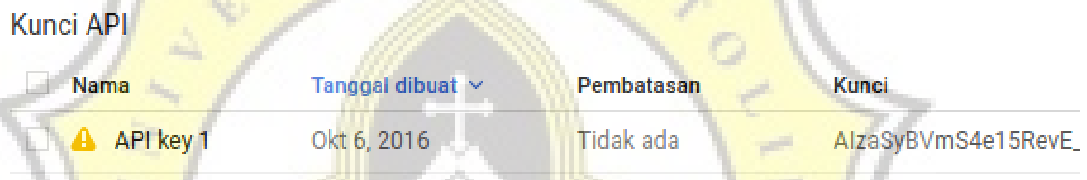
CHAPTER V

IMPLEMENTATION AND TESTING

5.1. Implementation

5.1.1. Google Maps API Implementation

Google Maps API makes ease for users to use and manage Google Maps's feature. Then the API Key is needed in order for the user's project can using the features. The following is a Google API Key:



Kunci API

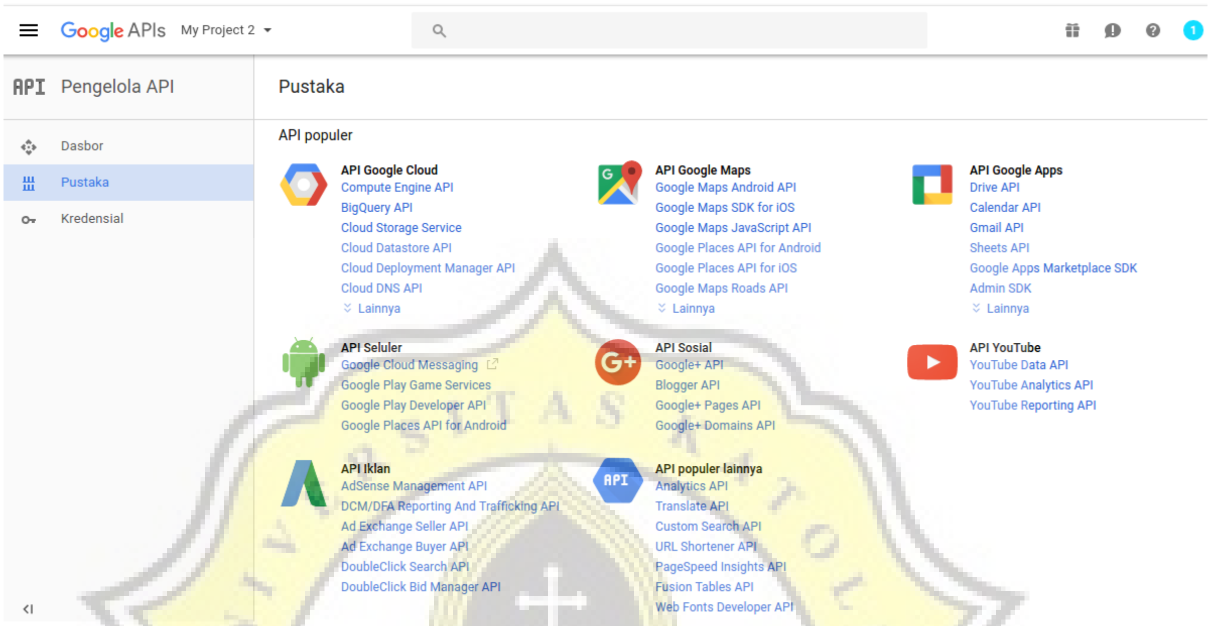
Nama	Tanggal dibuat	Pembatasan	Kunci
API key 1	Okt 6, 2016	Tidak ada	AIzaSyBVmS4e15RevE_

Figure 5 : API Key

Due to this project have some function such as current location, and search box, then the API Key is the most important factor because it has a function to connecting between the user project with the Google Services.

On API Key, in addition to link the project with Google Maps, can also add library in order to add some special functions such as search box, avoiding some road in map, and much more.

In order to use features which are needed in this project, the keys must be activated from Google Developer console.


Google APIs My Project 2

API Pengelola API

Dasbor
Pustaka
Kredensial

Pustaka

API populer

API Google Cloud
Compute Engine API
BigQuery API
Cloud Storage Service
Cloud Datastore API
Cloud Deployment Manager API
Cloud DNS API
Lainnya

API Google Maps
Google Maps Android API
Google Maps SDK for iOS
Google Maps JavaScript API
Google Places API for Android
Google Places API for iOS
Google Maps Roads API
Lainnya

API Google Apps
Drive API
Calendar API
Gmail API
Sheets API
Google Apps Marketplace SDK
Admin SDK
Lainnya

API Seluler
Google Cloud Messaging
Google Play Game Services
Google Play Developer API
Google Places API for Android

