it so that the aerial vehicle paths can be shown over the map. I also implemented scaling of google map point so that the points lies in visual studio window and can be shown above the google map.

7.2 Future work

The application is being developed. The future work is to add the algorithms which will be used to design the flight paths. The algorithms will design the path in real time and will be optimized so that running time becomes as low as possible. As the software is going to be used in real world, necessary testing will also be done. Finally, the software will be deployed. We will also keep track of licensed users of the software.

report

by Partha MALAKAR

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INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI

GUWAHATI - 781039, ASSAM

CERTIFICATE

*This is to certify that the work contained in this thesis entitled “**Design and implementation of Voice Based Path Planning System for Airborne Vehicles** ” is
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Supervisor: **Prof. Pradip K. Das**

Article Error 

 Professor,

April, 2021

Department of Computer Science & Engineering,

Guwahati.

Indian Institute of Technology Guwahati, Assam.

Acknowledgements

I would like to show my gratitude to my supervisor, Prof. Pradip K. Das, and my mentors Komal Bharti, Ph.D. scholar Computer Science Department IIT Guwahati and Vanshali Sharma, Ph.D. scholar Computer Science Department IIT Guwahati, for their support throughout this project. I am very thankful to them for their guidance which helped me to learn new things and complete my BTP work. I am grateful for their valuable time and constant efforts for helping me out in some critical problems in my BTP work.

Prep. (ETS)

Sincerely,

Partha Pratim Malakar

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Chapter 1

Introduction

We are building a software tool to implement path planning for airborne vehicles using voice commands. This software will be used in different airborne vehicles. Our aim is to build a software which can be operated using voice command i.e handsfree, has a menu-based GUI and runs faster to make the path planning easier for pilots. My job is to design the interface of the application. This semester I implement speech recognition, speech synthesis, extracting data and coordinates from google map, placing google map in visual studio application and drawing objects on map in visual C++ language.

1.1 Organization of The Report

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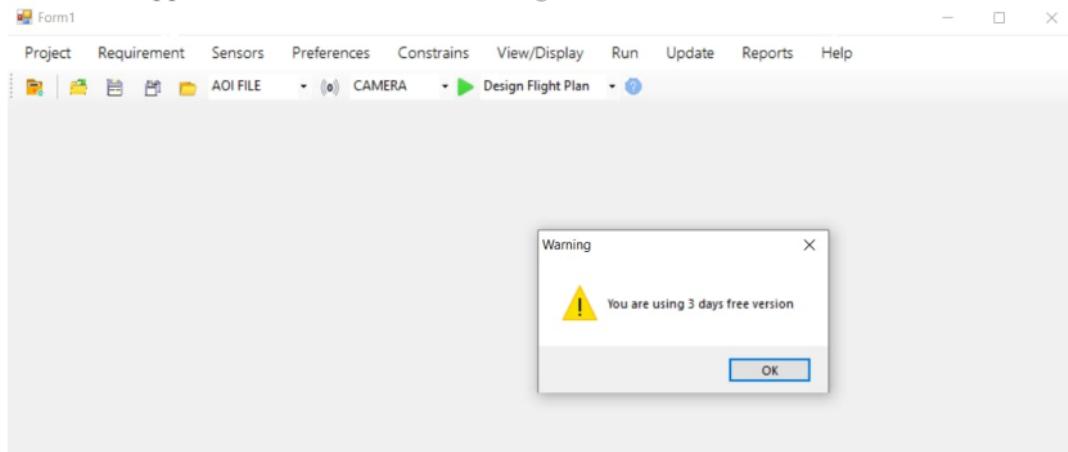
Chapter 5 explains how to scale coordinates data so that they fit in visual studio windows form application

