Identifying Landmarks and Relations in grounded route descriptions of IITK

Instructor: Prof. Amitabha Mukerjee
Group 17: Mohit Gupta and Subham Modi
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Motivation and Importance of Problem

Google Maps is the most popular navigation tool, which you must have used to find your doctor's clinic, a cinema hall or a friend's house. One just provides the source and the destination and receives as output the shortest path connecting them with a textual description of the turns and distances. But if instead you ask someone who knows the area well, the path between the same source and the same destination, it is very likely that we would get a very different type of response which would be more legible and more understandable, without even having to look at the map.

How is the response of an intelligent user different and more effective?
An Intelligent agent uses a landmark and other points of interest in the description and choice of path is also different, rather than choosing the one with the shortest distance which may be more complicated.
Example: If you want to explain the route to the Computer Center (CC) from Hall 2 to someone new to IITK, you would ask him to go straight towards the SAC crossing and then take a left towards the Auditorium and on reaching there, enter the gate opposite to it where he would see the CC building slightly rightwards. Instead if you yourself would go to the CC, then you would more likely take a path through the academic area.

"It is easier to follow directions if they are explained through a series of landmarks instead of street names. Landmarks play a central role in human spatial cognition. They are fundamental to the way humans learn an environment and construct mental representations of it. Landmark knowledge is the first level of spatial knowledge a person develops in a new environment. Because of their dominance in human mental representations of space, landmarks are widely used in human way finding and human communication about routes." *(Including Landmarks in Routing Instructions, 2010)*

Relevant Work Done

Prof. Matt Duckham and Prof. Stephan Winter from the Department of Geomatics at the University of Melbourne have developed for Whereis.com, an Australian web mapping and routing service owned by Sensis, a model for incorporating landmarks into routing instructions. The model relies on information about the types of landmarks present in the environment, in addition to the road network and route geometry. It is functional with a collection of about 170,000 landmarks in the whole of Australia.

Varunesh Mishra, Sushobhan Nayak and Amitabha Mukerjee investigated three path finding heuristics for way finding in hierarchical maps. They looked into their relative efficacy in predicting human behavior by comparing the results against paths obtained from subjects for a campus map. They also tried to provide an explanation based on working memory hypothesis and the properties of the regionalized environment like the college campus to explain this trend.

Method and Procedures

We plan to make a collection of several inputs in the form of natural language like an intelligent agent would explain a route between a given source and a destination to someone who is new to IITK. Our program would have to understand the language, read the landmarks and the path description from it and map them on the existing IITK map. We would hence find the popular paths and frequently used places which will we will use to generate more effective routes and their description in the form of natural language like an intelligent agent, using Natural Language Processing (NLP).

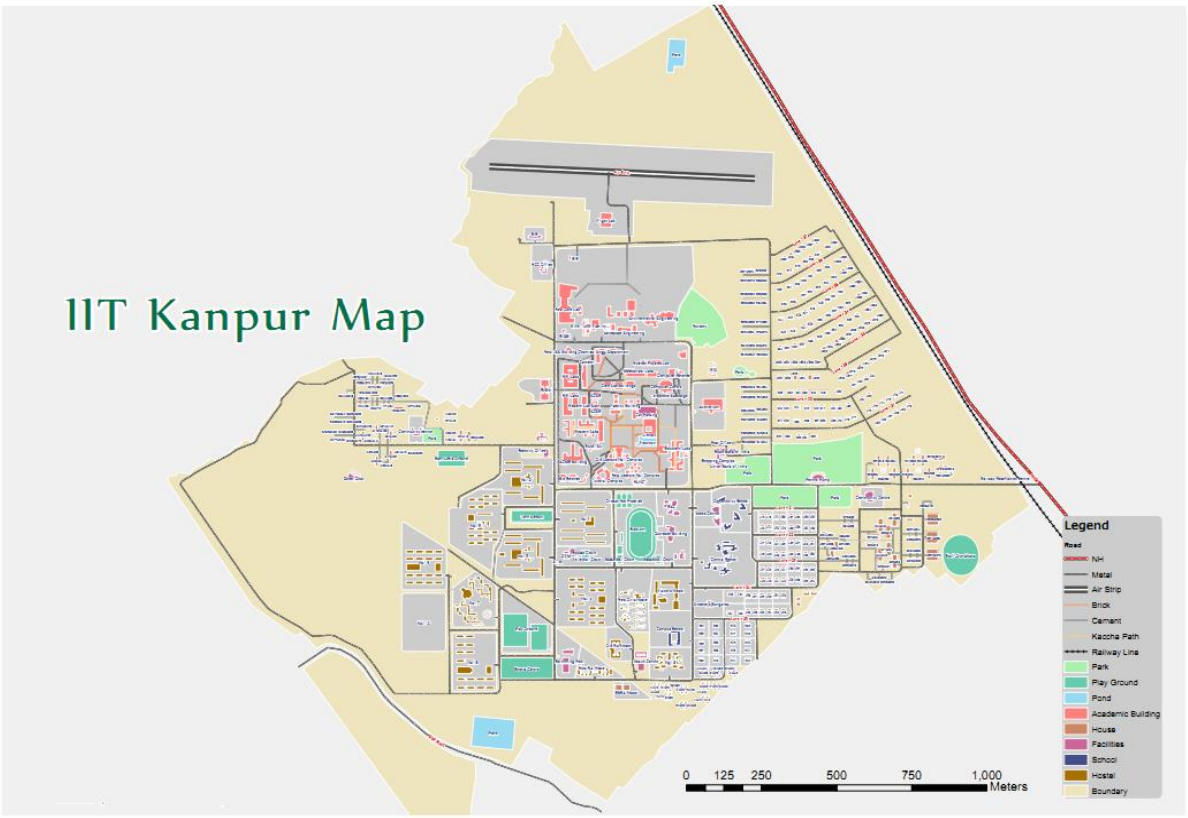

Figure: www.geokno.com [5]

We would associate a popularity counter to each elementary road unit. The roads will be ranked on the basis of higher popularity. The ranking, along with the length of the road will be jointly used as the cost to compute an effective route using a minimum cost path-finding algorithm.

Dataset and Source Codes

The map file (.shp) for IITK has been borrowed from Prof. Bharat Lohani, Dept. of Civil Engineering, IITK. A modified version of the file has been borrowed from Arbaz Khan, Dual Degree student, Dept. of Computer Science and Engineering, IITK.

References

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5. www.geokno.com/products/largemap.php