API Sosial
Google+ API
Blogger API
Google+ Pages API
Google+ Domains API

API YouTube
YouTube Data API
YouTube Analytics API
YouTube Reporting API

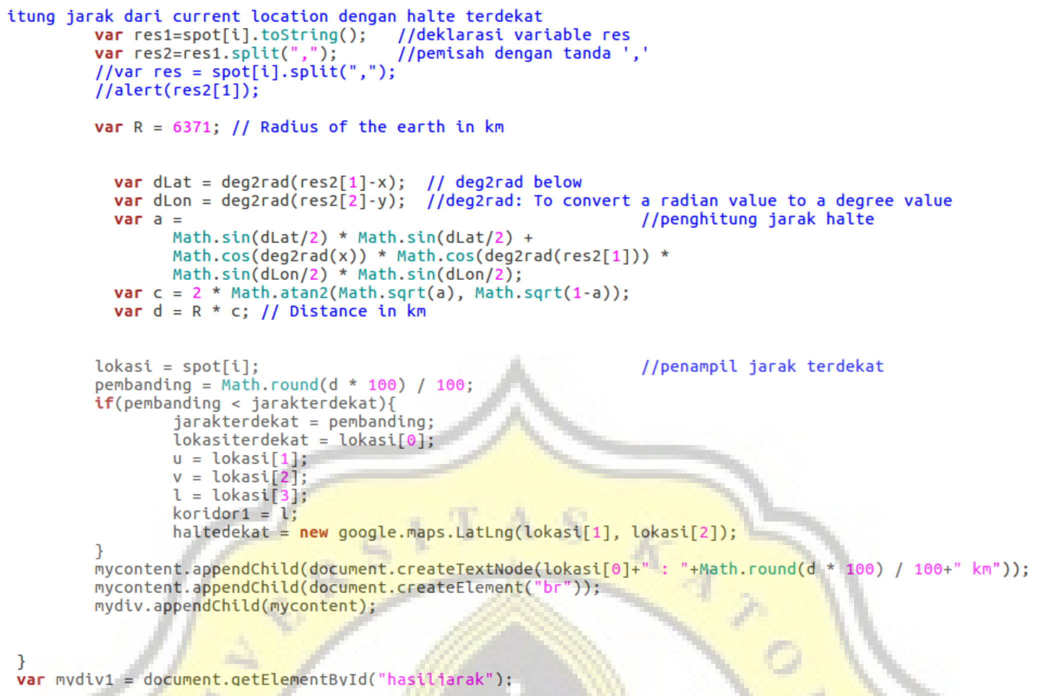
API Iklan
AdSense Management API
DCM/DFA Reporting And Trafficking API
Ad Exchange Seller API
Ad Exchange Buyer API
DoubleClick Search API
DoubleClick Bid Manager API

API populer lainnya
Analytics API
Translate API
Custom Search API
URL Shortener API
PageSpeed Insights API
Fusion Tables API
Web Fonts Developer API

Figure 6: Create New Project in Google API Console

5.1.2. Distance Calculator

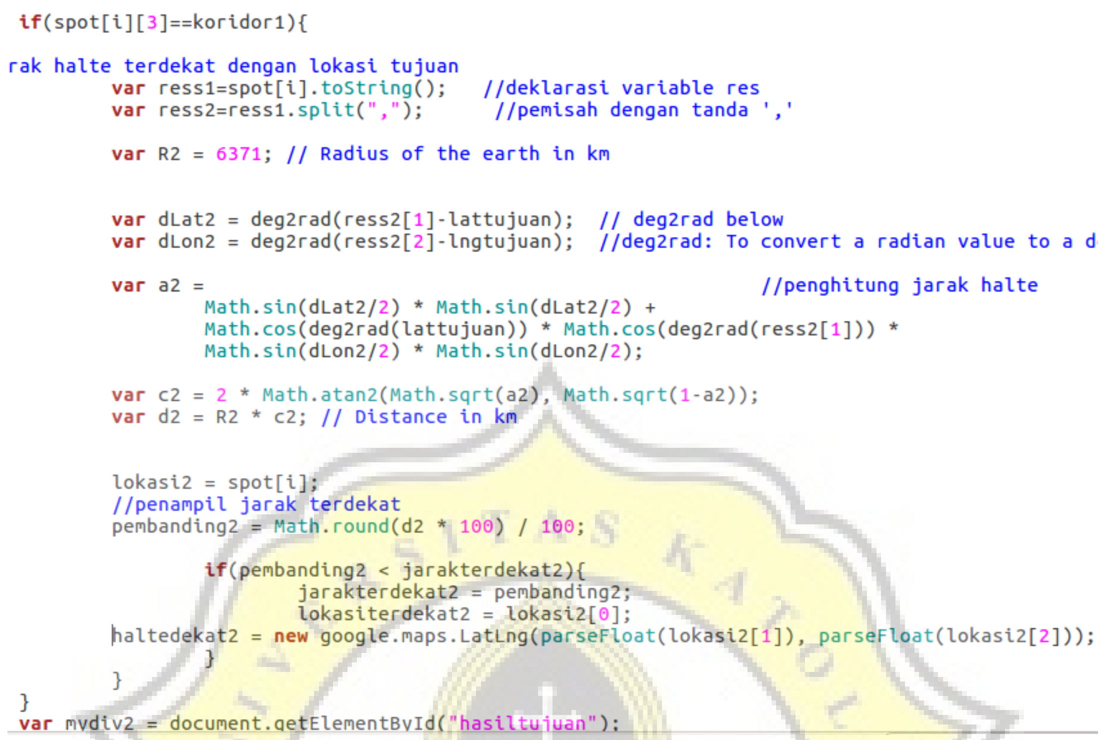
To know how much the distance that will be reached by the user also important because users won't know how much the distance will be reached when displayed only the line of route or even only exist point of markers. Then the Haversine Formula was selected as a solution in the calculation of the distance between bus stops with the user or the bus stop with the destination location.



```
itung jarak dari current location dengan halte terdekat
         var res1=spot[i].toString();   //deklarasi variable res
         var res2=res1.split(",");      //pemisah dengan tanda ','
         //var res = spot[i].split(",");
         //alert(res2[1]);

         var R = 6371; // Radius of the earth in km


           var dLat = deg2rad(res2[1]-x);  // deg2rad below
           var dLon = deg2rad(res2[2]-y);  //deg2rad: To convert a radian value to a degree value
           var a =                                             //penghitung jarak halte
                 Math.sin(dLat/2) * Math.sin(dLat/2) +
                 Math.cos(deg2rad(x)) * Math.cos(deg2rad(res2[1])) *
                 Math.sin(dLon/2) * Math.sin(dLon/2);
           var c = 2 * Math.atan2(Math.sqrt(a), Math.sqrt(1-a));
           var d = R * c; // Distance in km


         lokasi = spot[i];                                   //penampil jarak terdekat
         pembanding = Math.round(d * 100) / 100;
         if(pembanding < jarakterdekat){
                 jarakterdekat = pembanding;
                 lokasiterdekat = lokasi[0];
                 u = lokasi[1];
                 v = lokasi[2];
                 l = lokasi[3];
                 koridor1 = l;
                 haltedekat = new google.maps.LatLng(lokasi[1], lokasi[2]);
         }
         mycontent.appendChild(document.createTextNode(lokasi[0]+" : "+Math.round(d * 100) / 100+" km"));
         mycontent.appendChild(document.createElement("br"));
         mydiv.appendChild(mycontent);


 }
 var mydiv1 = document.getElementById("hasiljarak");
```