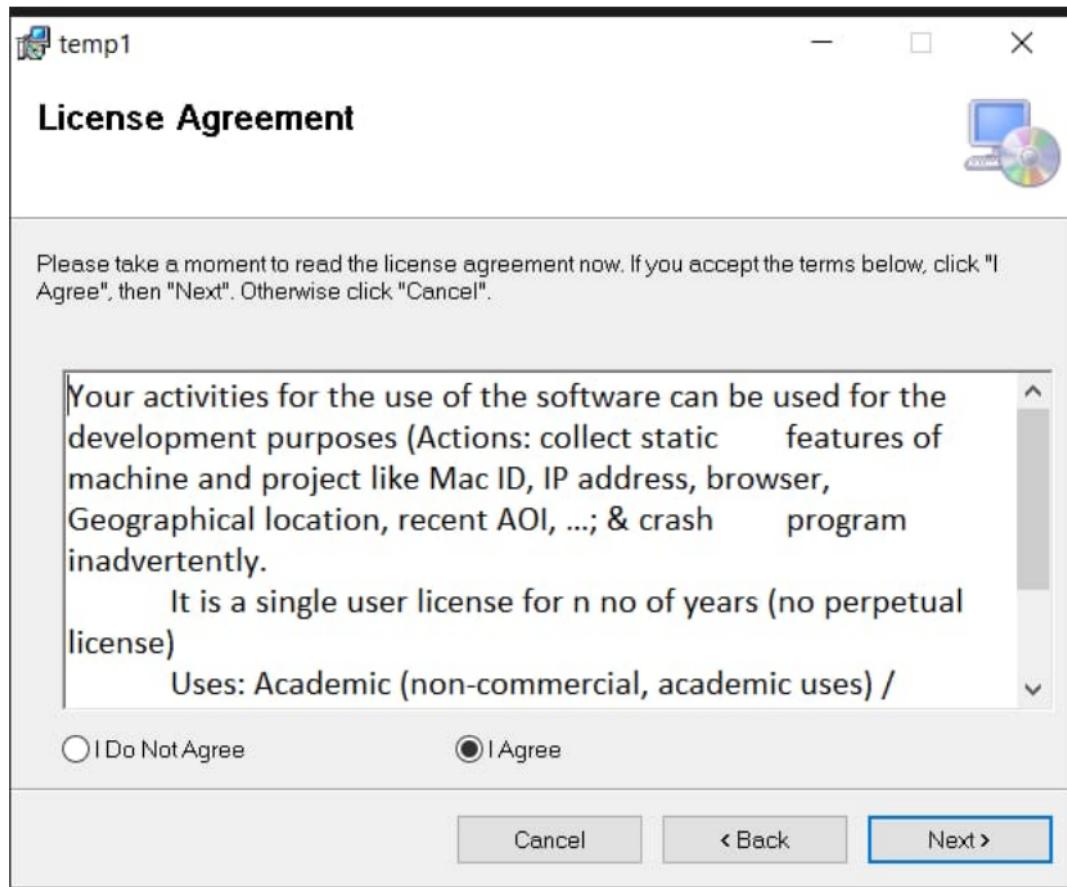
chapter 6 explain methods of placing google map in visual studio and drawing objects on it.

Chapter 2

Review of Prior Works

In the last semester I build the front-end GUI structure of the application in visual C++. I added all the features in lists as menu and menuitems. I used ‘toolStrip’ for creating the menu and used ‘toolStripMenuItems’ for creating the menu item. I also created a setup file for the application and added a license agreement with it.





Chapter 3

Speech Recognition and Synthesis

Sp. (ETS)

3.1 Implementing Speech recognition in visual studio

Article Error (ETS)

I implement speech recognition in visual studio windows form application in visual c++ language.

Article Error (ETS)

3.1.1 Issues faced while implementing voice recognition

- Voice recognition is not very accurate.Because everyone speaks differently and speech features are more recognizable for the US based english language. Therefore, for better recognition we have to do voice training in windows.
- Even after voice training, sometimes words are misrecognized. Therefore I made the application to recognize some specific words and sentences and do not recognize if anything else is spoken. This also makes the application more efficient to listen to those specific commands.
- There were few tutorials available for speech recognition in Visual C++.So, it took me a long time to implement.

3.1.2 Implementation steps

1. In visual studio right click the project, go to reference, then click add new reference
Article Error (ETS) Verb (ETS)

and add reference to system::speech.

Garbled (ETS)

2. Add the following namespaces in the windows form code

```
using namespace System::Speech::Synthesis;
using namespace System::Speech::Recognition;
```

3. In the form onload function add the following code

```
SpeechRecognitionEngine^ recognizer ;
recognizer=gcnew SpeechRecognitionEngine();
/*For creating grammar for sentence1*/

String^ mysentence="Hello I am Partha";//sentence 1
Grammar^ myGrammar= gcnew Grammar(gcnew GrammarBuilder(mysentence));
recognizer->LoadGrammar(myGrammar);
/*creating grammar for sentence 2*/

String^ mysentence2="Exit the application";//sentence 2
Grammar^ myGrammar2= gcnew Grammar(gcnew GrammarBuilder(mysentence2));
recognizer->LoadGrammar(myGrammar2);

/*We can create and load Grammer for multiple sentences in the same way*/

recognizer->SetInputToDefaultAudioDevice();
recognizer->RecognizeAsync(RecognizeMode::Multiple);
recognizer->SpeechRecognized+=gcnew System::EventHandler<SpeechRecognizedEventArgs ^>(this, &Form1::GetSpeech);
```

4. Create a function GetSpeech in the same form class. When recognizer recognizes any grammar or sentence(sentence1 or sentence 2), the recognizer consider it as a event.

