LiDAR Hokuyu UST-10LX Test Report

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1. Objective

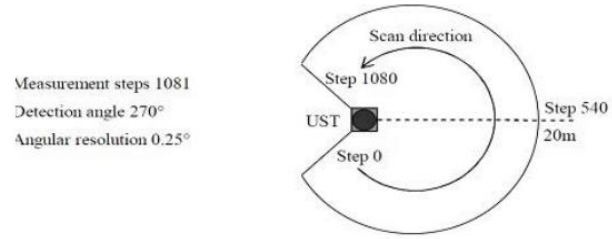
Our primary goal was to develop a method for simulating the Hokuyo LiDAR and evaluating its functionality.

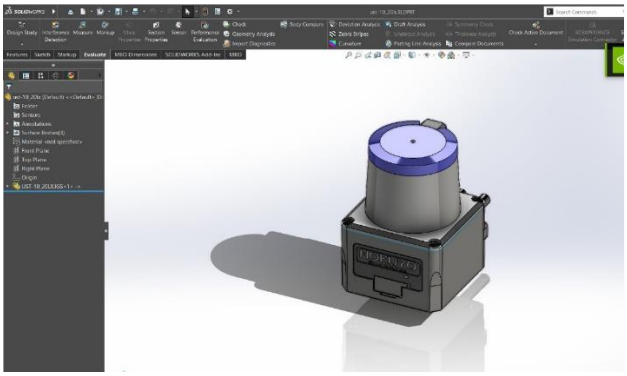
2. Equipment and Components

HOKUYU UST-10LX:

The **smallest** and the **lightest** of its kind.

It is possible to detect size, position and the moving direction of objects.





Mid-Detection Range	Up to 10m
Wide Detection Angle	270 °
Fast Response	25msec
High Angular Resolution	0.25°
Supply Voltage	DC 12V / DC 24V (operation range 10 to 30 V ripple within 10%)
Supply Current	150 mA or less (during start up 450 mA is necessary)
Accuracy	± 40 mm *1Scan angle 270°

Scan Speed	25 ms (motor speed 2,400 rpm)
Start-up Time	Within 10 sec (start-up time differs if malfunction is detected during start up)
Input	IP reset input, photo-coupler input (current 4 mA at ON)
Output	Synchronous output, photo coupler open collector output 30 VDC 50 mA MAX
Interface	Ethernet 100BASE-TX LED display
Power Supply	LED display (blue): Blinks during start up and malfunction state
Weight	130 g (excluding cable)
Material	Front case: polycarbonate Rear case: aluminum
Dimensions	(W × D × H) 50 × 50 × 70 mm (sensor only)

Connection

Power source, I/O cable

Cable length: 1,000 mm flying lead cable (AWG28)

Color	Signal
Red	COM input+
Gray	COM output-
Light blue	IP reset input
Orange	Synchronous output
Brown	+VIN (12 VDC / 24 VDC)
Blue	-VIN

Ethernet cable

Cable length: 300 mm

Color	Signal
Blue	TX+
White	TX-
Orange	RX+
Yellow	RX-

For more information, check out the **Data/Specs Sheet:**

- https://hokuyo-usa.com/application/files/6716/8451/4574/Hokuyo_-_UST-10LX_-_Spec_Sheet_-_Final.pdf
- https://autonomoustuff.com/-/media/Images/Hexagon/Hexagon%20Core/autonomousstuff/pdf/hokuyo-ust-10lx-datasheet.ashx?la=en&hash=95B57270899F50608C18BF48CC1AD043

3. Testing Procedure

3.1. Figuring Out Connections

We began by referencing the data and specifications sheet to identify the correct wire connections for data compatibility. After analyzing the wiring configuration, we realized we did not have the proper connection. So, we soldered a connection using a resistor wire and connecting wire. We connected the **blue wire** to **-Vin** and the **brown wire** to **+Vin**.

3.2. How to Connect to Ethernet with Hokuyu

To connect the Hokuyo LiDAR via Ethernet, we configured the PC's network settings to match the LiDAR's IP address range, ensuring proper communication before performing a ping test to verify connectivity.

