CSIT 6910 Independent Project

Google Maps Integrated with HKUST

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Content

1. INTRODUCTION

1.1 Overview

In recent years, with rapid development of Internet, our life has been significant changed by many convenient tools which offered by it. Google Maps is one of those tools that billions people use in their daily life. Actually, Google Maps contains tremendous information which can give us advice about almost everything about locations anytime and anywhere as long as we have Internet devices. What's more, one of the reasons why Google Maps is so prevalent over the world is that it can offer multi-dimensional user experience rather than just find out your location.

Generally speaking, Google Maps is already very consummate. But when we focus on the details about HKUST in this map, however, there is only just a simple image to tell us where this university is and what the shape it looks like. From the point of a UST student, what Google Maps offers about HKUST may not satisfy their need. So there is a need to add more functions and interfaces to give the users of Google Maps who is looking for more information about HKUST a better user experience. That's how this project came into being.

1.2 Project Objectives

The final objective of this project is to improve user experience of those people who try to looking for more information about HKUST by Google Maps. In order to realize this goal, the improvement should be implemented in the follow aspects:
- This map should have more detail data to describe the structure of HKUST.
- This map should improve the efficiency of demonstrating information.
- This map should offer multi-dimensional methods to show the information the user needed.

2. BACKGROUND

2.1 Google Maps

Google Maps is a web mapping service application and technology provided by Google, that powers many map-based services, including the Google Maps website, Google Ride Finder, Google Transit, and maps embedded on third-party websites via the Google Maps API. It offers street maps, a route planner for traveling by foot, car, bike (beta), or with public transportation and a locator for urban businesses in numerous countries around the world. Google Maps satellite images are not updated in real time, but rather they are several months or years old.

2.2 Google Maps API

Google Maps API is an Application Programming Interface offered by Google to program on Google Maps. With this Google Maps API, it is possible for those programmers who have interests on Google Maps to develop their own apps.

By using the Google Maps API, it is possible to embed Google Maps site into an external website, on to which site specific data can be overlaid. Although initially only a JavaScript API, the Maps API was expanded to include an API for Adobe Flash applications (but this has been deprecated), a service for retrieving static map images, and web services for performing geocoding, generating driving directions, and obtaining elevation profiles. Over 350,000 web sites use the Google Maps API, making it the most heavily used web application development API.

3. PROJECT CONFIGURATION

The whole project can generally be divided into four different layers and a User Interface to control the elements on those layers. From the bottom to the top, the four layers are: Basic Google Maps Layer, Map Overlays, Text Overlays, Marker Overlays. What's more, there are also several links combined in this UI system which makes it possible for the users to go to the website of the place they are looking for directly. This feature can improve the efficiency of searching for useful information.

The Basic Google Maps Layer is the most common layer which already exists on Google Maps, so there is no need to give any more introductions. The major content of this report is to give a detail describe about the other three layers and the UI system.