And when that event happens, GetSpeech function will be called

```
private: System::Void GetSpeech(System::Object^ sender, SpeechRecognizedEventArgs^ e)
{
    textBox1->Text= e->Result->Text;
    /*e->Result->Text is the recognized text*/
}
```

3.2 Implementing Speech synthesis in visual studio

Missing " " 

I also implemented text to speech in the application. Implementing text to speech is easier than speech recognition.

3.2.1 Implementation steps

1. Add reference to system speech.


2. Add the following namespace in the windows form code

```
using namespace System::Speech::Synthesis;  
using namespace System::Speech::Recognition;
```

3. Create a SpeechSynthesizer variable inside the form class

```
private:SpeechSynthesizer^ synth;
```

4. Inside the form onload function add the following lines

```
synth=gcnew SpeechSynthesizer();
```

5. To convert text to speech add

```
synth->Speak(" Any string or string^");
```

Chapter 4

Extracting and reading data from Google map

As a need of our final product I had to extract some points and their from google map. I used google earth pro desktop application for this purpose. Besides different advanced features, google earth pro allows us to extract coordinates as collections of points, as a path or as a polygon. These data are save in .km or .kmz file. For creating test data, I made a path around iitg border coordinates and saved it as .km file. The structure of .km type file is like xml. Reading .km file is hard using the common file reading technique and I only needed the data under <coordinate></coordinate>. Therefore to avoid complexities and unwanted errors, I used xml reader to read .km type file. It reads the tag as 'XmlNodeType::Element' and the data between a start tag and end tag as 'XmlNodeType::Text'. I stored the data under <coordinate></coordinate> as a string and split the string to get the X,Y coordinates of the points.

A sample .km file

```

<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://www.opengis.net/kml/2.2" xmlns:gx="http://www.google.com/kml/ext/2.2" xmlns:kml="http://www.opengis.net/kml/2.2" xmlns:atom="http://www.w3.org/2005/Atom">
<Document>
  <name>iitPolygon.kml</name>
  <StyleMap id="m_ylw-pushpin2">
    <Pair>
      <key>normal</key>
      <styleUrl>#s_ylw-pushpin2</styleUrl>
    </Pair>
    <Pair>
      <key>highlight</key>
      <styleUrl>#s_ylw-pushpin_hl2</styleUrl>
    </Pair>
  </StyleMap>
  <Style id="s_ylw-pushpin_hl2">
    <IconStyle>
      <scale>1.3</scale>
      <Icon>
        <href>http://maps.google.com/mapfiles/kml/pushpin/ylw-pushpin.png</href>
      </Icon>
      <hotSpot x="20" y="2" xunits="pixels" yunits="pixels"/>
    </IconStyle>
  </Style>
  <Style id="s_ylw-pushpin2">
    <IconStyle>
      <scale>1.1</scale>
      <Icon>
        <href>http://maps.google.com/mapfiles/kml/pushpin/ylw-pushpin.png</href>
      </Icon>
      <hotSpot x="20" y="2" xunits="pixels" yunits="pixels"/>
    </IconStyle>
  </Style>
  <Placemark>
    <name>iitPolygon</name>
    <styleUrl>#m_ylw-pushpin2</styleUrl>
    <lineString>
      <tessellate>1</tessellate>
      <coordinates>
        91.69224993220115,26.18404837908317,0 91.69244109712824,26.18413346042097,0
        91.69264978304681,26.18430515663465,0 91.69297334081791,26.1842814354464,0
        91.69434533439403,26.18444978359543,0 91.6947720597376,26.184263510828,0
        91.69617399526659,26.18321718168159,0 91.69829682229999,26.18407203179709,0
        91.70101651752898,26.18509701471491,0 91.70101721802399,26.18587730951125,0
        91.70076311923131,26.18711833200602,0 91.70273130955833,26.18820646854189,0
        91.70429351758246,26.18896978641304,0 91.70382359041363,26.19055157121243,0
        91.70332925283657,26.19158962666206,0 91.70289862528375,26.19376242671766,0
        91.70267965774189,26.19788719830624,0 91.70061894560871,26.19691954181756,0
        91.69886078120744,26.19627312490485,0 91.69768216483214,26.19725515436802,0
        91.697547710859,26.19984608068036,0 91.69743950898338,26.20166320341402,0
        91.69136792958952,26.200658070195358,0 91.68947762426137,26.19871922712344,0
        91.68771152257756,26.19787163847593,0 91.68730685274595,26.19612349356576,0
        91.6883243188279,26.1954990381744,0 91.6874986983032,26.19542953324231,0
        91.68706128602967,26.19389491337337,0 91.68668361763875,26.19169860066337,0
        91.68684295935833,26.18987866108632,0 91.68746068520193,26.18894040064047,0
        91.68843482904576,26.18844833465499,0 91.68824503288381,26.1876704513493,0
        91.68880511623931,26.18749971378285,0 91.68835940548348,26.18463912466619,0
        91.6891154021298,26.18436535199852,0 91.68919859071075,26.18401818447994,0
        91.68891174784477,26.1833354739076,0 91.68938257202313,26.18287746698505,0
        91.69091539554796,26.18279002327086,0 91.69097644955265,26.18255389174641,0
        91.69214571033001,26.18257920113964,0 91.69223612949169,26.18394449103461,0
      </coordinates>
    </lineString>
  </Placemark>
</Document>
</kml>

