

# Evaluating the traffic conditions from Tsukuba station to Tsuchiura station in Japan at three different travel time schedules

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## 1. Motivation

Information on road traffic condition is very important for public commuters. It can provide guidance to commuters, *e.g.* the best time to travel from one particular place to another.

## 2. Introduction

The advancement of technology particularly in the field of geography has provided opportunity to evaluate situations/conditions affecting our daily lives. For example, a Global Positioning System (GPS) receiver in conjunction with Geographic Information System (GIS) can be used to evaluate traffic conditions.

The objective of this fieldwork is to evaluate the traffic conditions from Tsukuba station to Tsuchiura station in Japan at three different travel time schedules using mean speed and overall travel time as indicators.

## 3. Study Area

The fieldwork was carried out in the two cities in Japan, namely Tsukuba and Tsuchiura (Fig. 1.).

## 4. Methodology

To attain the purpose of this fieldwork, on November 28, 2011 (Monday), I travelled from Tsukuba center to Tsuchiura by bus three times following the three travel time schedules: T1= 8:30; T2=12:06 and T3=18:06 (*exact time when the bus left Tsukuba bus station*). While on board the bus, the locations of the designated bus stops were marked using a GPS receiver (Fig. 1). The GPS tract line and waypoints containing the coordinates and time were downloaded and processed in ArcGIS.

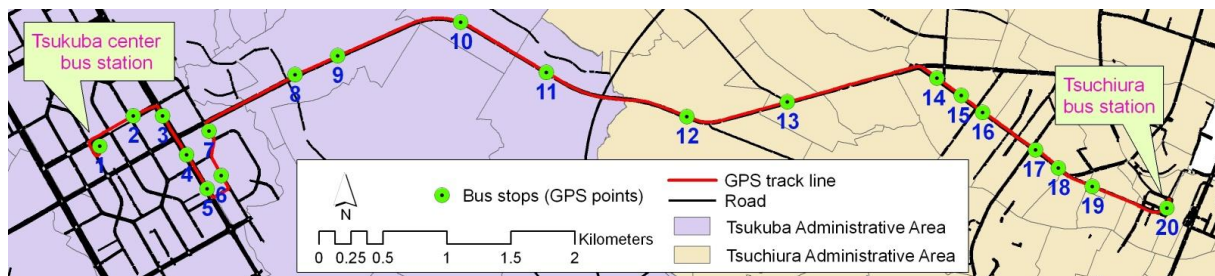
The track line was split into route segments based on the waypoints (designated bus stops) and the length of each segment or the distance between two adjacent waypoints was determined. The travel speed for each segment was calculated by dividing the length of the segment over the travel time between the two waypoints that composed the said segment. The calculation of speed for each segment was done in all three travel time schedules. One-way Analysis of Variance (ANOVA) was done to determine whether there is a significant difference in the mean travel speed of the three travel time schedules.

## 5. Results and Discussion

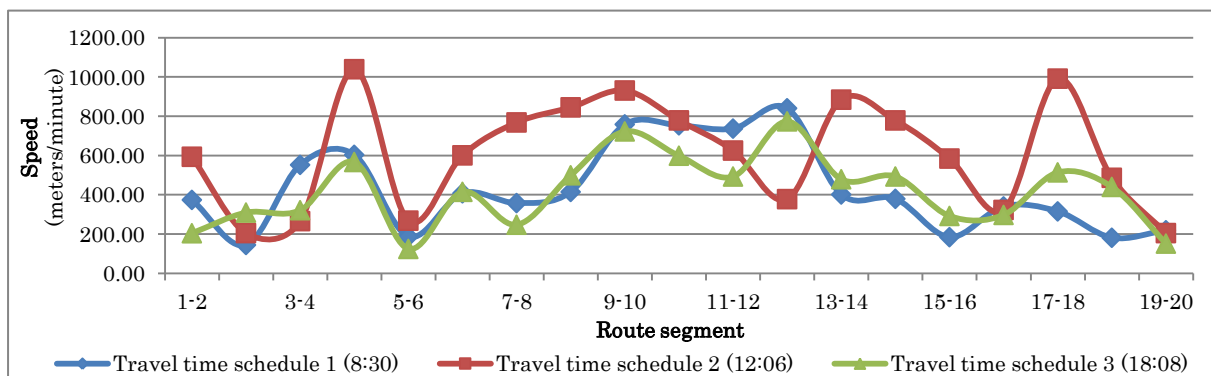
The main results are presented in Fig. 2 and Table 1. The ANOVA results revealed that there are statistically significant differences between the mean speed of the three time schedules ( $F(2, 54) = 4.146, p = 0.021$ ). A Tukey's post-hoc test revealed that there is a significant difference in the mean speed between T1 and T2 ( $p = 0.049$ ) as well as between T2 and T3 ( $p = 0.035$ ). However, there is no significant difference in the mean speed between T1 and T3 ( $p = 0.988$ ).

**Table 1.** Mean route segment speed and overall travel time

Schedule	Mean route segment speed (m/min)	Overall travel time (min)	Number of initial passengers	Number of stops
T1	429.24	28.33	12	8
T2	608.21	22.10	5	4
T3	418.32	31.60	25	9



**Fig. 1.** The GPS tract line and the 20 designated bus stops marked by GPS waypoints



**Fig. 2.** The calculated speed for each route segment for the three different travel time schedules