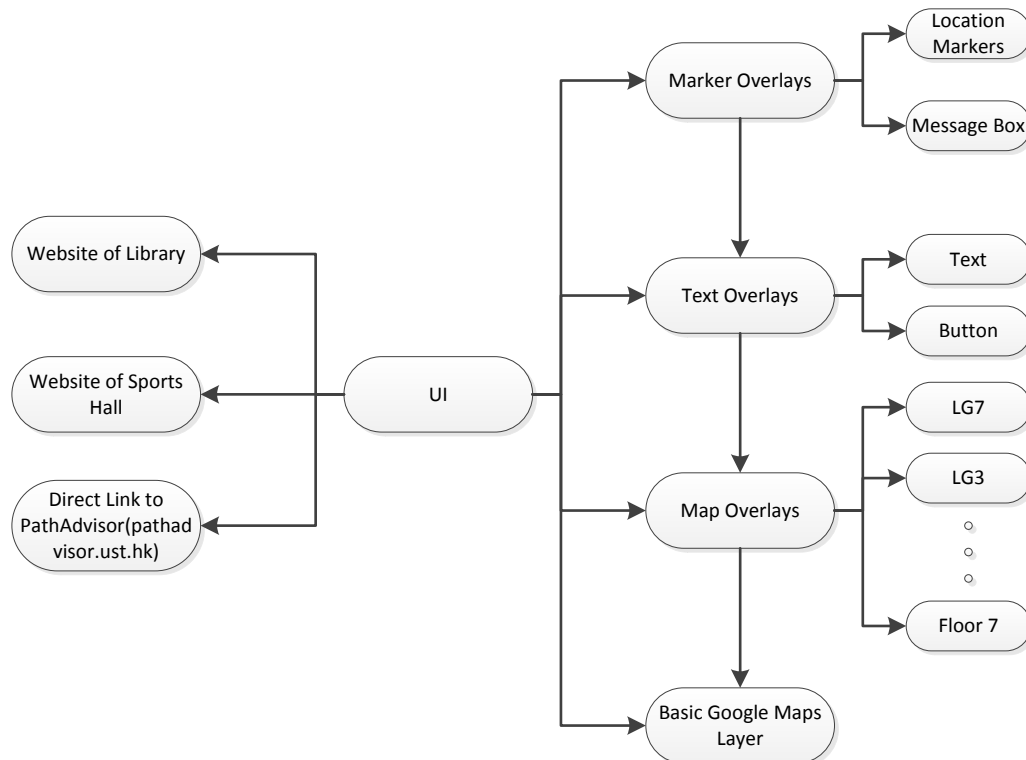Here attached an illustration about the basic configuration of this project.

Figure 3.1 Project Configuration of Google Maps Integrated with HKUST

3.1. Map Overlays

The basic idea of this part is to describe the details of the HKUST building by demonstrating it in each floor. Here in this project, 11 floors of the major building of HKUST have been described, so 11 different maps are added using Google Map Overlays which is offered by Google Maps API.

The tool used to realize this element is an object called GroundOverlay offered by Google Maps API. The constructor for a GroundOverlay specifies a URL of an image and the LatLngBounds of the image as parameters. The image will be rendered on the map, constrained to the given bounds, and conformed using the map's projection. A brief illustration about those maps is given as follow:
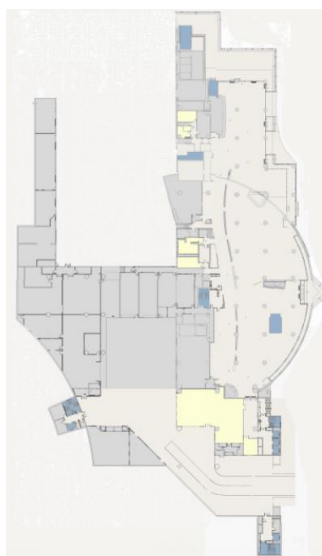

Ground Floor

LG1

Floor 1

LG3

LG7

Floor 2

Floor 3   **Floor 4**   **Floor 5**

Floor 6   **Floor 7**

Figure 3.2 Maps of Each Floor in HKUST

3.2 Text Overlays

The Google Maps API V3 provides an OverlayView class for creating your own custom overlays. The OverlayView is a base class providing several methods you must implement when creating your overlays. The class also provides a few methods that make it possible to translate between screen coordinates and locations on the map. That makes it possible to build an overlay supporting text which can be edited in HTML format.
To create a Text Overlay:

Set the custom object's prototype to a new instance of google.maps.OverlayView(). This one will effectively "subclass" the overlay class.
Create a constructor for your custom overlay, and set any initialization parameters to custom properties within that constructor.
Implement an onAdd() method within your prototype, and attach the overlay to the map. OverlayView.onAdd() will be called when the map is ready for the overlay to be attached..
Implement a draw() method within your prototype, and handle the visual display of your object. OverlayView.draw() will be called when the object is first displayed as well.

```
function TxtOverlay(pos, txt, cls, map)
        {
             // Now initialize all properties.
             this.pos = pos; this.txt_ = txt;this.cls_ = cls; this.map_ = map; this.div_ = null;
              // We define a property to hold the image's div. We'll actually create this div
              //upon receipt of the add() method so we'll leave it null for now.
              // Explicitly call setMap() on this overlay
           this.setMap(map)
          }
TxtOverlay.prototype = new google.maps.OverlayView();
TxtOverlay.prototype.onAdd = function ()
        {
              // Note: an overlay's receipt of onAdd() indicates that the map's panes are now
              //available for attaching the overlay to the map via the DOM.
          }
```