```

4.1 Implementation

1. Declare the following variables in the form class

```
/*variable to store no of coordinate points*/
int point_count;
/*arrays to store x and y coordinate*/
array<double> ^ Arrx;
array<double> ^ Arry;
```

2. Code to read and store data from .kml file

```
1 XmlTextReader ^ reader = gcnew XmlTextReader("Path to .kml file");
2 while (reader->Read())
3 {
4     String ^ s1;
5     switch (reader->NodeType)
6     {
7
8     case XmlNodeType::Element: // The node is an element or tag.
9         s1 = reader->Name;      //save the tag name
10        break;
11    case XmlNodeType::Text:    //Text between start tag and end tag
12        if (s1 == "coordinates") //if the tag is coordinate
13        {
14            String ^ str = reader->Value; //then get the data and store in string
15            /*Coordinates of different points are separated by a space
16             so split the string into string array*/
17            array<String ^> ^ StringArray = str->Split(' ');
18            for each (String ^ temp in StringArray)
19            {
20                if (temp[0] == ' ' || temp == "" || temp[0] == '\t') //If the data is empty, then break;
21                break;
22                if (sizeof(temp) == 0)
23                break;
24                array<String ^> ^ StringArray1 = temp->Split(',');
25                int count = 0;
26                for each (String ^ templ in StringArray1) //check 3 values (x,y,z) are present in a coordinate
27                {
28                    count++;
29                }
30                if (count < 3)
31                    break;
32                double dub;
```

```
33     /*
34      StringArray1[0]=X coordinate
35      StringArray1[1]=Y coordinate
36      */
37      dub = Convert::ToDouble(StringArray1[0]); /*converting to double and stroing x coordinate*/
38      /*Arrx is a double array to store x coordinate of points*/
39      /*point_count is a integer variable to store no of points*/
40      Arrx[point_count] = dub;
41      /*converting to double and stroing y coordinate*/
42      dub = Convert::ToDouble(StringArray1[1]);
43      /*Arrx is a double array to store x coordinate of points*/
44      Arry[point_count] = dub;
45      point_count += 1;
46    }
47  }
48 }
49 }
50 }
```

Chapter 5

Scaling coordinates and drawing

5.1 Conversion from cartesian coordinate system

Google map and visual studio uses the following coordinate system:



So points given in the cartesian coordinate system should be converted to this coordinate system.

