

Forum8 World16 Workshop 2019 Presentation

Matthew Swarts (with F8 support from Airi Hotta)

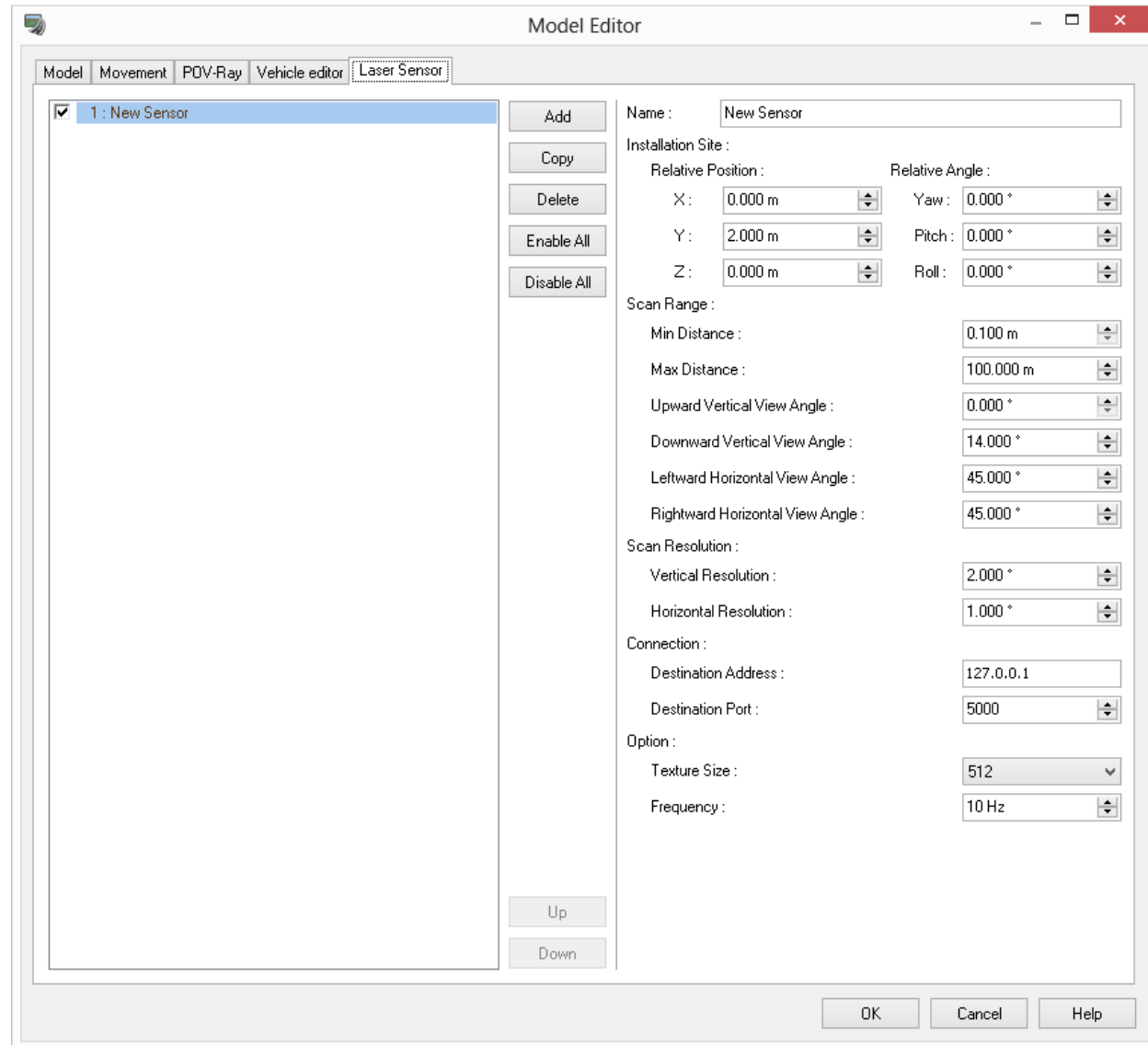
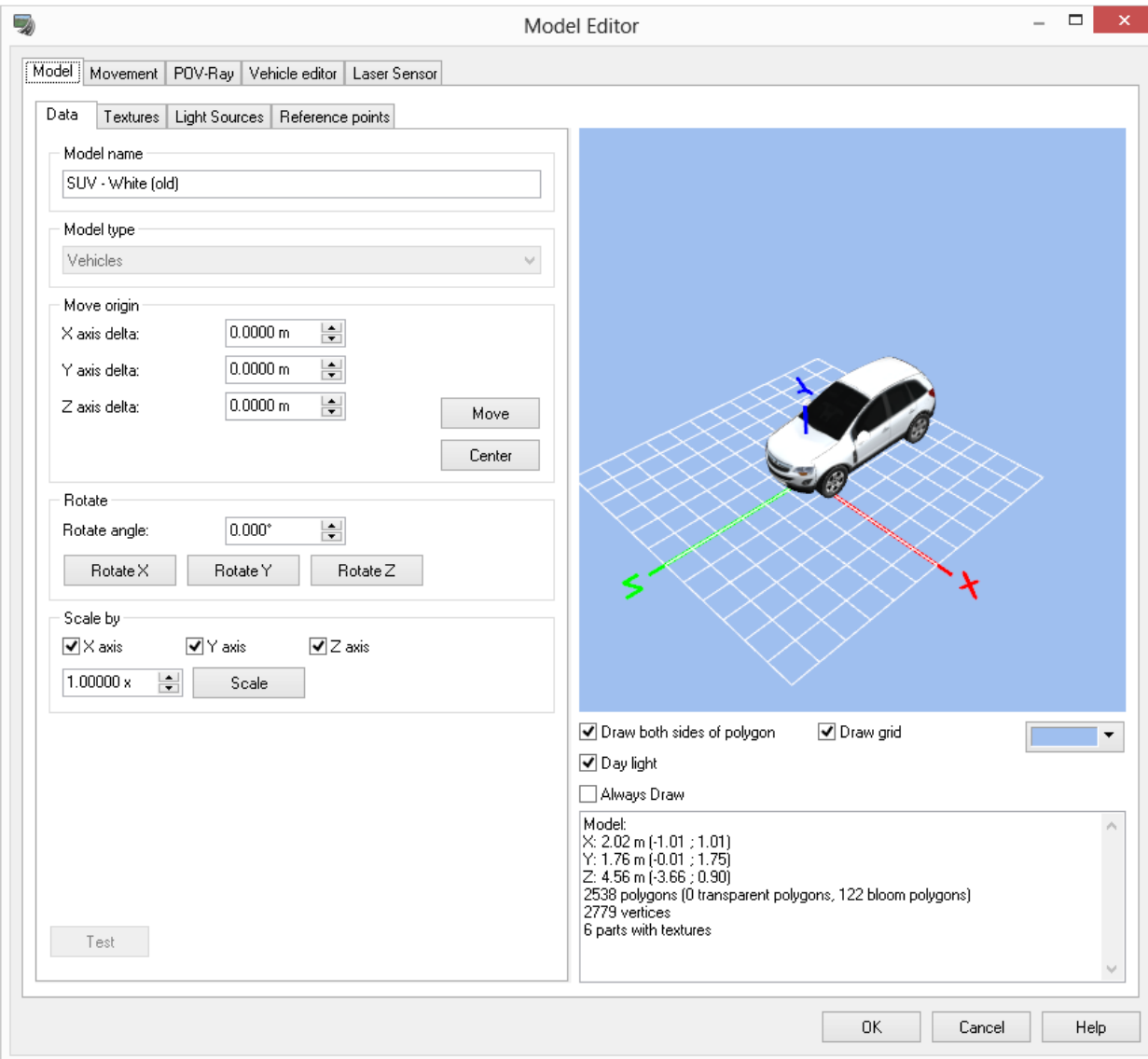
Georgia Tech Research Institute

