U-turn at midblock median opening is frequently provided in developing countries to facilitate the local access. U-turn movement at the midblock median opening is primarily based on gap acceptance process. The u-turn driver musts wait for a large enough gap of through traffic to make a u-turn maneuver. The u-turn traffic interrupts the through traffic streams and sometimes creates problems on the road network. The traffic operation at u-turn should be improved by some measures. Currently, traffic police controls and manages the u-turn facility in peak periods for smoother traffic flow. This study aims to improve the capacity of u-turn at midblock median opening by implementing the control at u-turn.

This study has three main topics: u-turn behavior, u-turn capacity, and u-turn control. The behavior study investigates the behavior of u-turning vehicle to identify the significant factors on driver’s decision. The potential factors are evaluated to know their significance level. The capacity study evaluates the existing capacity model and proposed estimation improvement. The estimated capacities from the two methods are compared with the field capacity. The control study provides a control warrant for u-turn and evaluates the effect of police control. The waiting time is estimated and its function of the conflicting traffic volume is formulated. The control warrant is recommended based on the waiting time threshold.

The significant factor identification employs the binary logistic regression technique. The technique examines the significance levels of all potential factors. This method also yields the u-turn decision model based on the significant factors. The u-turn capacity is estimated by the gap acceptance model and compared with the field capacity. The adjustment method to improve the u-turn capacity estimation is based on the balancing of volume-to-capacity ratio (v/c). This method incorporates the traffic interactions between the two traffic streams. The waiting time estimation utilizes the spreadsheet simulation. The randomly generated gaps are compared with the preset critical headway to determine whether the u-turn vehicle accept the gaps or not. The waiting time of a driver is the accumulation of his/her rejected gaps. The evaluation of police control is based on the comparison of discharge headway between the continuous u-turn movement with and without control.
From the considered eight factors, gap size, speed of conflicting vehicle, and waiting time at the front position of the queue are statistically significant at the confidence interval of 95%. It is interesting to find that the queue time does not significantly affect the u-turn decision. The waiting time of more than 30 seconds would frustrate the drivers to accept the significant smaller gap. The developed u-turn decision model, which explanatory variables included gap size, conflicting speed, and waiting time, can predict the u-turn decision well with the percentage correctness of more than 85%. For capacity estimation, the gap acceptance model overestimates the field capacity in case of negative exponential headway distribution and underestimates in case of Erlang-2 distribution. The difference in driver behavior when responding to different conflicting headway can properly explain the situation. The proposed adjustment method can estimate the capacity closer to the measured field capacity than the gap acceptance model does. For waiting time estimation, the u-turn traffic characteristics (volume, random or queued, follow-up condition) do not affect the amount of waiting time. The relationship between waiting time and conflicting flow rate is in the exponential form. The influence of headway distribution type is much higher than the effect of critical headway value. When considering the randomness of the critical headway, the estimated waiting time is decreased. The control warrant in term of conflicting traffic volume can be determined by the inverse of waiting time function, given the impatient waiting time threshold. When a police controls u-turn, the queue discharge characteristic is similar to the movement at a signalized junction. The u-turning vehicles move with smaller departure headway; consequently, the police control increases the u-turn discharge flow rate of about 10%. The wider median results in the higher u-turn movement headway and the lower discharge flow rate. However, too narrow median causes uncomfortable u-turn maneuver, decreases the discharge flow rate, and diminishes the efficiency of police control.