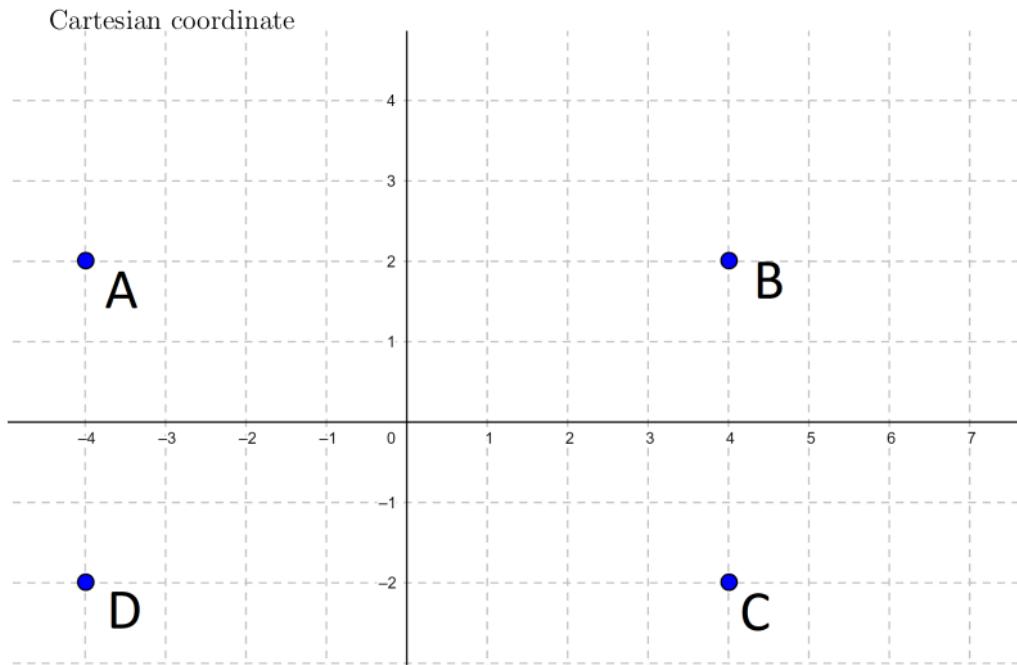
Let $P(x,y)$ is a point in cartesian plane then in visual studio window the point will be $Q(X_{new},Y_{new})$ where

$$X_{new} = ()windowsformwidth + x$$

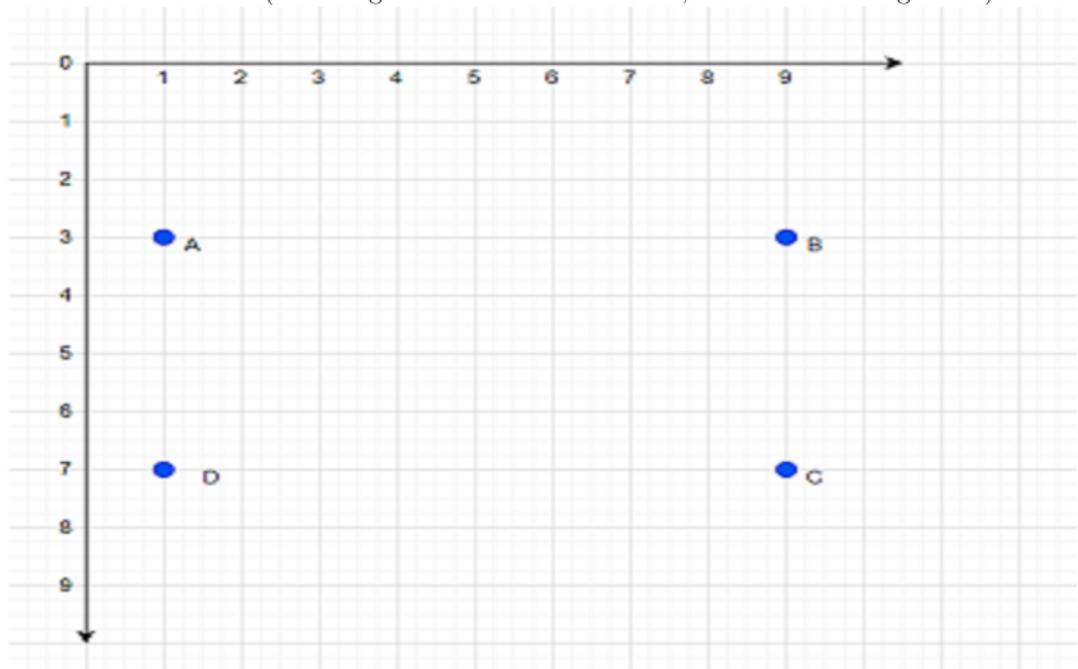
Sp. (ETS)

$$Y_{new} = ()windowsformheight - y$$

Sp. (ETS)