Figure 7: Haversine Formula on Current Location

In general, the Haversine Formula such as aplliying Trigonometric methods on earth, and using radius of the earth as a unit of distance.



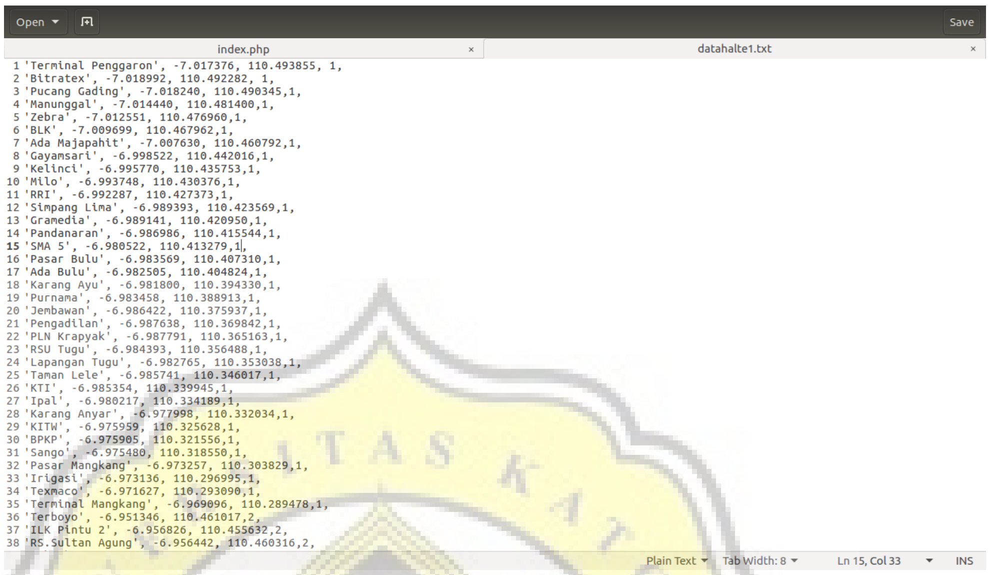
```
 if(spot[i][3]==koridor1){

rak halte terdekat dengan lokasi tujuan
         var ress1=spot[i].toString();   //deklarasi variable res
         var ress2=ress1.split(",");      //pemisah dengan tanda ','

         var R2 = 6371; // Radius of the earth in km


         var dLat2 = deg2rad(ress2[1]-lattujuan);  // deg2rad below
         var dLon2 = deg2rad(ress2[2]-lngtujuan);  //deg2rad: To convert a radian value to a d

         var a2 =                                         //penghitung jarak halte
                 Math.sin(dLat2/2) * Math.sin(dLat2/2) +
                 Math.cos(deg2rad(lattujuan)) * Math.cos(deg2rad(ress2[1])) *
                 Math.sin(dLon2/2) * Math.sin(dLon2/2);

         var c2 = 2 * Math.atan2(Math.sqrt(a2), Math.sqrt(1-a2));
         var d2 = R2 * c2; // Distance in km


         lokasi2 = spot[i];
         //penampil jarak terdekat
         pembanding2 = Math.round(d2 * 100) / 100;

                 if(pembanding2 < jarakterdekat2){
                         jarakterdekat2 = pembanding2;
                         lokasiterdekat2 = lokasi2[0];
         haltedekat2 = new google.maps.LatLng(parseFloat(lokasi2[1]), parseFloat(lokasi2[2]));
                 }
         }
 }
 var mydiv2 = document.getElementById("hasiltujuan");
```

