Transportation Research Board – AED50 Data Challenge

LiDAR datasets for TRNSFOR22 competition were collected at the intersection of MLK and Georgia Ave in Chattanooga, TN. Three Ouster® OS1-128 LiDAR sensors (10Hz rotation frequency) were permanently installed on light poles to capture the real-time movement of all road users, including vehicles, pedestrians, cyclists, etc. A snapshot of Google Map and the actual intersection scene is shown in Fig. 1.

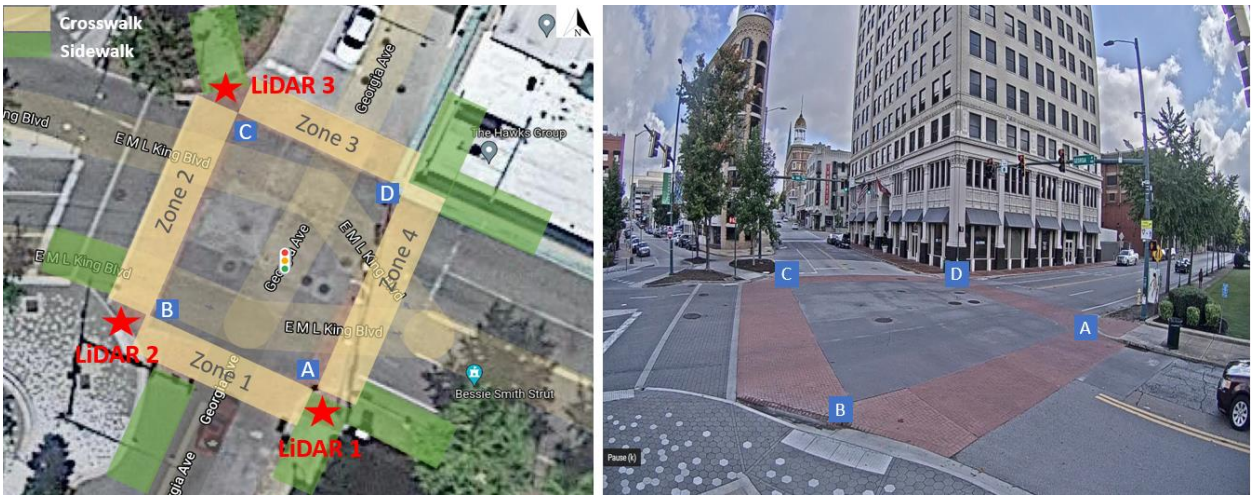

Fig. 1 Data collection site.

The raw LiDAR point cloud data have been pre-processed by Seoul Robotics software. The output of detected road user information was saved in CSV files, which can be downloaded from the competition website. The attributes of LiDAR data are provided in Table 1.

Table 1. Attributes of LiDAR data.

Attributes	Unit	Note
Timestamp	millisecond	Unix timestamp of LiDAR input message
ID		The ID of the object
Label		None (0), Car (1), Pedestrian (2), Cyclist (3), Misc (4)
Confidence		Confidence of tracking quality (0.0~1.0)
BBox_Position_X	meter	Center X of bounding box
BBox_Position_Y	meter	Center Y of bounding box
BBox_Size_X	meter	Longitudinal length of the bounding box (relative to yaw)
BBox_Size_Y	meter	Lateral length of the bounding box (relative to yaw)
BBox_Size_Z	meter	Height of bounding box
BBox_Yaw	rad	Heading (0.0~2.0Pi)
Velocity_X	meter/second	Velocity in longitudinal direction
Velocity_Y	meter/second	Velocity in lateral direction

Tracking_Status		None (0), Validating (1), Invalidating (2), Tracking (3), Drifting (4), Expired (5) **Validating**: checking validity in the early stage of tracking. **Invalidating**: short term prediction when tracking is lost in *Validating* status. **Tracking**: stable tracking. **Drifting**: short term prediction when tracking is lost in *Tracking* status. **Expired**: expired tracking.

