The Transportation Infrastructure Perception and Data Fusion

Design Team - SD2 Spring 2021

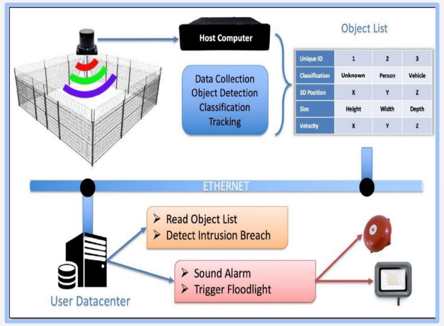
UNC CHARLOTTE

Project Overview

The Transportation infrastructure perception and data project utilizes advanced sensing technology to collect raw data. This data will consist of 3D cloud point data, Graphical data and visual data for analysis. This data will then be condensed for analysis.

Project Requirements

- Create a comprehensive infrastructure perception system utilizing Cameras, LiDAR, Radar and DSRC.
- Collect data sets from each piece of technology and store.
- Produce a cleansed dataset for research.



Sensing Technology

Cameras

- 180 degree/360 degree VUZE XR.
  - 360 degree viewing camera
  - Wireless control
  - Drone Implementation
- Stereo IR MYNT EYE
  - Stereo IR Camera
  - Depth and 3D Reconstruction
  - OpenCV Object Detection.

LiDAR

- Mountable Flow management.
- 360° of Accurate High-volume 3D object tracking.
- Day or Night
- Range 2-150 meters
- Qortex 2.0 and Q-view platforms for collections of 3D cloud data.

Radar

- Mountable radar device capable of measuring distance and signal strength
- Stationary and mountable application
- Detects moving and stationary objects at a range of 1-40 meters
- Adjustments can be made through the software
- Requires a power supply of 12-30 V dc
- Sensing functions are unaffected by poor weather.

Drone

- Platform for mobile collection.
- 35 min flight time
- GPS, long range telemetry radio
- Water Resistant for inclimate weather

Project Software

LiDAR:

Q-View: Sensor Management
Qortex 2.0: 3D Perception Sensing

Radar:

Banner Radar Configuration Software, Microsoft Excel

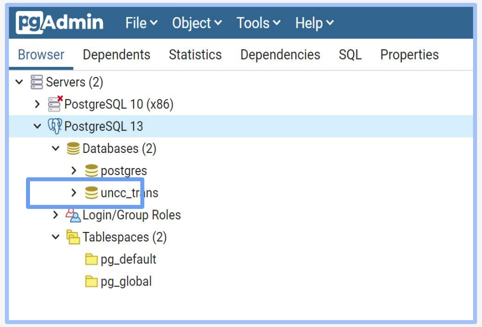
Camera:

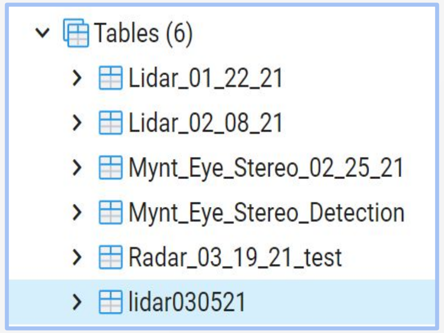
C++ Program for running different camera functions.
Python script running YOLOv3 object detection for photo, video, and live video feed.

Drone:

Mission Planner Flight Software

Database





Statistical Queries

Query Editor | Query History

```
SELECT distinct id, AVG(size_x), AVG(velocity_x),AVG(accleration_x)
FROM lidar030521 Group by id;
```

Data Output | Explain | Messages | Notifications

	id integer	avg double precision	avg double precision	avg double precision
1	348	0.449570283	1.616914315	0.015271581500006301
2	939	0.148551633	0.1102050296666668	0.0010213153333326
3	339	0.54016908	0.3929966093333333	0.00247753566661
4	739	0.18292094985714286	0.031746299428571434	0.007344003857142857
5	397	1.7449570989999998	3.716195862333333	0.04044977599997104
6	618	0.39464030425	0.31602849475	0.005304276500001122
7	832	2.49734402	-0.057647634	5.72e-15

Datasets

File Edit Format View Help

Height: 1600 Width: 1800

Object Detected:	Confidence:	x-location:	y-location:
car	1.0	1353	701
car	0.99	1095	683
bus	0.99	274	610
car	0.98	1017	702
car	0.95	949	719
car	0.92	655	730
car	0.9	897	720
car	0.64	931	720
car	0.62	835	725
car	0.54	689	730

- All Data sets were exported into a .csv file.
- Datasets were then formatted utilizing excel and sql code
- Table were created inside the database for each dataset
- Data Imported into Database
- Statistical Queries were generated for potential traffic flow research

Other Accomplishments

- Research papers completed on stereo vision, and RGB vs IR Object Detection
- Device data sheets made for cameras, LiDAR and Radar.
- Program code walkthrough.
- DataBase code walkthrough.
- Radar can accurately count items and determine velocity

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References
[1] UNCC_TRAN_Poster