Research on early verification method for traffic safety countermeasure effectiveness based on traffic behavior observations

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1. Introduction

Traffic safety countermeasure effectiveness is verified mainly using accident data. However, the occurrence probability of traffic accidents is low so it takes about four years to collect the accident data necessary for verification of effectiveness, and there are cases where, if a follow-up countermeasure is needed, the confirmation of its need and its implementation are delayed.

So the National Institute for Land and Infrastructure Management aims to establish a method of rapidly verifying the effectiveness of countermeasures by observing change of traffic behavior after the implementation of each countermeasure.

2. Verification of traffic safety countermeasure effectiveness by observing traffic behavior

This research was a trial verification of countermeasure effectiveness based on a number of indices. The following is an example.

The object location is a location where the number of right turn collisions was reduced by the right turn guide line. The right turn guide line which was installed guides cars whose drivers intend to turn right to the appropriate position to stop and wait before turning right at the intersection. Its purpose is to make it easy for these drivers to confirm the locations of cars traveling straight from the opposite direction (oncoming cars), so they do not start their turn at a dangerous time.

First, as an index to quantitatively represent change of traffic behavior (time to start the right turn) to be improved by the right turn guide line, the position of oncoming cars at the time the right turn begins (time when the car turning right passes the waiting location indicated by a white line on top of the right turn guide line) was measured. The location of the oncoming car is represented by the distance to the stop line from the car among oncoming cars which is nearest to the stop line. Figure 1 organizes the correlation between the frequency that the oncoming car location at the time a right turn starts was at or below the thresholds (30m, 40, 60m) with the average annual number of right turn collisions. The number of cars turning right during the



Figure 1. Locations of Oncoming Cars at Start of Right Turn Figure 2. Difference in Time of Entry to Collision Are

time period of the measurements was 18 before the countermeasure and was almost identical at 17 after the countermeasure. A positive correlation was seen between change of the number of accidents and change of the index, and it is assumed that it is possible to measure the reduction of accidents based on the reduction of the frequency the location of the oncoming car when a driver started a right turn was at or lower than the threshold value.

It is considered to be possible to verify the effectiveness of a countermeasure based on an index which represents the change of traffic behavior to be improved by the countermeasure in this way.

Next, as an index which quantitatively represents the danger of a collision, the area where the traveling courses of a car turning right and an oncoming car overlap was defined as the collision area, and the difference between the times the cars enter this area was measured. Figure 2 organizes the correlation of the frequency that the difference in entry time is at or below the threshold (3 seconds, 4 seconds, 5 seconds) with the annual number of right turn car – oncoming car accidents. There is a positive correlation with the number of accidents, so it can be hypothesized that accidents are reduced by lowering the frequency that the difference between the times of entry to the collision area is at or lower than the threshold value.

It is assumed to be possible to verify countermeasure effectiveness, even with an index representing the danger of collision in this way.

3. Summing up and future challenges

The above results show that in order to verify the effectiveness of a countermeasure based on traffic behavior, selecting the index is important. In the future, it will be clarified what kinds of traffic behavior indices should be used for which kinds of accidents and traffic safety countermeasures, to establish early verification methods for countermeasure effectiveness based on traffic behavior.