

Thesis Project Portfolio

Engineering Route Planning Algorithms in Polar Coordinates

(Technical Report)

Delivery Apps' Convenient and Destructive Business Models

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

Introduction

Route planning algorithms serve as a building block to help transportation networks including cars, buses, and trains get from one point to another. These algorithms have gone through rapid development, resulting in advancements that have led to increased safety, reduced transportation expenses, and overall better planning for businesses.

Using route planning algorithms, third-party delivery companies continue to grow by generating large amounts of revenue from advertising ordering low-cost food. To increase usage, these delivery apps have minimized costs for consumers, forming a convenience culture to train them to expect what they want and when they want it. However, while making it convenient for consumers, delivery apps charge high commission rates for every order, squeezing restaurants with high fees. From the perspective of restaurants, these apps are predatory and leave them without much profit on the order.

In real world contexts, route planning algorithms are seen in various applications, including autonomous vehicles, and taxis. Most notably, these algorithms are at the core of the operation of the primary services delivery apps offer, from companies such as DoorDash, Grubhub, and Uber Eats. The exploration of creating better and new methods of route planning is directly related to the underlying technologies used by the products of these companies that are discussed as creating conflicting business models.

Technical Topic: Engineering Route Planning Algorithms in Polar Coordinates

Rigorous research has brought improvements to the functionality of classic route planning algorithms, but they have yet to be placed and examined in more complex settings. The

objective of my technical research is to adapt existing route planning algorithms to more complex environments and, potentially, further optimize them. More specifically, I will place these algorithms in polar coordinates to gain insight as to how they work, which will be done by building a simulator in the form of a Java applet. The end product will hopefully make the algorithms more efficient and improve route planning in practice.

STS Topic: Delivery Apps' Convenient and Destructive Business Models

The goal of my STS research paper is to detail the convenient business model third-party delivery apps have created for consumers, but the financially destructive business model they have created for workers and restaurants. Beneath their wonderfully designed route planning technology, delivery platforms leave restaurants with next to nothing, as reported by multiple sources. Although delivery platforms have promised a higher demand from customers to partnered restaurants, top takeout platforms bring on enormous fees and that recently there has even been a pushback against high commission-based delivery apps, even calling for boycotts. These delivery apps are taking advantage of and causing restaurants to lose the majority of their hard-earned revenue.

Conclusion

Creating the project from scratch, I built a Java applet useful for visualization, and numerous discoveries of graph algorithms in polar coordinates. Popular graph algorithms were placed in a unique environment, introducing a new perspective to their behavior. Although some progress has been made, going forward, more algorithms are to be implemented into the simulator, including A* and bidirectional search. Observations are still in the process of being

converted into optimizations to make them more efficient and improve route planning in practice.