Figure 8 : Haversine Formula on Destination Location

The first steps in implementation are declaring the radius of the earth which is 6371 as well as latitude and longitude of the current location and destination into variables. Then convert the value of latitude and longitude into string data type and store them into new variables. After that, enter the result of the conversion of number to convert again from degrees into radians and the stored the value to another new variables.

The lastest conversion results are entered into the Haversine Formula in the form of trigonometry calculation. Only then the distance value of each bus stops can obtained. To get the closest bus stop, the distance values must be sorted to find the smallest one.

5.1.3 Data Storage

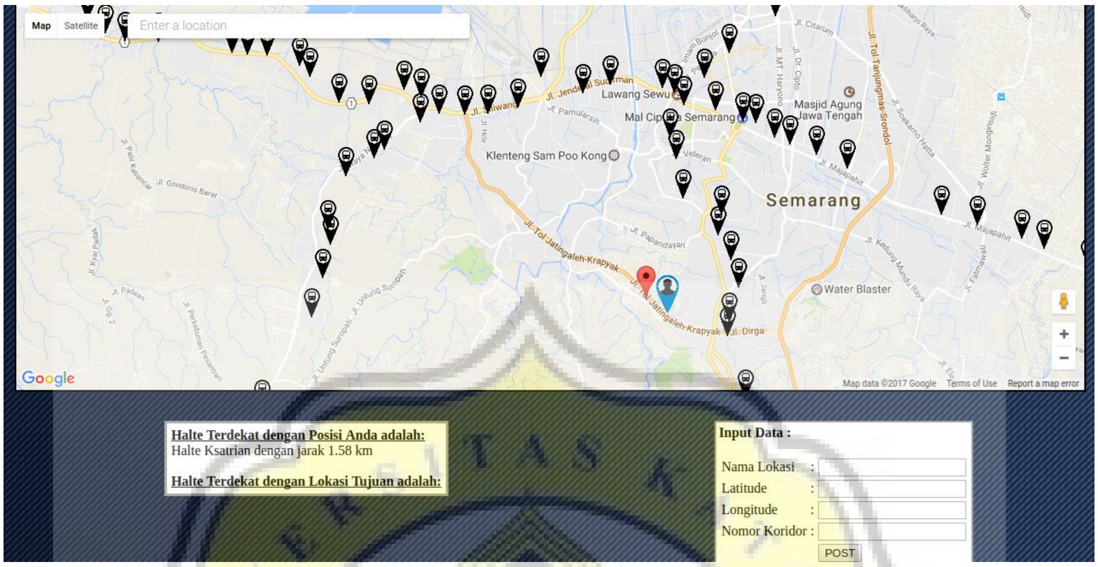


```
'Terminal Penggaron', -7.017376, 110.493855, 1,
'Bitratex', -7.018992, 110.492282, 1,
'Pucang Gading', -7.018240, 110.490345,1,
'Manunggal', -7.014440, 110.481400,1,
'Zebra', -7.012551, 110.476960,1,
'BLK', -7.009699, 110.467962,1,
'Ada Majapahit', -7.007630, 110.460792,1,
'Gayamsari', -6.998522, 110.442016,1,
'Kelinci', -6.995770, 110.435753,1,
'Milo', -6.993748, 110.430376,1,
'RRI', -6.992287, 110.427373,1,
'Simpang Lima', -6.989393, 110.423569,1,
'Gramedia', -6.989141, 110.420950,1,
'Pandanaran', -6.986986, 110.415544,1,
'SMA 5', -6.980522, 110.413279,1,
'Pasar Bulu', -6.983569, 110.407310,1,
'Ada Bulu', -6.982505, 110.404824,1,
'Karang Ayu', -6.981800, 110.394330,1,
'Purnama', -6.983458, 110.388913,1,
'Jembawan', -6.986422, 110.375937,1,
'Pengadilan', -6.987638, 110.369842,1,
'PLN Krapyak', -6.987791, 110.365163,1,
'RSU Tugu', -6.984393, 110.356488,1,
'Lapangan Tugu', -6.982765, 110.353038,1,
'Taman Lele', -6.985741, 110.346017,1,
'KTI', -6.985354, 110.339945,1,
'Ipal', -6.980217, 110.334189,1,
'Karang Anyar', -6.977998, 110.332034,1,
'KITW', -6.975959, 110.325628,1,
'BPKP', -6.975905, 110.321556,1,
'Sango', -6.975480, 110.318550,1,
'Pasar Mangkang', -6.973257, 110.303829,1,
'Irigasi', -6.973136, 110.296995,1,
'Texmaco', -6.971627, 110.293090,1,
'Terminal Mangkang', -6.969096, 110.289478,1,
'Terboyo', -6.951346, 110.461017,2,
'ILK Pintu 2', -6.956826, 110.455632,2,
'RS.Sultan Agung', -6.956442, 110.460316,2,
```