Aerospace, Technology, and Advanced Systems Laboratory

Food Processing Technology Division

Energy and Sustainability Lab

Create and Attach Sensor Model to Vehicle



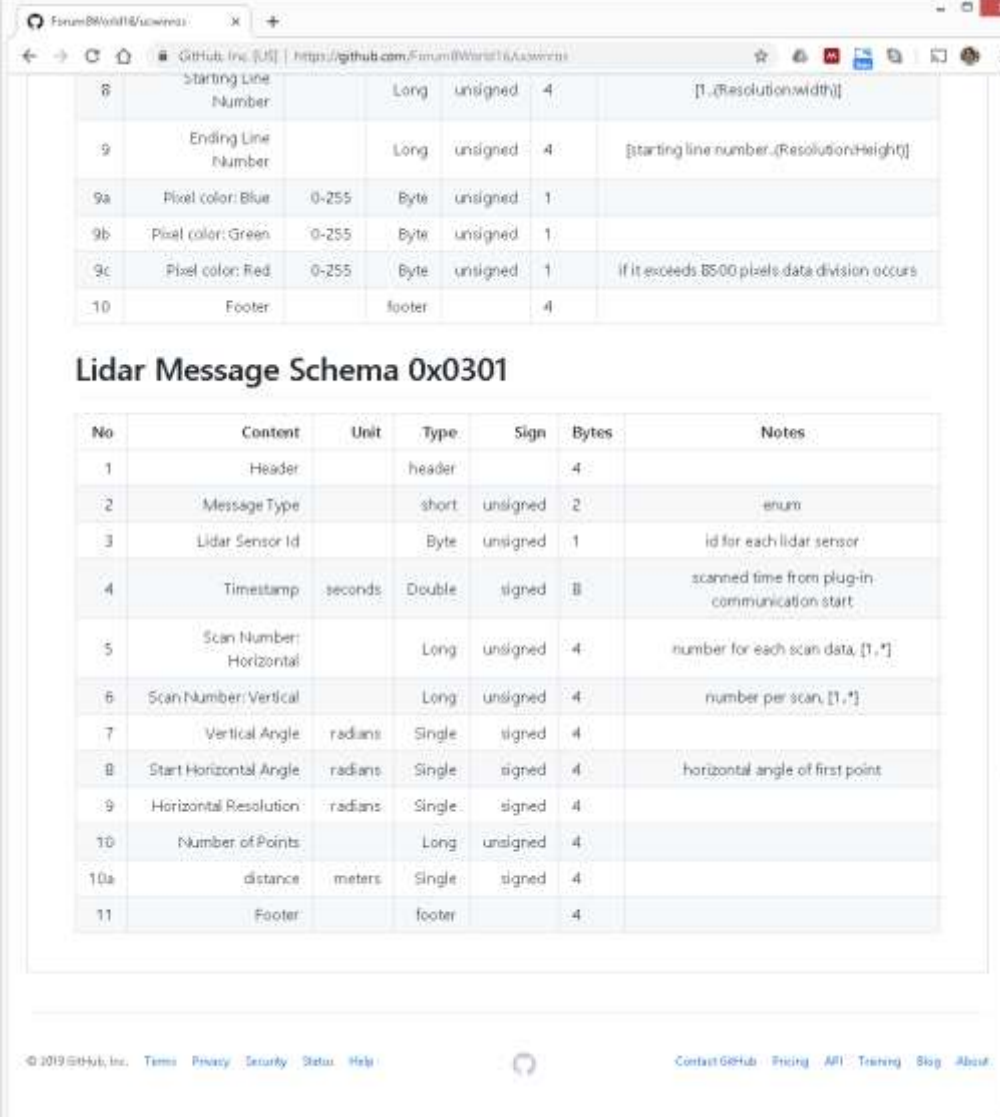
Drive Vehicle in Environment and Transmit Scanning Device