Visual studio window (assuming windows form width=10, windows form height=10)



5.2 Scaling coordinates to windows from size limit

For points from google map. X coordinate ranges from -180 to 180 and y coordinate ranges from -180 to 180. So to scale a set of points to visual studio window range I used the following formulas —

$$x_{\text{diff}} = \frac{\text{maximum value of x coordinate} - \text{minimum value of x coordinate}}{\text{form width}}$$

$$y_{\text{diff}} = \frac{\text{maximum value of y coordinate} - \text{minimum value of y coordinate}}{\text{form height}}$$

P(x,y) is a given point. In visual studio window coordinate of P will be, $P'(\text{Xnew}, \text{Ynew})$ where

$$X_{\text{new}} = \frac{(x - \text{minimum value of x coordinate}) \times \text{form width}}{x_{\text{diff}}}$$

$$Y_{\text{new}} = \frac{(y - \text{minimum value of y coordinate}) \times \text{form height}}{y_{\text{diff}}}$$

5.3 Drawing in visual studio

To draw in visual studio windows form:

1. Add the following variables in the windows form class

```
private:  
array<Point>^ local;  
Graphics^ pg;  
Pen^ pen1;
```

2. Initialize the variables in form onload function

```
pg = CreateGraphics();  
pen1 = gcnew Pen(Color::Red);  
local = gcnew array<Point>(point_count);
```

3. Read data, count the number of points and store the points in the point (local) array.
4. Draw objects using the following code

```
/*To draw polygon*/  
pg->DrawPolygon(pen1, local); //local is array<Point>^  
/*To draw rectangle*/  
pg->DrawRectangle(pen1, x_coordinate_of_top_left_point, y_coordinate_of_topleft_point, width, height);  
/*To draw a circle in vs*/  
pg->DrawEllipse(pen1, x_coordinate_of_center, y_coordinate_of_center, diameter, diameter);
```

Chapter 6

Placing ~~google~~ map in ~~visual~~ studio and drawing on it

I used google map in my visual studio application. Visual studio uses ‘webbrowser’ from toolbox to open ~~urls~~ or HTML files. By default ,visual studio ‘webbrowser’ uses Internet Explorer.

6.1 Implementation Steps

We can open ~~google~~ map in ~~visual~~ studio in the following ways.

6.1.1 Using google map url directly in ~~webbrowser~~ `webbrowser->Navigate(google map url)`

Here ~~webbrowser~~ open the url in Internet Explorer.But the Google map does not work properly with IE. So,the map appears with 2 errors—

- Script error –~~a~~window pop up automatically with some error message time to time.
- IE compatibility view error.

Also sometimes the map does not load properly.

The only solution I found till now is just close the error window and ignore the error.

6.1.2 using HTML files

Place the google map url in a separate html file and open the html file in ‘webbrowser’.

By using another html file, we can open microsoft edge in ‘webbrowser’. (By default ,visual studio webbrowser uses IE).

This can be done in 2 ways —

- Using api key

I tried this approach by making a api key and adding the map url in html file with the api key, but the api key didn't work properly. I also tried by opening the html file in other browser (chrome and firefox) but the same api key error appears. Code sample—

```
<!DOCTYPE html>
<html>
<head>
<title>Simple Map</title>
<meta http-equiv="X-UA-Compatible" content="IE=edge" >
<script src="https://polyfill.io/v3/polyfill.min.js?features=default"></script>
<style type="text/css">
/* Always set the map height explicitly to define the size of the div
 * element that contains the map. */
#map {
  height: 100%;
}

/* Optional: Makes the sample page fill the window. */
html,
body {
  height: 100%;
  margin: 0;
  padding: 0;
}
</style>
<script>
let map;

function initMap() {
  map = new google.maps.Map(document.getElementById("map"), {
    center: { lat: -34.39, lng: 150.644 },
    zoom: 8,
  });
}
</script>
</head>
<body>
<div id="map"></div>

<!-- Async script executes immediately and must be after any DOM elements used in callback. -->
<script
  src="https://maps.googleapis.com/maps/api/js?key=Your api key&callback=initMap&libraries=&v=weekly"
  async defer
></script>
</body>
</html>
```