Figure 9: Data Storage in Text File

From figure 9 showing the form of BRT data that stored in a text file. As in the previous description that the data containing name, latitude, longtude, and the corridor’s number. Every data will separated by the comma symbol. For the BRT’s stops name which is string data, flanked by prime (‘) symbol.

5.2 Testing

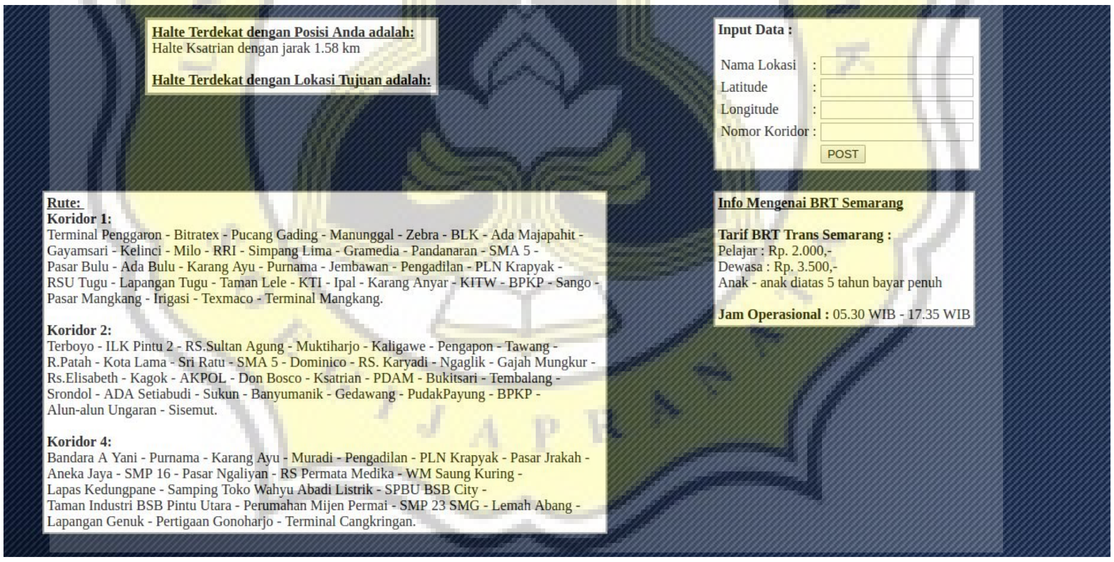


Halte Terdekat dengan Posisi Anda adalah:
Halte Ksatrian dengan jarak 1.58 km

Halte Terdekat dengan Lokasi Tujuan adalah:

Input Data :
Nama Lokasi :
Latitude :
Longitude :
Nomor Koridor :

Figure 10: Main Display (A)



Halte Terdekat dengan Posisi Anda adalah:
Halte Ksatrian dengan jarak 1.58 km

Halte Terdekat dengan Lokasi Tujuan adalah:

Input Data :
Nama Lokasi :
Latitude :
Longitude :
Nomor Koridor :

Rute:
Koridor 1:
Terminal Penggaron - Bitratex - Pucang Gading - Manunggal - Zebra - BLK - Ada Majapahit - Gayamsari - Kelinci - Milo - RRI - Simpang Lima - Gramedia - Pandanaran - SMA 5 - Pasar Bulu - Ada Bulu - Karang Ayu - Purnama - Jembawan - Pengadilan - PLN Krapyak - RSU Tugu - Lapangan Tugu - Taman Lele - KTI - Ipal - Karang Anyar - KITW - BPKP - Sango - Pasar Mangkang - Irigasi - Texmaco - Terminal Mangkang.

Koridor 2:
Terboyo - ILK Pintu 2 - RS.Sultan Agung - Muktiharjo - Kaligawe - Pengapon - Tawang - R.Patah - Kota Lama - Sri Ratu - SMA 5 - Dominico - RS. Karyadi - Ngaglik - Gajah Mungkur - Rs.Elisabeth - Kagok - AKPOL - Don Bosco - Ksatrian - PDAM - Bukitsari - Tembalang - Srondol - ADA Setiabudi - Sukun - Banyumanik - Gedawang - PudakPayung - BPKP - Alun-alun Ungaran - Sisemut.

Koridor 4:
Bandara A Yani - Purnama - Karang Ayu - Muradi - Pengadilan - PLN Krapyak - Pasar Jrakah - Aneka Jaya - SMP 16 - Pasar Ngaliyan - RS Permata Medika - WM Saung Kuring - Lapas Kedungpane - Samping Toko Wahyu Abadi Listrik - SPBU BSB City - Taman Industri BSB Pintu Utara - Perumahan Mijen Permai - SMP 23 SMG - Lemah Abang - Lapangan Genuk - Pertigaan Gonoharjo - Terminal Cangkringan.

