**BDA PROJECT CHECKPOINT 2**

**SUBMITTED BY**

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**AIM:**

Propose a cost function to minimize on your project.

**COST FUNCTION:**

Cost = (Trip Time (mins) / 30 (mins)) + (1/10) (The time spent stopped in traffic, at stop signs, or at stop lights. / TIME (mins)).

The total cost function is composed of two parts: the objective function and the regularization. The objective in this case is to reduce the trip time from work to home or the other way round. The usual travel times is 30 minutes, so the travel time is normalized by 30 (as mentioned in the write up).

For the regularization part, we have decided to consider to reduce the time spent on stop signs or traffic lights. So, for calculating the total time stopped, we will compare the latitude/longitude with the corresponding time, and check if the coordinates have changed or not and in the process add the time in minutes wherever the coordinates remain the same or in other words, do not change. The total time will be the normalization for the regularization part of cost function. This data will be fetched and calculated from the GPS file provided to us. This will be coded when implemented. Then the factor of 1/10 assures that the regularization does not dominate the objective function (as in write up). The final computed cost has no units on it.

**POSSIBILITY OF NOISE:**

There is noise because the sensor may not fix at least four satellites reliably. The best example is that when the car is parked in the driveway, the track looks like it is moving around even though it is not moving actually. This is because the device has a hard time seeing enough satellites.

**Garmin Global Positioning System receivers** work by using GPS satellites that orbit the Earth. The orbits have been arranged so that there are at least four satellites visible to GPS receivers at any one time. The Garmin GPS receiver picks up the satellite signals and uses them to triangulate the user's location through a process called trilateration. The first satellite locates you somewhere on earth. The second satellite narrows your location to a circle created by the intersection of the two satellite spheres. The third satellite reduces the choice to two possible points. Finally, the forth satellite helps calculate a timing and location correction and selects one of the remaining two points as your position. There can be instances that the satellites are not found and as a result, we get spurious recordings like one mentioned above. Measures to reduce or avoid this are:

* Ensure that the antenna is flipped up to be parallel to the ground.
* If your device is trying to acquire satellites for the first time, it may take longer than normal to establish an initial position. If the device is powered on and outdoors with a clear view of the sky, this should not take more than 3-5 minutes.
* If your device does not have a full view of the sky while placed in the car, it may not acquire satellites properly. For best satellite acquisition, mount the device on the windshield or dashboard.
* If your device is indoors, it may not acquire satellites. Even standing next to a window indoors will block a majority of the sky which is needed for a device to locate and lock onto a satellite signal.
* If your vehicle has a protective coating on its windshield or electronic devices which interfere with the device receiving signal, your device may not be able to acquire satellites in this environment.
* Some vehicles are equipped with special windshields that may contain metal in the glass (metal oxide) that prevents the GPS device from having a clear line of sight to the satellites. Windshields with solar ray glass, solar tint, heated, or heat-reflective windshields and insulated or Insta-Clear glass may also affect satellite acquisition.
* If you suspect this to be an issue, try taking the device outside of the vehicle with a clear view of the sky for 3-5 minutes so that the device can acquire satellites. If your device loses satellites once moved back into your vehicle, this is most likely the reason.