Table 3.1 the pseudo code for TxtOverlay

3.3 Marker Overlays

Markers identify locations on the map. By default, they use a standard icon, though you can set a custom icon within the marker's constructor or by calling setIcon() on the marker. The google.maps.Marker constructor takes a single Marker options object literal specifying the initial properties of the marker. The following fields are particularly important and commonly set when constructing your marker:

- position (required) specifies a parameter called LatLng identifying the initial location of the marker.
- map (optional) specifies the Map object on which to place the marker.

Within the Marker constructor, the map should be specified on which to add the marker. If the argument is not specified, the marker is created but is not attached (or displayed) on the map. You may add the marker later by calling the marker's setMap() method. To remove a marker, call the setMap() method passing null as the argument.

3.4 UI Design

In this part, two kinds of UI control are implemented in this project. The first one is realized by HTML language, which is to offer an interface to choose the floor of the HKUST major building; the second one using Custom Controls which offered by Google Maps API, which is offered to location different facilities of HKUST directly.

3.4.1 HTML Control Panel

Up on the top of the website, a panel is displayed for the user to choose which floor of HKUST major building they want to view. With this panel, the users can clearly identify how many floors we have and go to the floor they are looking for efficiently. Actually, this panel is built using HTML language and is separated from the Google Maps. In order to interact with Google Maps, several interfaces using javascript have been added in this project.
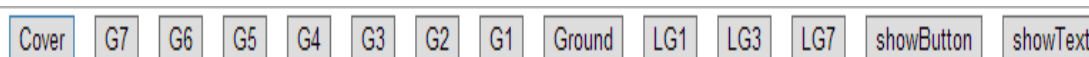

Figure 3.3 Frontend Look of HTML Control Panel

3.4.2 Google Maps API Custom Controls

As well as modifying the style and position of existing API controls, you can create your own controls to handle interaction with the user. Controls are stationary widgets which float on top of a map at absolute positions, as opposed to overlays, which move with the underlying map. More fundamentally, a control is simply a <div> element which has an absolute position on the map, displays some UI to the user, and handles interaction with either the user or the map, usually through an event handler.

To create unique custom control, few "rules" are necessary. However, the following guidelines can act as best practices:

- Define appropriate CSS for the control element(s) to display.
- Handle interaction with the user or the map through event handlers for either map property changes or user events (e.g. 'click' events).
- Create a <div> element to hold the control and add this element to the Map's controls property.
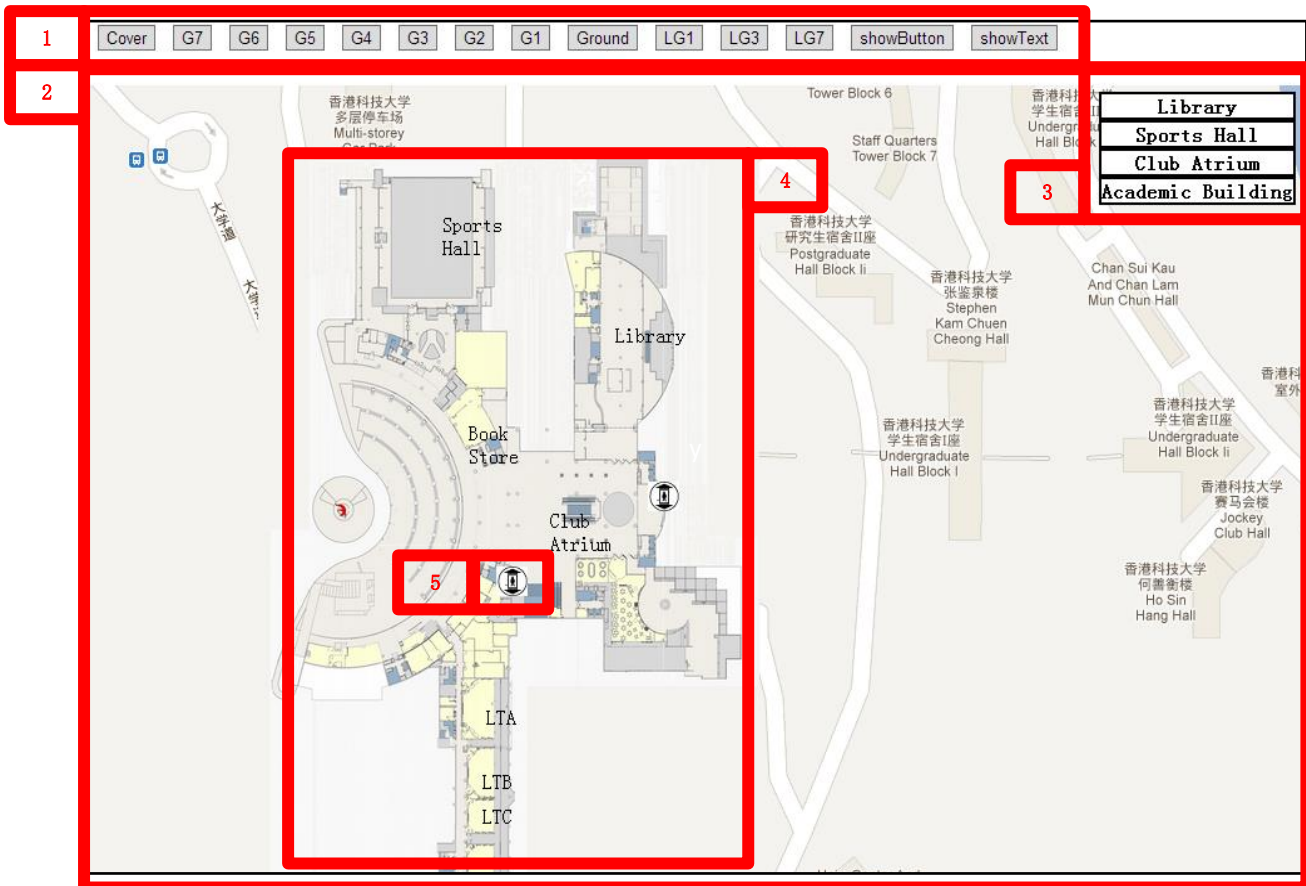
4. PROJECT DEMONSTRATION

Figure 4.1 Overview of the Website

1. The Floors Choosing Panel
2. The Major Panel of Google Maps Integrated with HKUST
3. The Facilities Selecting Panel
4. The Overlays of HKUST Major Building
5. Lift

The buttons on the Facilities Selecting Panel will locate the center of the map to the position of the certain facility and drop a marker there for better recognition. What more, this marker attached a message box which contains pictures of this facility to give the user a direct introduction what this facility looks like.

Different menus will be displayed when the user right clicks at different place. A menu will be displayed if the user right clicks on the lift button. In this menu the user can select which floor he wants to go, just like the function of a lift. If the user right clicks on the other location of the overlays of the HKUST major building, there will be a link which can projecting the location of this place he clicks to another website: Pathadvisor (http://pathadvisor.ust.hk).

Figure 4.1 Function Illustration of the Website

1. Message box generate by clicking the marker
2. Location marker generated by clicking facility button on the facilities panel
3. Menu generated by right clicking the lift button.

5. FURTHER DEVELOPMENT

Since limited time, the basic structure of the project is done and there are many possibilities for further development and improvement, such as:

1. The interface of the application can be improved to make it become friendlier.
2. The map used in Map Overlays can be better designed.
3. More facilities and text content can be added to this map to make it more plentiful.
4. A function to give advice on going from a start place to a certain destination can be implemented on this project.

