

# The Effect of Real-time Traffic Information System Relieving Traffic Congestion

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**Abstract:** This study investigates the effect of real-time traffic information on the traffic flows in Korea. Recently, the development of smartphones has made it easier to use the route guidance service based on real-time traffic information. By the Big Data analysis in the study, it was found that the number of postings on the web community sites increased sharply in 2010 and 2011 when the smartphones spread widely. In the analysis of the traffic speeds by time, the average traffic speeds for morning and evening rush hours on weekdays from 2009 to 2014 of the 142 sections in the 6 national highways in Gyeonggi-do, Korea were used. From the results of the analysis, it was found that the percentage of the number of sections with the improved traffic flows increased greatly in 2012 compared to 2011. The findings of the study indicate the effect of the real-time traffic information on improving traffic flows.

**Keywords:** Big Data, Real time, Traffic information, Congestion, Smartphone, Navigation

## I. INTRODUCTION

With the widespread of smartphones, access to real-time traffic information has been improved. In case that the number of drivers using the same route guidance service and traveling to the same destination increase, it can be suspected that travel time increases due to the increase of the traffic for that route. Therefore, it is necessary to investigate if the real-time traffic information improves the traffic flow.

The aim of this study is to investigate the effect of real-time traffic information on traffic flows in Korea. With the Big Data analysis, the usage pattern of the real-time traffic information and its effect on traffic flows were identified.

## II. ANALYSIS OF REAL-TIME TRAFFIC INFORMATION USE

The service providers of the real-time traffic information navigation in Korea do not release the data for the number of the usages of their services on the real-time traffic information. Thus, the research data to identify the usage pattern of the real-time traffic information was drawn from internet postings.

In the study, the number of postings was considered the indication for the amount of the real-time traffic information use. The internet postings regarding “Kimgisa”, “T Map”, “OllehNavi” which are the three most widely used smartphone navigation applications were crawled from the three major web community sites in Korea, Naver Café, Naver Blog, and Ppomppu. In this manner, 62,835 postings posted from January 2008 to June 2015 were collected, and the number of the postings by year was counted [1,2,3].

The filtering function of the search engine, Naver, was used to filter the postings duplicated or including some extraneous keywords like “Pabnida” or “Oppa”. There were many postings for sales on the web sites and most of them include “Pabnida” which means “Sell” in Korea. These postings should be removed for an accurate counting.

In addition, there were the postings including “Kimgisa” with other meaning than the smartphone navigation application. The word “Kimgisa” is often used as a nickname for a boyfriend or a husband meaning women’s personal driver. Obviously, “Kimgisa” in these cases is not related to real-time traffic information, so the postings including “Kimgisa” with a meaning of a boyfriend or a husband should be excluded. In this manner, postings related to the smartphone navigations were obtained.

Even after the first filtering using the filtering function of the search, some postings irrelevant to the smartphone navigation applications could still remain. In order to get rid of the remained irrelevant postings, R program was used for the second filtering. With the second filtering, the postings not related to the smartphone navigation applications were removed completely from the counting.

As shown in Figure 1, the number of postings increased sharply in 2010 and reached the peak in 2011. It is almost certain that this sharp increase occurred due to the widespread of smartphones which started in 2010. After that it shows a decline until 2012 and gradually increased again. From this, we concluded that 2011 can be considered the benchmark that we can tease out the impact of real-time traffic information on traffic flows.

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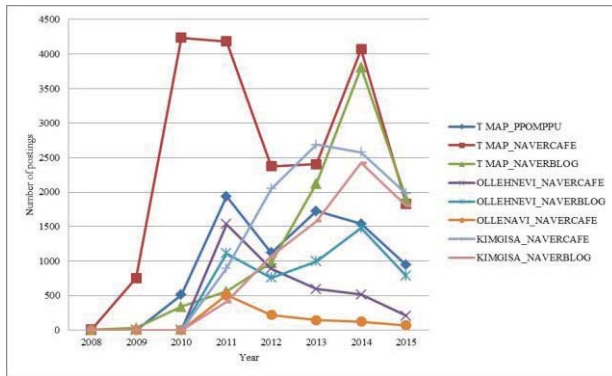


