Location Unaware Wayfinding

A dissertation submitted
in Partial Fulfillment of the Requirements
for the Degree of

Btech-Mtech Integrated

by

Arbaz Khan

to the
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY KANPUR
April 27, 2014

CERTIFICATE

It is certified that the work contained in the dissertation titled **Location Unaware Wayfinding**, by **Arbaz Khan**, has been carried out under our supervision and that this work has not been submitted elsewhere for a degree.

Prof Harish Karnick
Computer Science and Engineering
IIT Kanpur

Prof Bharat Lohani
Department of Geoinformatics
IIT Kanpur

Prof. Stephan Winter
Department of Geomatics
University of Melbourne

April 27, 2014

ABSTRACT

Name of student: **Arbaz Khan** Roll no: **Y9227128**

Degree for which submitted: **Btech-Mtech Integrated**

Department: **Computer Science and Engineering**

Thesis title: **Location Unaware Wayfinding**

Names of Thesis Supervisors

1. **Prof Harish Karnick**
2. **Prof Bharat Lohani**
3. **Prof. Stephan Winter**

Month and year of thesis submission: **April 27, 2014**

A computational model of understanding place descriptions is a cardinal issue in multiple disciplines and provides critical applications especially in dialog-driven geolocation services. This research targets the automated extraction of spatial triplets to represent qualitative spatial relations between recognized places from natural language place descriptions via a simple class of locative expressions. We attempt to produce triplets, informative and *convenient* enough as a medium to convert verbal descriptions to graph representations of places and their relationships. We present a reasoning approach devoid of any external resources (such as maps, path geometries or robotic vision) for understanding place descriptions. We then apply our methodologies to situated place descriptions and study the results, its errors and implied future research.

Contents

Chapter 1

Introduction

1.1 Wayfinding

Human wayfinding is the process of purposeful and directed movement from an origin to a specific destination. The problem of wayfinding is the identification of the ordered sequence of actions to be performed in a spatial environment to reach at a desired location. In our everyday interaction with the spatial environment, we are involved with different instances of wayfinding tasks. In some, the exact sequence of actions is well familiar but in others we need either an external assistance or a personal strategy to find our ways. The modern advancements in technology have diminished the efforts involved in discovering and implementing wayfinding strategies. With the advent of smartphones, it has been made possible to build powerful applications which can show maps, compute routes and determine current location via GPS positioning. It has removed the complexities of carrying a map and understanding its symbols and notations. Significant efforts have been put into the research and development of the systems for navigational assistance using smartphones. Despite the powerful services offered as digital navigational aids, there come several issues along with it. Apart from the installation and usage costs associated with these services, the accuracy behind the positioning systems is a vital concern. The inaccuracies extend from measurement errors in positioning algorithms from the satellites to the map matching algorithms at the application

end. The situation becomes worse when the navigation route goes through narrow streets under tall buildings. Since the services rely upon the details in the map and the crowdsourced information available, the success in utility is highly variable.

In addition to the above shortcomings in modern digital navigation aids, research works have identified user preference for auditory presentation for route information as well as a memory advantage for auditory over visual information. Experiments have indicated that the reaction times are fastest with pure auditory route instructions as compared to electronic route maps or turn-by-turn displays.

These findings motivated us to work on a system which exploits the auditory mode of route guidance, eliminates the use of global positioning systems and works on minimum map information.

There have been several measures executed and advancements accomplished to decrease the accuracies.