6. CONCLUSION

The aim of this project is to improve the user experience of HKUST google map user by three different new added features. The first one is adding more layers of floors in the major building of HKUST so that the user can find more detail information about the inner structure of HKUST. At the same time, two different interfaces(floor selecting panel and lift button) have be used to help the user select floors more directly and more efficiently. The second feature is that the user can locate a certain facility just by clicking a certain button. This feature is realized by adding a facilities selecting panel using Google Maps API Custom Controls. In addition, once a facility is selected a marker attached with an information box will be put there for better recognition and demonstration. The last modified feature is a projecting to another website which has a similar function (pathadvisor.ust.hk).

7. REFERENCES

[1] Google Developers, https://developers.google.com/maps/ retrieved on 13th April 2013.

[2] Wikipedia, http://en.wikipedia.org/wiki/Google_Maps_API#Google_Maps_API retrieved

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[3] Gabriel Svennerberg "Beginning Google Maps API V3" Apress

http://books.google.com.hk/books?id=gHb8m0GSV2MC&printsec=frontcover&dq=google+map+

api&hl=zh-CN&sa=X&ei=QVaUUdSRH6aSiAfH_4H4BQ&ved=0CDgQ6AEwAQ#v=onepage&q=googl

e%20map%20api&f=false

[4] Google Maps API Tutorial http://econym.org.uk/gmap/ retrieved on 13th April 2013.

[5] Rich Gibson, Schuyler Erle "Google Maps Hacks" P40-P42

[6] Official Google Maps API Blog http://googlemapsapi.blogspot.hk/ retrieved on 13th April

2013.

8. APPENDIX

Minutes of 1st Meeting

Date: 03/11/2013

Time: 03:00 p.m

Place: Rm.3512

Attending: Prof. Rossiter, Zou Lincen

Absent: None

Recorder: Zou Lincen

1. Approval of Minutes

Since this is the first meeting, there is no approval of minutes of previous meeting.

2. Report on Progress

Since this is the first meeting, there is no progress to be reported.

3. Discussion Items and Things To Do

- Project idea

- Development platform for Google Maps for HKUST

4. Meeting Adjournment

The meeting was adjourned at 03:20 p.m.

Minutes of 2nd Meeting

Date: 03/27/2013

Time: 04:30 p.m

Place: Rm.3512

Attending: Prof. Rossiter, Zou Lincen

Absent: None

Recorder: Zou Lincen

1. Approval of Minutes

The minutes of the last meeting were approved without amendment.

2. Report on Progress

Zou Lincen realize the functions of add markers and message box on the Google Maps

3. Discussion Items and Things To Do

- Add layers on top of the basic Google Map.

- Descript the structure of HKUST in detail.

4. Meeting Adjournment

The meeting was adjourned at 04:50 p.m.

Minutes of 3rd Meeting

Date: 04/15/2013

Time: 10:30 a.m

Place: Rm.3512

Attending: Prof. Rossiter, Zou Lincen

Absent: None

Recorder: Zou Lincen

1. Approval of Minutes

The minutes of the last meeting were approved without amendment.

2. Report on Progress

Zou Lincen add Maps overlays and text overlays on the basic Google Maps overlay.

3. Discussion Items and Things To Do

- Modify the picture used in Maps overlays

- Add links to Pathadvisor(pathadvisor.ust.hk)

4. Meeting Adjournment

The meeting was adjourned at 10:50 a.m.

Minutes of 4th Meeting

Date: 05/16/2013

Time: 10:30 a.m

Place: Rm.3512

Attending: Prof. Rossiter, Zou Lincen

Absent: None

Recorder: Zou Lincen

1. Approval of Minutes

The minutes of the last meeting were approved without amendment.

2. Report on Progress

Zou Lincen finished the functions and UI design for Google Maps Integrated with HKUST.

3. Discussion Items and Things To Do

- finish the report

4. Meeting Adjournment

The meeting was adjourned at 10:50 a.m.