Optimizing Map Navigation Using Contextual Information

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When solving and optimizing logistic problems, most of the widely used methods usually focus on attributes like distance or duration among two of the points on a map. By using services like Google Distance Matrix[1] we can even enrich the optimization algorithm with the information on the current traffic in the form of duration which increases if there are traffic jams caused by peak hours or accidents. All of this information is based on observations which are made in real time. Although it could be precise in larger cities, where you have the mass to cover the map in real time, there are many places in the world where you simply cannot identify the traffic. Also when given the requirement to predict travel times ahead of time, it's impossible to rely just on the current state of the traffic.

Thanks to the fact that GPS localisation enabled smartphones have become an indispensable gadgets used in everyday life and as such, among many other features, provide us an easy and uncostly way to use mobile map navigation. With emerging number of people using map navigation a great number of GPS traces[1] is left behind by the everyday use of map navigation. This enables services like Google distance matrix to ubiquitously use the active GPS sensors when possible to incorporate current state of traffic to the navigation process, however, in practice there is often the need to know the state of the traffic ahead of time. In that case we must account the contextual information of the environment to create a traffic dynamics prediction model.

There has been a considerable amount of research in this field, the most common scenario is to train a prediction model that considers the time information, such as time of the day, day in the week or season[2] but thanks to high availability of online information, we could easily enhance the prediction model by other contextual sources, such as weather information (intensity of wind, temperature, etc.) or proximity of locally important events. For locally important events[3] we could consider not only the obvious events by definition, like sport matches, concerts or conferences, but also

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[1] https://developers.google.com/maps/documentation/distancematrix/

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the areas around business centres or schools during the time period of start and the end of the work hours or we could consider the information whether it is holiday or not.

The idea of our project is to augment the duration or distance data between the points on a map with contextual information of the environment. The theory is, that traffic jams and the traffic dynamics overall show up in patterns. We want to analyse weather conditions, location and time to build a traffic dynamics model which could improve the relevance of traffic dynamics prediction. To confirm our hypothesis we will use a realistic dataset of car positions from a delivery company, where we will compare the results predicted by our model with the duration data retrieved from Google Distance Matrix service and the actual delivery arrival times.

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References

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