10 Week Summer Internship Report

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Introduction:

This project that I have worked on from 1st June to 15th August under the guidance of Professor Rajesh Sundaresan aims on creating a marker simulation of people moving from one place to another using different modes of transport in the IIT Jodhpur campus.

We have used the tool "**Leaflet**" to create this marker simulation i.e., to move each mode of transport from one place to another in the campus via the shortest route possible. Leaflet is an open source Javascript library used to build web mapping applications. A typical use of Leaflet involves binding a Leaflet "map" element to an HTML element.

We searched for numerous other tools for this project which includes ABStreet, SUMO but there were a few issues in them. Leaflet didn't have any of those which we were facing in the rest, and hence made it the most convenient library for the marker simulation. Leaflet has a few inbuilt functions in it which made it easier for us to figure out how to move the markers.

We also created a map in which the latitude and longitude coordinates of a specific location can be found out upto 15 significant decimals by clicking on it which I have named as **coordinates.html**.

Code:

Link to the Github repository of this Project: https://github.com/cni-iisc/internships.git

This step involves importing a regular world map (from OpenStreetMaps) and setting the map in such a way that when we run the HTML file, it opens the IIT Jodhpur area. It also involves setting the maximum zoom, minimum zoom and the default zoom in the map as per our convenience. We import the .js package we need for Leaflet and the .js package which is needed for the marker animation.

```
<body>
  <div id="map">

  </div>
  <script src="https://unpkg.com/leaflet@1.2.0/dist/leaflet.js"></script>
  <script src="https://unpkg.com/leaflet-routing-machine@latest/dist/leaflet-routing-machine.js"></script>

  <script>
  var map = L.map('map', {
    center: [26.47452,73.115],
    zoom: 15.6
  });


  L.tileLayer('https://api.maptiler.com/maps/streets/{z}/{x}/{y}.png?key=96s2uc8tHryEc9jfNqir',{
    tileSize: 512,
    zoomOffset: -1,
    minZoom: 4,
    maxZoom: 30,
    crossOrigin: true
    }).addTo(map);
```

The next step involves setting up variables with images of different modes of transport and the final destination to be reached by the vehicles with the sizes of the icons set accordingly.

```
  var car = L.icon({
    iconUrl: 'car.png',
    iconSize: [40, 40], // size of the icon
  });

  var bicycle = L.icon({
    iconUrl: 'bicycle.png',
    iconSize: [20, 20], // size of the icon
  });

  var man = L.icon({
    iconUrl: 'man.png',
    iconSize: [20, 20], // size of the icon
  });

  var bike = L.icon({
    iconUrl: 'fast-delivery.png',
    iconSize: [20, 20], // size of the icon
  });

  var redIcon = L.icon({
    iconUrl: 'red.png',
    iconSize: [30, 30], // size of the icon
  });
```

Below is the code for adding the markers which indicate the initial position and the final position of the trips which are to be made. In this case, there are 4 trips in total where marker2, marker4, marker6 and marker8 indicate the final positions to be reached by marker, marker3, marker5 and marker7 respectively. The latitude and longitude of the locations have been taken from the coordinates.html file.

```
var marker = L.marker([26.465895749384593, 73.1151375786186], {icon:car}).addTo(map);
var marker2 = L.marker([26.47336296840691, 73.11549274391665], {icon:redIcon}).addTo(map);
var marker3 = L.marker([26.46623190470775, 73.11196505676078],{icon:bicycle}).addTo(map);
var marker4 = L.marker([26.47336296840691, 73.11549274391665], {icon:redIcon}).addTo(map);
var marker5 = L.marker([26.472489016685753, 73.11527823273175], {icon:man}).addTo(map);
var marker6 = L.marker([26.47278193530995, 73.11367978524191], {icon:redIcon}).addTo(map);
var marker7 = L.marker([26.471110848560432, 73.11198960989715],{icon:bike}).addTo(map);
var marker8 = L.marker([26.479350799700075, 73.11608098447324], {icon:redIcon}).addTo(map)
```

We now have an **“on click” function**, which makes the marker bounce and then move from the initial position to the final position at the speed we wish them to go after clicking on it. **L.Routing.control()** is a function in Leaflet which sets the shortest possible path between 2 coordinates (the initial and the final destination in this case). We can also take a longer route (if needed) rather than the route which is recommended by Leaflet, by adding the coordinates of another point on the route which we desire to go between the coordinates of the start position and the destination point.

Once there is a route found between these points, there is a **setTimeout function** made which makes the marker move between the initial and final positions via the route entered in the L.Routing.control() function. We can then set the speed by changing the value placed after the setTimeout function which actually determines the time before which the trip must complete (100*index in this case. 100 is in the milliseconds unit) to any value like 50*index, 200*index etc. The lower the value, the faster the vehicle’s trip completes.

This is the code for one trip. Multiple trips can be created by using the same process and changing only the initial and final destinations between which the vehicles have to travel. We can also make all of the markers move simultaneously by removing the “onclick” function, the bouncing function and only keeping the L.Routing.control() function.

