Establishment of PCU Values for Urban Intersections Using Drones

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Abstract

Passenger Car Unit (PCU) is used to convert heterogeneous traffic conditions into a uniform traffic flow rate when designing roads and intersections. The impact generated by mixed traffic condition, especially in developing countries, makes it different from factors used in similar countries and also vehicle operating characteristics, road-related parameters & environmental condition makes it more country-specific. Since the PCU factors currently practiced in Sri Lanka are older than 20 years (seems outdated), a revision is needed to establish a new set of PCU factors to represent the real context. In general, practical difficulties associated with data collection and complexity in methodologies have hindered such timely revisions, especially in developing countries. However, some studies were carried out recently to identify appropriate PCU factors for four-lane & two-lane roads in Sri Lankan but not for intersections. The application of drones for traffic engineering purposes is becoming more common now and it has proven records to eliminate many obstacles we had before such as cost for data collection using multi-video cameras, observers & providing the other facilities. Also, it minimizes the practical difficulties that occurred in data collection & processes. The level of accuracy of video footage is higher in a stable bird eye view mode and thus unmanned aerial vehicles (Drone) are been used effectively in various applications in traffic engineering. Therefore, the objective of this research is to develop a methodology to develop PCU factors using drone videos. In this study, the area occupancy of different categories of vehicles at various traffic compositions is compared with the passenger car only traffic conditions having the same stream speed. Since video-based traffic data could provide accurate information with respect to vehicle movement and related characteristics, drone videos were used to collect traffic data at an intersection. Overcoming the difficulties had with drones like short flight time, the effect of the weather & drone Wireless Problems, Basic headway method was used in this study to develop a framework to calculate PCU factors. Applying the method developed, PCU factors for ten (10) vehicle categories were developed. There is a significant variation in Three Wheelers, Motorcycles & the Commercial Vehicles, compared to the literature. The study was limited to the development of PCU factors for intersection only (for traffic signal design). However, considering the accuracy of the method proposed and other practical advantages (less cost and easy to collect data) there is a high possibility to extend the same method to determine the PCU factors on other road sections, such as arterials, highways, and freeways in the future.

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