Case Study

COLLECTING ORIGIN-DESTINATION DATA FOR PUBLIC TRANSITS

Innovative method of data collection is cost-effective and privacy-protective

Overview

Ottawa is Canada's capital, in the east of southern Ontario, near the city of Montréal and the U.S. border. As of 2018, the city's population was 1,363,000 people and increasing at a growth rate of around 1.34%.

The City of Ottawa

The City of Ottawa manages a wide range of public transit services through OC Transpo. This department transports around 340,000 people each day across the Ottawa-Gatineau region.

In the INRIX 2018 Global Traffic Scorecard, Ottawa was ranked the 68th most congested city in the world. In addition to the congestion negative impacts on the environment, it was also hurting businesses as they were reliant on roads for the transportation of goods and services.

Company Name: City of Ottawa
Date: January, 2018
Website: https://ottawa.ca/en

The Challenge

Per passenger, a bus carrying 40+ people takes up much less room on the road than the 58.5% of Ottawa citizens who drove themselves self to work in 2016. With the main contributor of congestion being traceable to the vast, and growing, number of individual cars on the road, the question remained on the best way to reduce personal vehicles and encourage public transit usage. To encourage people to use public transportation and to switch from private vehicles, this mode of transportation needed to be well-designed, reliable, and comfortable.

Overall, public transit agencies needed to make operational decisions that would increase the efficiency of their services. Such decisions would be reliant on estimating the number of passengers, identifying their origins and destinations, and optimizing the travel cost. As a result, the objective of this study was to capture the travel route and origin-destination information along the OC Transpo Bus in Ottawa and use the information to better manage and optimize Ottawa transit.

The Solution

SMATS' took an innovative approach to solving the traffic congestion problem using Wi-Fi and Bluetooth sensors for route travel times, as well as passengers' origins and destinations. For this case, specifically, SMATS TrafficBox™ portable sensor was placed in the bus for capturing and storing signals from mobile devices. The TrafficBox™ was also equipped with a GPS module, a battery, and a processing unit.

The SMATS TrafficBox™ captured passengers' devices' Wi-Fi and Bluetooth MAC addresses passively and anonymously. It also stored the detecting signals' timestamps, their Received Signal Strength Indicator (RSSI), and the sensor location. TrafficBox™ could detect 3 types of Bluetooth signals: Bluetooth Connected, Bluetooth Discovery, and Bluetooth LE, as well as Wi-Fi signals.

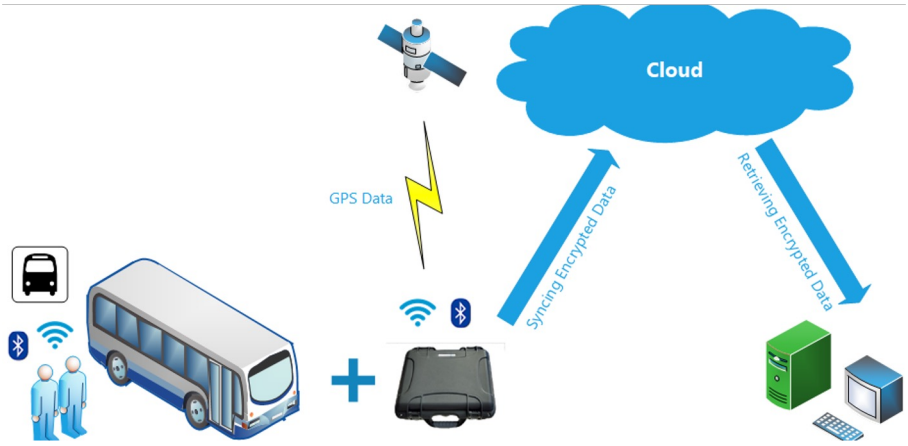
The Results

The study found that people were using public transit more during rush hours, so SMATS collected data during these peak times to obtain the largest volume of relevant data possible. From there, the study determined the peak time was during evening rush hour from 4:00 PM to 5:30 PM and that period was monitored for six days. Among different urban routes along the Ottawa Transpo line, route 87-Baseline was selected because it serves downtown Ottawa and has plenty of bus stops.

After cleaning the data set from outliers, SMATS used clustering techniques to separate passengers from non-passengers' signals automatically. Therefore, the following features were extracted from the raw data set:

- The average of RSSI: Summation of all the RSSI values for each MAC address divided by its counts.
- The variance of RSSI: Variance of all the RSSI values for each MAC address.
- The number of detection: Number of all the records for each MAC address.
- Travel time: Difference between the last and first detection time.
- Travel Distance: The route distance between entry and exit coordinates.

With the collected data and applied filtering algorithms, SMATS was able to distinguish the signals of passengers from non-passengers and determine their origin-destination (OD) information. By comparing the passenger manual counts, an average sample rate of 20% was calculated. In addition, by comparing ground-truth OD data and passengers' cluster, passengers OD was estimated with around 90% accuracy.



SMATS for Public Transits

Traditional methods for gathering origin-destination studies include observational surveys and studies, which are unfortunately subject to response biases. With SMATS Traffic Data Management, OC Transpo was successfully able to collect origin-destination data with 90% accuracy. Furthermore, the method of data collection used by SMATS was cost-effective, non-invasive, and privacy protected, unlike traditional methods.

Let us help you achieve your traffic management goals

Get a FREE demo: info@smats.ca