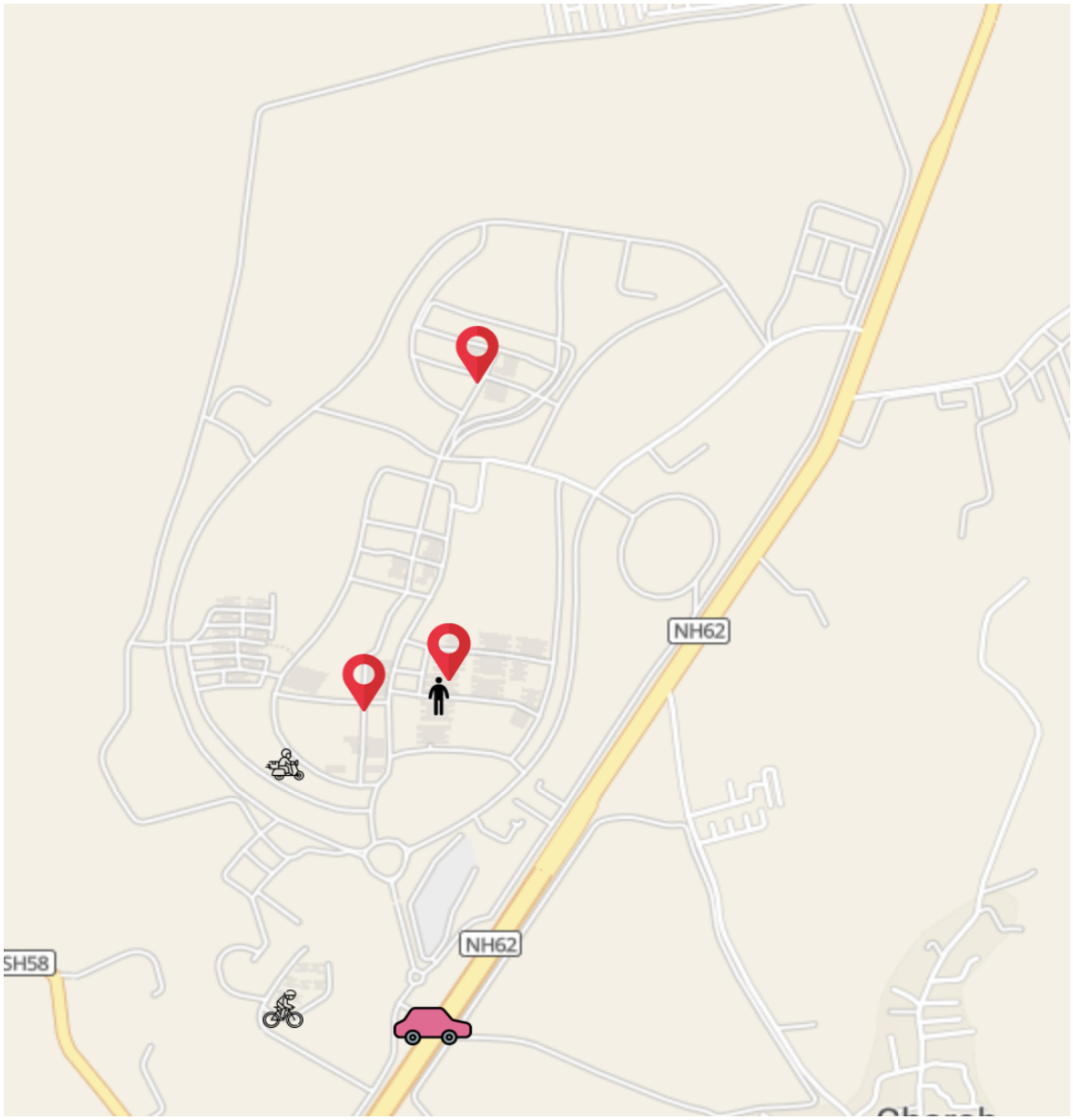
```
  marker.on('click',function(e) {
  console.log(e)
  // var newMarker = L.marker([e.latlng.lat,e.latlng.lng]).addTo(map);
  var pos = map.latLngToLayerPoint(marker.getLatLng())
  pos.y -= 25;
  var fx = new L.PosAnimation();

  fx.once('end',function(){
    pos.y += 25;
  fx.run(marker._icon, pos, 0.8);
  });

  fx.run(marker._icon, pos, 0.3);
  L.Routing.control({
    waypoints: [
      L.latLng(26.465895749384593,73.1151375786186),
      L.latLng(26.47336296840691,73.11549274391665)
    ],
  })
  .on('routesfound', function(e) {
    var routes = e.routes;
    console.log(routes);
    e.routes[0].coordinates.forEach(function(coord,index){
      setTimeout(function() {
        marker.setLatLng([coord.lat,coord.lng]);
      },100*index)
    })
  }).addTo(map);
})
```

Final Output:

The snapshot below shows the 4 different people at 4 different places which are the initial points and the red markers indicate the destination towards which they will be travelling.



On clicking each of the icons, they move from their start position to their destinations via the shortest path possible. A snapshot of the vehicles as they are moving is attached below. The instructions to follow while going between 2 different locations appears on

the right once the marker starts its journey. This is a default feature of the L.Routing.control() function.