3.3. URG Benri Software

URG Benri is a **software tool** developed by Hokuyo for configuring, testing, and visualizing data from their LiDAR sensors. It allows users to adjust sensor settings, visualize real-time data, log scan results, and perform diagnostic tests. It allowed us to test the LiDAR through a graphical interface. It can be downloaded and installed from Hokuyo's official website. After installing it,

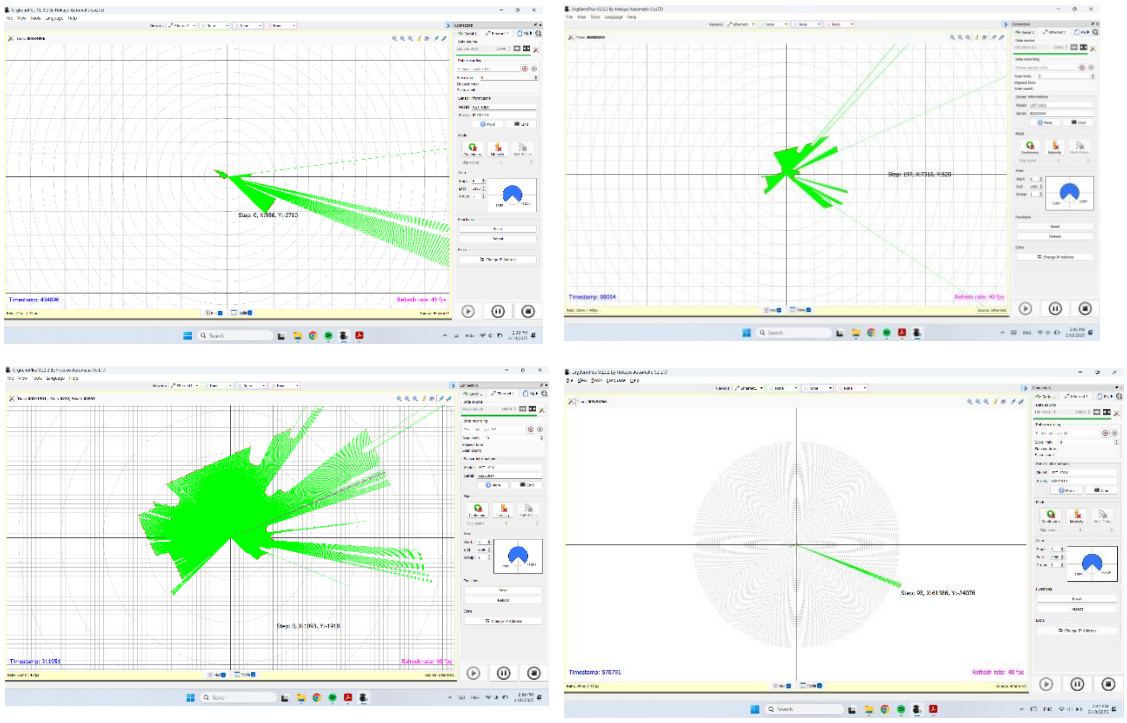
we connected it to the LiDAR, configured network settings, and connected it to power to verify functionality.

3.4. Connecting to Power

Initially, we attempted to connect the LiDAR to an Arduino that provided only 5V, which was insufficient since the LiDAR requires a minimum input of 10V. As a result, we switched to using the power bank included with the TRAXXAS kit, which supplied 12V to the LiDAR, making it functional.

4. Test Results and Observation

The URG Benri software visualizes the data collected by the Hokuyu and **displays green** when the path is **clear**. If an object is placed within a 10-meter radius, the green light is blocked.



5. Safety Guidelines

- Operate the LiDAR in a clean environment with normal temperatures, away from dust and moisture.
- Regularly clean the lens with care. This component is crucial for our **object detection system**, which will rely heavily on it, and it is also of **significant cost**, so it must be handled with caution.

6. Conclusion and Recommendations

We successfully tested the LiDAR, and its performance met our expectations. However, there are still some very slight uncertainties regarding its accuracy, as well as **whether** an **additional component**, such as a **camera**, will be needed for object detection. It is crucial to handle the device with **great care**. **Further testing** is required, particularly once all components are integrated and the car is prepared to begin autonomously moving.