The Ohio State University Campus Area Bus Service
Automated Traffic Surveillance Using Existing Cameras on Transit Buses
Dataset Repository

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Note: This document is created to allow the DOI of the dataset to publish while waiting for formal clearance to release the data. The publication of the journal article in MDPI Sensors is on hold pending the activation of this DOI link. Data will be uploaded as soon as formal clearance is obtained from the OSU Counsel's Office of Public Records.

This dataset contains the raw data used in the research and development study reported in "Automated Traffic Surveillance Using Existing Cameras on Transit Buses".

This dataset consists of 11 video clips, each approximately 20 min. in duration, taken from the driver (left) side read camera of an in-service Ohio State University (OSU) Campus Area Bus Service (CABS) 40-foot transit bus running the West Campus Loop route. One set, consisting of 7 videos, was collected on a sunny day in October 2019. A second set, consisting of 3 videos, was collected during and after periods of rain and heavy rain in March 2022. Each video is accompanied by manually extracted ground truth of vehicles, and some other objects, that are in the roadway and observed by the camera.

The camera is located:

The route is illustrated:

Table of Video Clips:

Discussion of Ground Truth file format:

Publication: Keith A. Redmill, Ekim Yurtsever, Rabi G. Mishalani, Benjamin Coifman, and Mark R. McCord, "Automated Traffic Surveillance Using Existing Cameras on Transit Buses". MDPI Sensors, accepted 12 May 2023. Complete citation to follow upon publication.

Abstract: Millions of commuters face congestion as a part of their daily routines. Mitigating traffic congestion requires effective transportation planning, design, and management. Accurate traffic data are needed for informed decision making. As such, operating agencies deploy fixed-location and often temporary detectors on public roads to count passing vehicles. This traffic flow measurement is key to estimating demand throughout the network. However, fixed-location detectors are spatially sparse and do not cover the entirety of the road network, and temporary detectors are temporally sparse, providing often only a few days of measurements every few years. Against this backdrop, previous studies proposed that public transit bus fleets could be used as surveillance agents if additional sensors were installed, and the viability and accuracy of this methodology was established by manually processing video imagery recorded by cameras mounted on transit buses. In this paper, we propose to operationalize this traffic surveillance methodology for practical applications, leveraging the perception and localization sensors already deployed on these vehicles. We present

an automatic, vision-based vehicle counting method applied to the video imagery recorded by cameras mounted on transit buses. First, a state-of-the-art 2D deep learning model detects objects frame by frame. Then, detected objects are tracked with the commonly used SORT method. The proposed counting logic converts tracking results to vehicle counts and real-world bird's-eye-view trajectories. Using multiple hours of real-world video imagery obtained from in-service transit buses, we demonstrate that the proposed system can detect and track vehicles, distinguish parked vehicles from traffic participants, and count vehicles bidirectionally. Through an exhaustive ablation study and analysis under various weather conditions, it is shown that the proposed method can achieve high-accuracy vehicle counts.

Keywords: vehicle detection and tracking; traffic monitoring; computer vision; intelligent transportation systems