- Without api key

Search for any location in google map. Click the share option ,then embed the location html code in the html file. The only problem with this approach is, a red marked appears on that location. Sample code

```
<!DOCTYPE html>
<html>
<head>
    <meta charset="utf-8">
    <title>Customize the scroll-bar</title>
    <meta http-equiv="X-UA-Compatible" content="IE=edge" >
    <style media="screen">
        .container {
            position: relative;
            width: 100%;
            height: 0;
            padding-bottom: 56.25%;
        }
        .map {
            position: absolute;
            top: 0;
            left: 0;
            width: 100%;
            height: 100%;
        }
    </style>
</head>

<body>
    <div class="container">
        <!-- Google Map Copied Code -->
        <iframe src="https://www.google.com/maps/embed?pb=1m18.1m12j1m3j1d1475.0149239952907j2d91.69559362336979j3d26.183953939411385j2m3j1f0l2
    </div>
</body>
</html>
```

6.2 drawing above google map

To draw over google map, I used 2 windows form. In one windows form I showed the google map. In the other one, I drew the objects and made the windows form transparent. Then I placed it over the windows form that has google map.

⁶ Chapter 7

Conclusion and Future Work

7.1 Conclusion

In this report, implementation some features of our application "a voiced based path planning system for aerial vehicle" is given. My work in this project is to design the GUI and interface. I implemented the voice recognition feature and therefore now the application can be run handsfree. I also placed the google map in the application and implemented drawing on it so that the aerial vehicle paths can be shown over the map. I also implemented scaling of google map point so that the points lies in visual studio window and can be shown above the google map.

7.2 Future work

The application is being developed. The future work is to add the algorithms which will be used to design the flight paths. The algorithms will design the path in real time and will be optimized so that running time becomes as low as possible. As the software is going to be used in real world, necessary testing will also be done. Finally, the software will be deployed. We will also keep track of licensed users of the software.

report

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Article Error You may need to use an article before this word.



Article Error You may need to use an article before this word. Consider using the article **the**.



Article Error You may need to use an article before this word.



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Proper Noun If this word is a proper noun, you need to capitalize it.



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Verb This verb may be incorrect. Proofread the sentence to make sure you have used the correct form of the verb.



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Garbled Grammatical or spelling errors make the meaning of this sentence unclear. Proofread the sentence to correct the mistakes.



Confused You have used **form** in this sentence. You may need to use **from** instead.



Confused You have used **a** in this sentence. You may need to use **an** instead.

PAGE 11



Missing "," You may need to place a comma after this word.



Frag. This sentence may be a fragment or may have incorrect punctuation. Proofread the sentence to be sure that it has correct punctuation and that it has an independent clause with a complete subject and predicate.



Confused You have used **form** in this sentence. You may need to use **from** instead.

PAGE 12



Confused You have used **their** in this sentence. You may need to use **they're** instead.



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Confused You have used **form** in this sentence. You may need to use **from** instead.



S/V This subject and verb may not agree. Proofread the sentence to make sure the subject agrees with the verb.



Article Error You may need to use an article before this word.



Missing "," You may need to place a comma after this word.



Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.



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Article Error You may need to remove this article.

PAGE 21



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Article Error You may need to use an article before this word.



Proper Noun If this word is a proper noun, you need to capitalize it.



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Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.



Missing "," You may need to place a comma after this word.



Confused You have used **a** in this sentence. You may need to use **an** instead.



Article Error You may need to use an article before this word. Consider using the article **the**.



Missing "," You may need to place a comma after this word.

PAGE 22



Article Error You may need to use an article before this word.



Frag. This sentence may be a fragment or may have incorrect punctuation. Proofread the sentence to be sure that it has correct punctuation and that it has an independent clause with a complete subject and predicate.



Article Error You may need to use an article before this word.



Article Error You may need to use an article before this word.



Article Error You may need to use an article before this word.



Garbled Grammatical or spelling errors make the meaning of this sentence unclear. Proofread the sentence to correct the mistakes.



Wrong Article You may have used the wrong article or pronoun. Proofread the sentence to make sure that the article or pronoun agrees with the word it describes.



Article Error You may need to use an article before this word.

PAGE 23



Hyp. You may need to add a hyphen between these two words.



Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.



Article Error You may need to use an article before this word.



S/V This subject and verb may not agree. Proofread the sentence to make sure the subject agrees with the verb.



Article Error You may need to use an article before this word.



Garbled Grammatical or spelling errors make the meaning of this sentence unclear.
Proofread the sentence to correct the mistakes.



Article Error You may need to use an article before this word. Consider using the article **the**.