FIGURE 1. Yearly Number of Postings

### III. TRAFFIC SPEED ANALYSIS

To analyze the traffic flow, the average traffic speeds for morning and evening rush hours (7 AM, 8 AM, 9 AM, 5 PM, 6 PM, 7 PM) on weekdays from 2009 to 2014 in the 142 sections of the 6 national highways in Gyeonggi-do, Korea were used. The 6 national highways investigated in the study are national highway no.1, no.39, no.43, no.45, no.46 in Gyeonggi-do. The 142 sections include the up and down lines. The data of the traffic speeds by time of the sections was used from Gyeonggi-do Transportation Information Center [4].

Based on the data, the hourly average traffic speeds of each rush hour time (7 AM, 8 AM, 9 AM, 5 PM, 6 PM, and 7 PM) for each year were compared to those for its previous year. The comparisons were statistically conducted to find out if the average speeds of the time for the year increase over the previous year. T-test and Wilcoxon test were used in the comparisons of the average speeds, depending on the normality and homoscedasticity of the data. The confidence level of the comparisons is 95%.

Exceptionally, the speed data in 2009 has only a data set from September to December, so a comparison of 2009 and 2010 used data sets from September to December in 2009 and 2010.

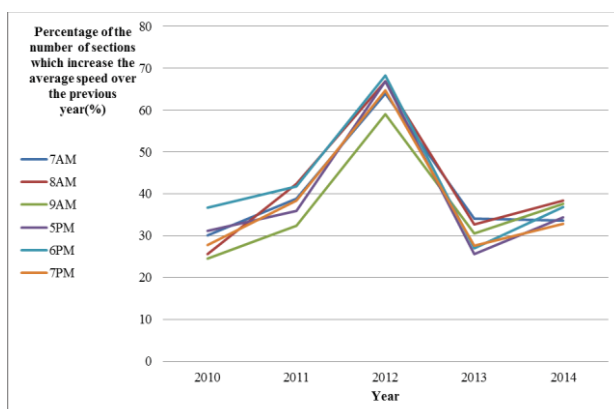


FIGURE 2. PERCENTAGE OF THE NUMBER OF SECTIONS WHICH INCREASE THE AVERAGE SPEED OVER THE PREVIOUS YEAR

The results of analysis of the traffic speeds (Figure 2) show the percentage of the number of the sections in which average traffic speeds by time significantly increase over

last year. As shown in Figure 2, the percentage of the number of the sections for the significant speed increases over the previous year jumped sharply in 2012.

The road repair status in Gyeonggi-do from 2009 to 2014 [5] shows that the costs of road repair and the number of road-widening works during this period did not increase especially. This road repair status indicates that the improvement of the traffic speeds in 2012 over 2011 is not simply due to road repairs or road widening. Also, registration of cars in Gyeonggi-do did not decrease during this period [6], thus indicating the number of cars in Gyeonggi-do is not a cause for the speed improvement in 2012.

Thus, by considering the road repair and car registration status and the usage pattern of the real-time traffic information, we could conclude that the effect of real-time traffic information caused the traffic flow to improve. After 2012, the traffic speed increases compared to the previous years did not appear remarkably. This is probably because improving effect on traffic flow by real-time navigation reached the limit.

The reason for the gap between the time in which traffic flow was improved sharply and the time in which the number of the real-time traffic information peaked was considered that smartphone navigation applications started service in the early 2011 and took about a year to secure many users.

### IV. CONCLUSIONS

By the Big Data analysis in the study, it was found that the number of postings on the web community sites in Korea increased sharply in 2010 and 2011 when the smartphones spread widely. From the analysis of the traffic speeds for rush hours of the 142 sections in the 6 national highways in Gyeonggi-do in Korea, it was found that the percentage of the number of sections with the improved traffic flows increased greatly in 2012 compared to 2011.

By considering the road repair and car registration status, the usage pattern of the real-time traffic information, and time to secure users of real-time traffic information, we could conclude that the effect of real-time traffic information caused the traffic flow to improve. The findings of the study indicate the effect of the real-time traffic information on improving traffic flows.

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