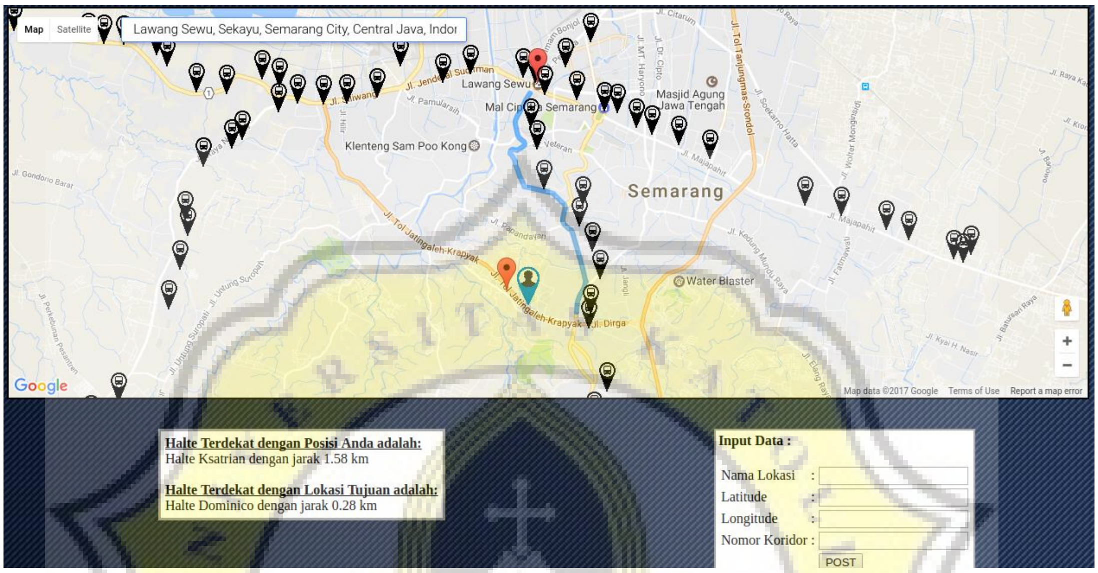
Info Mengenai BRT Semarang

Tarif BRT Trans Semarang :
Pelajar : Rp. 2.000,-
Dewasa : Rp. 3.500,-
Anak - anak diatas 5 tahun bayar penuh

Jam Operasional : 05.30 WIB - 17.35 WIB

Figure 11: Main Display (B)

From the figure 10 and 11 show the main display while run the application for the first time. At the upper part, there is a map and the markers of BRT‘s stop that scattered around the Semarang city will displayed. At the bottom part, there are several function which are displayed i.e. the closest bus stop, the routes between bus stops, the additional data of new bus stops, and general info about BRT.



Halte Terdekat dengan Posisi Anda adalah:
Halte Ksatrian dengan jarak 1.58 km

Halte Terdekat dengan Lokasi Tujuan adalah:
Halte Dominico dengan jarak 0.28 km

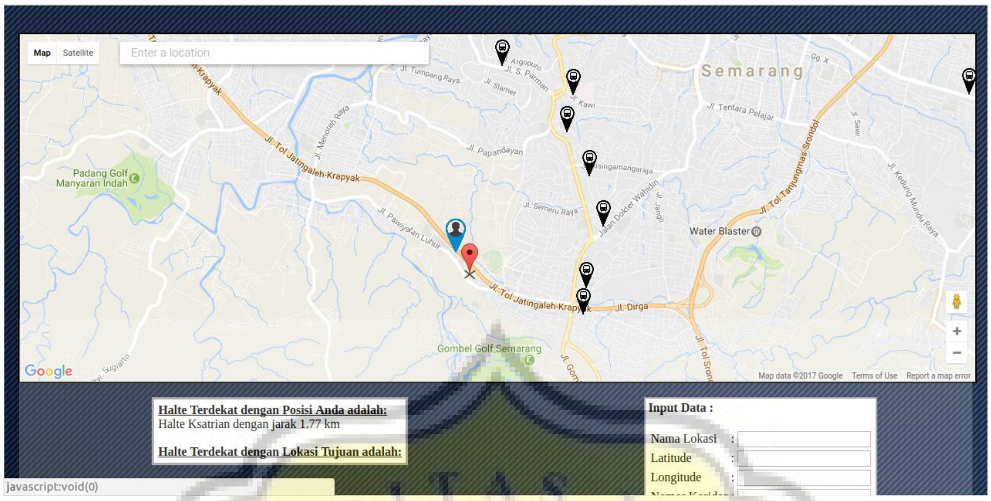
Input Data :

Nama Lokasi	:
Latitude	:
Longitude	:
Nomor Koridor	:

POST

Figure 12: Get Direction

In figure 12 show that the direction will directly obtained after the user inpute the name of destination location. The application will immidiately seek the closest stops from the destination location and calculate the distance from the destination stops with the destination location.