Use Custom Schema and TCP Buffer to Organize Message Stream

```
public class LidarDevice {
    225:     private final Color color;
    226:
    227:     //vertical -14 to 0 degrees with 8 segments is 2 degrees
    228:     //horizontal is -45 to +45 with 128 segments is 0.012358475*01611394424591291887183 radians
    229:     //                                0.70866141377223464509929333058209 degrees
    230:     int lidarRayCount = 91;
}

next_messageLength=403
_accumulatingBuffer length= 3224
message type: 301
    _accumulatedLength  = 1612
next_messageLength=403
_accumulatingBuffer length= 3224
message type: 301
    _accumulatedLength  = 1209
next_messageLength=403
_accumulatingBuffer length= 3224
message type: 301
    _accumulatedLength  = 806
next_messageLength=403
_accumulatingBuffer length= 3224
message type: 301
    _accumulatedLength  = 403
not enough bytes yet to process the next message in the buffer
received data length:403
before_messageLength= 403
message starts with: 97 1 0 0 1 3 1 2b c2 31 bf 8a b3 62 40 d6 5 0 0 1
accumulatingBuffer starts with: 97 1 0 0 1 3 1 50 55 35 a8 46 00 62 40 d5 5 0 0 0
_accumulatingBuffer length= 806
message type: 301
    _accumulatedLength  = 403
next_messageLength=403
not enough bytes yet to process the next message in the buffer
received data length:2821
before_messageLength= 403
message starts with: 97 1 0 0 1 3 1 2b c2 31 bf 8a b3 62 40 d6 5 0 0 2
accumulatingBuffer starts with: 97 1 0 0 1 3 1 2b c2 31 bf 8a b3 62 40 d6 5 0 0 1
_accumulatingBuffer length= 3224
message type: 301
    _accumulatedLength  = 2821
next_messageLength=403
_accumulatingBuffer length= 3224
message type: 301
    _accumulatedLength  = 2418
next_messageLength=403
_accumulatingBuffer length= 3224
message type: 301
```