To help contestants better understand the traffic environment at the selected intersection, screen records of real-time detection and tracking of road users using Seoul Robotics software are provided in Fig. 2. As shown in the figure, when an object is detected and tracked, it will be covered in a cylinder or rectangular bounding box, depending on the classification of the object:

- Red: Car/Rectangular
- Yellow: Cyclist/Rectangular
- Green: Pedestrian/Cylinder

Note: In the CVS files, vulnerable road users may be classified as cyclists or pedestrians.

Each tracked object gets a unique ID number that stays with the object until tracking is lost. If the object reappears (*Drifting*) in the expected location based on previous direction and velocity, the reacquired object will regain its previously assigned ID. If an object is lost for a longer period of time, it will permanently lose its ID and will be assigned a different ID if it is detected again.

Fig. 2 Screen record of LiDAR data.

In addition to the point cloud data, signal performance logs (SPM) were collected from the traffic control for the duration of data collection. These provide a real-time log of traffic signal operations including phase calls, detector status and signal status. The event types and associated IDs along with the phase diagram for the intersection are included in the dataset. The performance log CSV consists of records with the attributes defined in Table 2.

Table 2. SPM logs event attributes.

Attributes	**Unit**	**Note**
Timestamp	millisecond	Unix timestamp of event
Code	eventID	Event code or operator.
Param	eventID	Param or affected operand. (e.g., Phase, Detector, Call, etc)
Mapped Message		Mapped message using the Code and Param.

Fig. 3 below shows the phases for both vehicles and non-motorized road users.

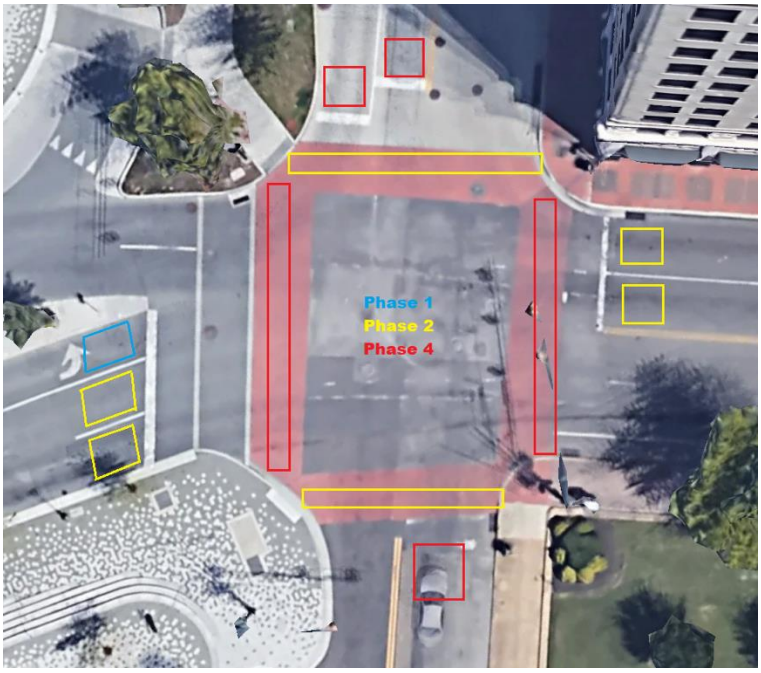

Fig. 3 Signal phases.

Download Data from the Website

Using the given link with password, contestants will be able to download a demo dataset and competition datasets. The demo folder includes 30-second data for contestants to familiarize themselves with the environment and context of the intersection. The competition folder only includes three segments of data that will be used for the data challenge. Please note that the 30-second data in the demo folder is extracted from the data in the competition folder. Details of what each folder contains are provided below.

Demo Folder:

- Video recording
- LiDAR recording
- LiDAR output CSV file
- SPM

Competition Folder:

- LiDAR output CSV file
- SPM