Map
Satellite
Enter a location
Semarang
Padang Golf Manyaran Indah
Water Blaster
Gombel Golf Semarang
Jl. Tol Jatingaleh-Krapyak
Jl. Dirga
Map data ©2017 Google Terms of Use Report a map error
javascript:void(0)

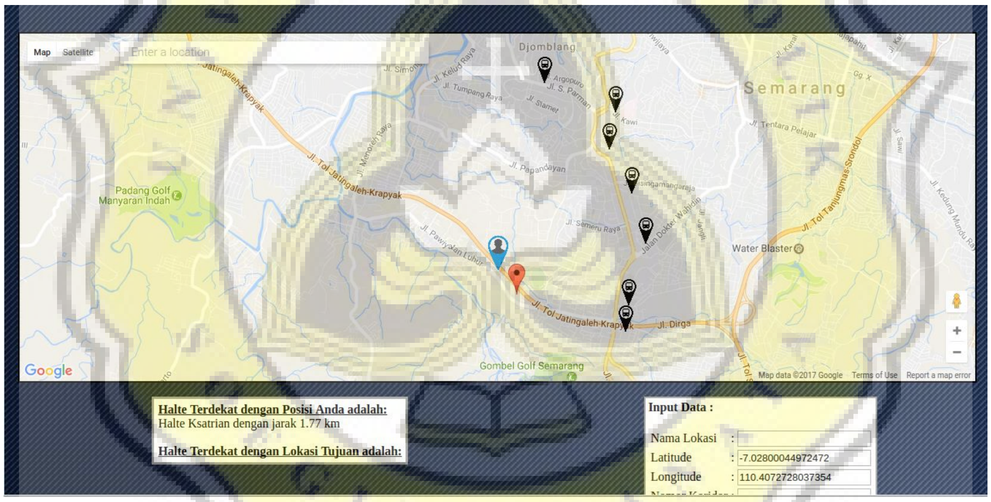
Halte Terdekat dengan Posisi Anda adalah:
Halte Ksatrian dengan jarak 1.77 km

Halte Terdekat dengan Lokasi Tujuan adalah:

Input Data :

Nama Lokasi	:	
Latitude	:	
Longitude	:	

Figure 13: Move the Draggable Marker


Map
Satellite
Enter a location
Djomblang
Semarang
Padang Golf Manyaran Indah
Water Blaster
Gombel Golf Semarang
Jl. Tol Jatingaleh-Krapyak
Jl. Dirga
Map data ©2017 Google Terms of Use Report a map error

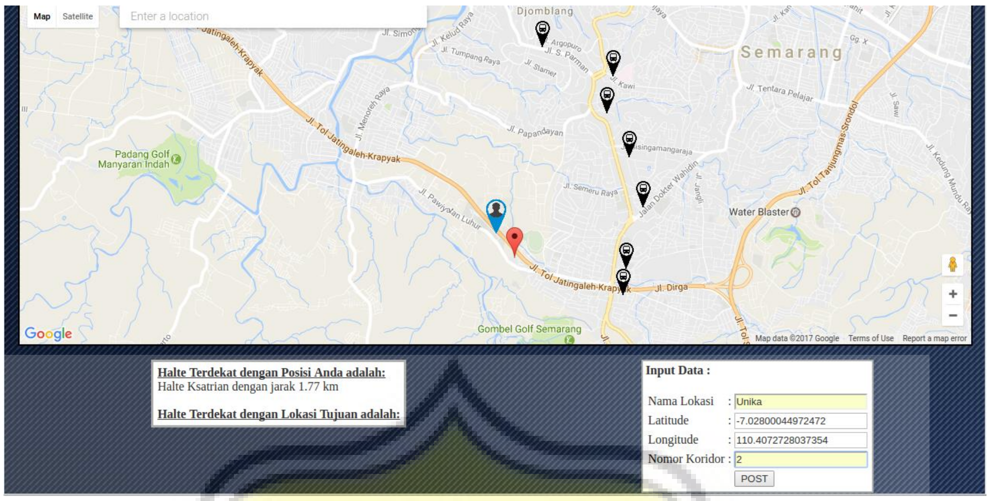
Halte Terdekat dengan Posisi Anda adalah:
Halte Ksatrian dengan jarak 1.77 km

Halte Terdekat dengan Lokasi Tujuan adalah:

Input Data :