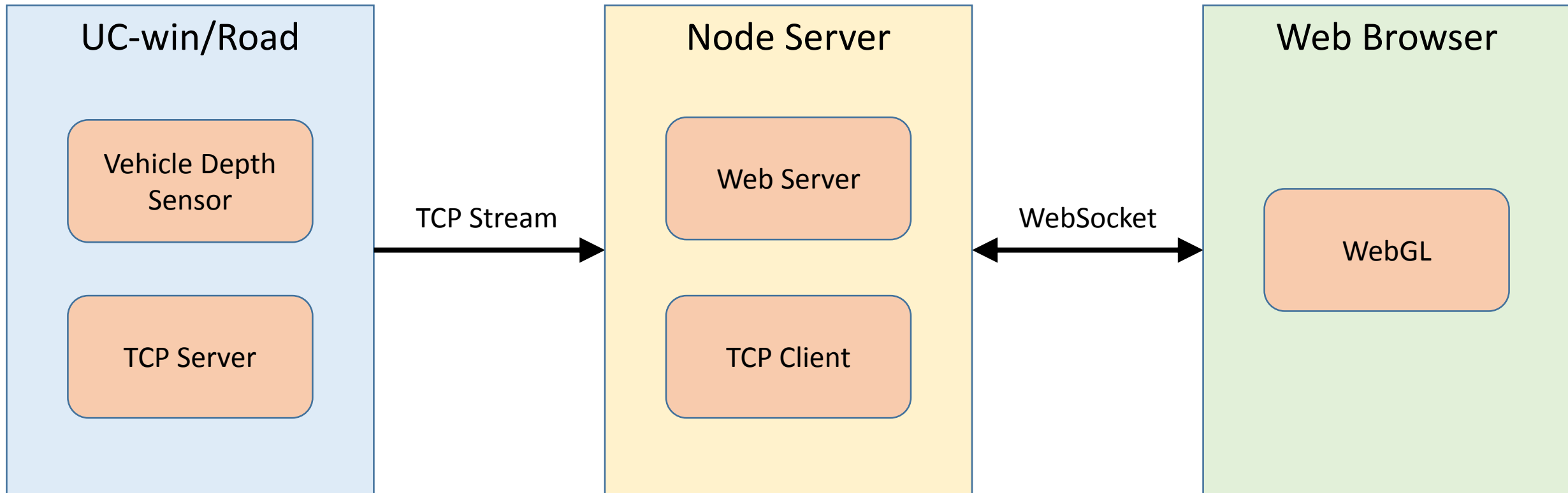


Lidar Message Schema 0x0301

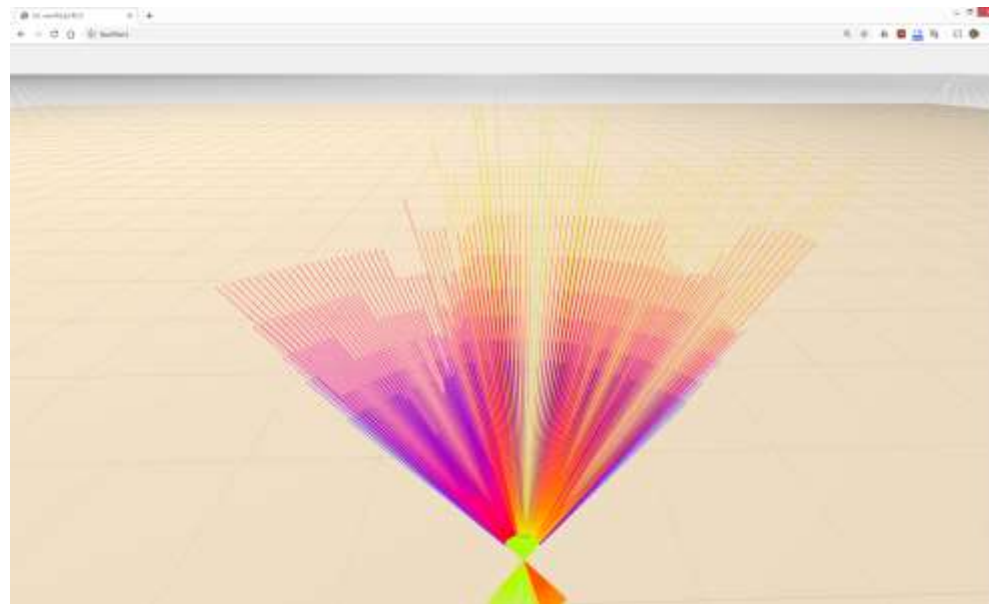
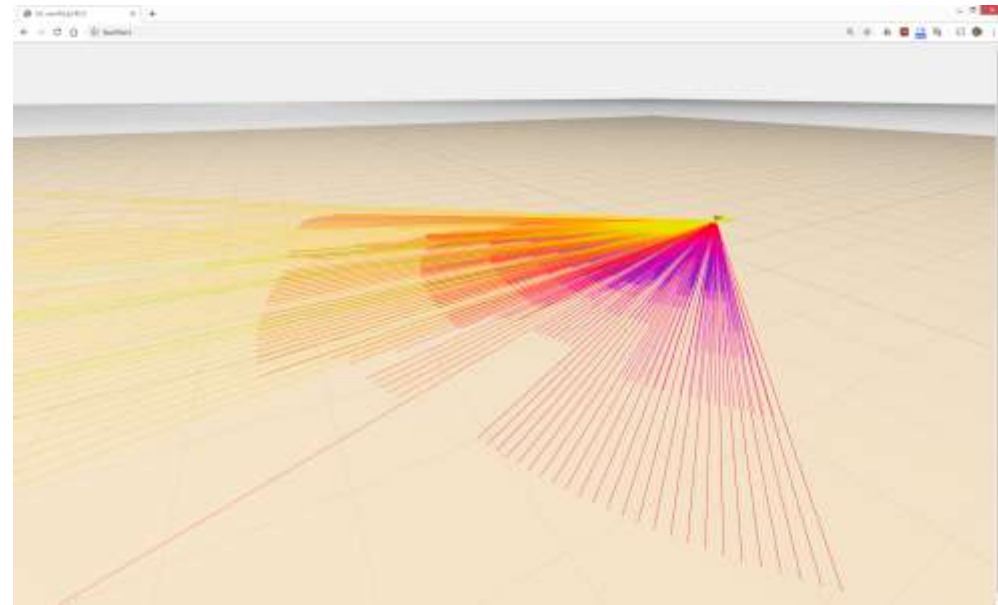
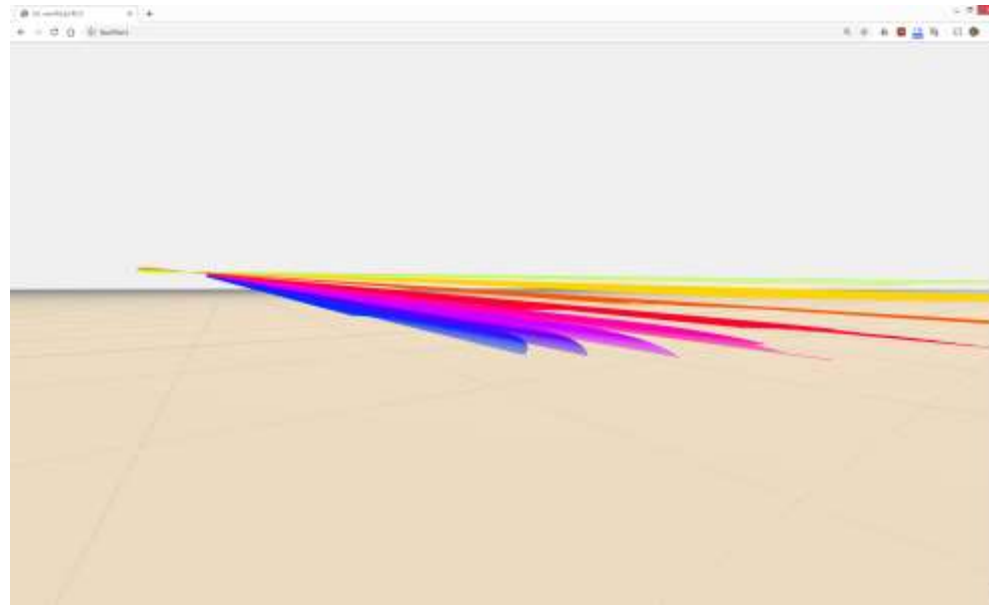
No	Content	Unit	Type	Sign	Bytes	Notes
1	Header		header		4	
2	Message Type		short	unsigned	2	enum
3	Lidar Sensor Id		Byte	unsigned	1	id for each lidar sensor
4	Timestamp	seconds	Double	signed	8	scanned time from plug-in-communication start
5	Scan Number: Horizontal		Long	unsigned	4	number for each scan data, [1..*]
6	Scan Number: Vertical		Long	unsigned	4	number per scan, [1..*]
7	Vertical Angle	radians	Single	signed	4	
8	Start Horizontal Angle	radians	Single	signed	4	horizontal angle of first point
9	Horizontal Resolution	radians	Single	signed	4	
10	Number of Points		Long	unsigned	4	
10a	distance	meters	Single	signed	4	
11	Footer		footer		4	

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Diagram of the TCP Data Stream Process



Output in Separate Application for Algorithm Development



Future Steps

- Implement Reverse Vehicle Control Schema to allow vehicle input
- Implement Odometry readout from UC-win/Road
- Implement IMU readout from UC-win/Road
- Add (Gaussian) noise function to depth sensors in UC-win/Road
- Connect to SLAM Algorithm which supports limited sensor data
- Add multiple depth scanners to a model in UC-win/Road
- Implement color camera streams for vehicles that don't use Lidar
- Connect to ROS for more complex control mechanisms