Nama Lokasi	:	
Latitude	:	-7.02800044972472
Longitude	:	110.4072728037354

Figure 14: Get the Latitude and Longitude



Halte Terdekat dengan Posisi Anda adalah:
Halte Ksatrian dengan jarak 1.77 km

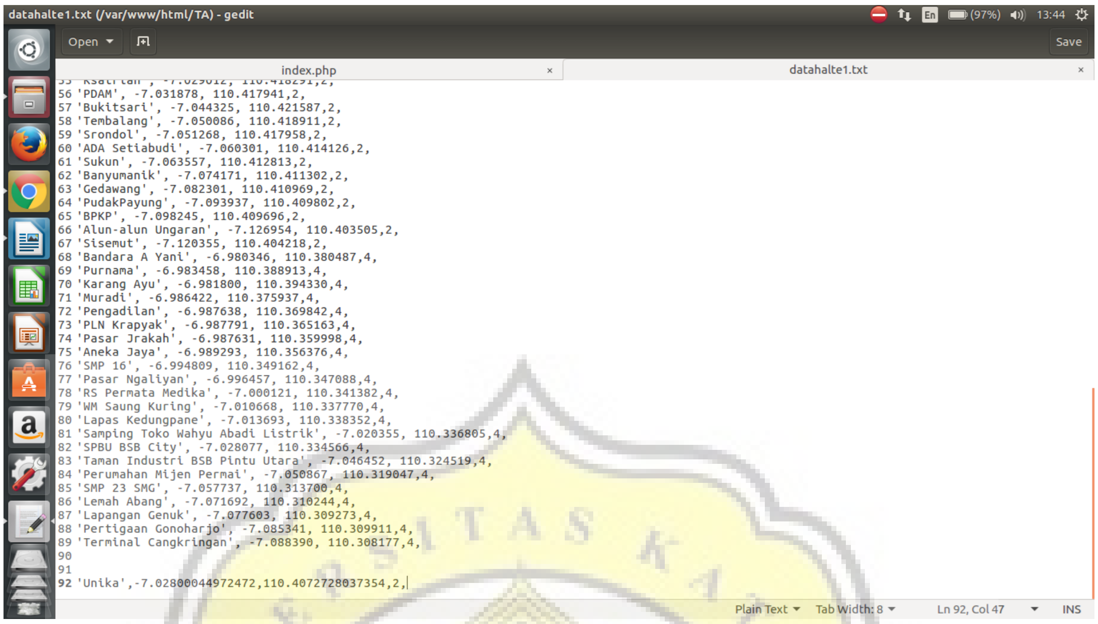
Halte Terdekat dengan Lokasi Tujuan adalah:

Input Data :

Nama Lokasi :	Unika
Latitude :	-7.02800044972472
Longitude :	110.4072728037354
Nomor Koridor :	2

Figure 15: Insert the Name and Corridor Number

From the several Figure above explain the steps of adding the BRT stops data when there is a new stops in field. On main display shows there is a red-colored marker near the current location marker, on the red-colored marker is draggable so users only need to drag the marker and get the value of latitude and longitude directly so that the value will displayed instanly on the coloumn of Input Data under the map. The next step is enter the name and corridor's number of BRT on the right coloumn. If all of the coloumn in the Input Data already filled, the user can save it by click the 'POST' button.



```
'PDAM', -7.031878, 110.417941,2,
'Bukitsari', -7.044325, 110.421587,2,
'Tembalang', -7.050086, 110.418911,2,
'Srondol', -7.051268, 110.417958,2,
'ADA Setiabudi', -7.060301, 110.414126,2,
'Sukun', -7.063557, 110.412813,2,
'Banyumanik', -7.074171, 110.411302,2,
'Gedawang', -7.082301, 110.410969,2,
'PudakPayung', -7.093937, 110.409802,2,
'BPKP', -7.098245, 110.409696,2,
'Alun-alun Ungaran', -7.126954, 110.403505,2,
'Sisemut', -7.120355, 110.404218,2,
'Bandara A Yani', -6.980346, 110.380487,4,
'Purnama', -6.983458, 110.388913,4,
'Karang Ayu', -6.981800, 110.394330,4,
'Muradi', -6.986422, 110.375937,4,
'Pengadilan', -6.987638, 110.369842,4,
'PLN Krapyak', -6.987791, 110.365163,4,
'Pasar Jrakah', -6.987631, 110.359998,4,
'Aneka Jaya', -6.989293, 110.356376,4,
'SMP 16', -6.994809, 110.349162,4,
'Pasar Ngaliyan', -6.996457, 110.347088,4,
'RS Permata Medika', -7.000121, 110.341382,4,
'WM Saung Kuring', -7.010668, 110.337770,4,
'Lapas Kedungpane', -7.013693, 110.338352,4,
'Samping Toko Wahyu Abadi Listrik', -7.020355, 110.336805,4,
'SPBU BSB City', -7.028077, 110.334566,4,
'Taman Industri BSB Pintu Utara', -7.046452, 110.324519,4,
'Perumahan Mijen Permai', -7.050867, 110.319047,4,
'SMP 23 SMG', -7.057737, 110.313700,4,
'Lemah Abang', -7.071692, 110.310244,4,
'Lapangan Genuk', -7.077603, 110.309273,4,
'Pertigaan Gonoharjo', -7.085341, 110.309911,4,
'Terminal Cangkringan', -7.088390, 110.308177,4,


'Unika',-7.02800044972472,110.4072728037354,2,
```

Figure 16: Data Storage after Adding New Data

On figure 16 show the stored data after user add new data. The data that stored have the same format with the origin data, it's just that there are a few down space so that shows there is a difference between the origin data with the new added data.