Video Descriptions

Figure 1 shows the approximate locations of 3D LIDAR imagers mounted onto a forklift at NIST. The videos titles of each video on the website are listed below the figure along with their associated descriptions. The videos show results of the imagers used to detect obstacles or clear path.

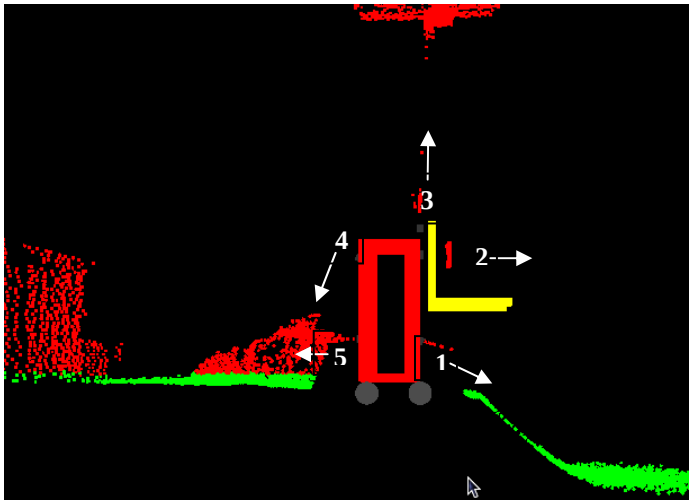

Figure 1 – Data from five 3D LIDAR imagers mounted onto a forklift. The approximate locations (numbers) and viewing angles (arrows) of the imagers are also shown. Note that 1, 2 and 3 move with the forks for these tests.

o forklift_lab_moving_forks_forksup_down

The forklift moves a load up and down. Note how imager 3 senses the ceiling truss, 2 is blocked by the load, 1 senses the standard sized obstacles in the floor when in the sensor field of view, 4 senses the clear floor and 5 senses obstacles behind the forklift.

o forklift_lab_no_load_noload

This video shows the same unloaded situation as the "forklift_lab_moving_forks_forksup_down" video. Without a load, imager 2 can see the garage door in front of the forklift.

o forklift_lab_person_walking_personwalking

(Note, data in this video is 2 sec ahead of the upper right video in this avi file).

A person is walking around the forklift and is detected by imagers 2, 4, and 5.

o forklift_lab_garage_door_up_down_garagedoor

The garage door opening is being detected by imager 2 as the door is raised and lowered.

o forklift_lab_door_edge_from_left_door_edge_left

Boxes are rolled in front of imager 2 from the left to the right. The data is shown looking down from above the scenario. If the width of the load and it's location on the forks are known, as depicted by the white frame box, an alert to the driver can be provided as shown with the upper left symbols to move to one side or the other to clear the doorway/passageway. The green light means clear, red light means stop, left door frame (yellow) means move to the right to clear and not shown is the right door frame (yellow) which means to move to the left to clear the doorway/passageway.

- forklift_lab_door_edge_from_right_door_edge_right

Same as the "forklift_lab_door_edge_from_left_door_edge_left" video showing boxes moved in front of the sensors from the right side.

- forklift_lab_obstacles_moving_forklift_obstacles_movingforklift

A lifted load is driven forward and backward several times in front of standard sized obstacles.

- forklift_lab_low_garage_door_lower_garage_door

A short load is moved towards a partially open garage door. In the data, a white box marks a potential load size being carried including the height of the highest forklift frame edge. The upper left shows a green light saying all is clear, a red light meaning stop and an upper door frame meaning the load or frame is too high to fit through the door. The short load allows imager 2 to see over it to sense the door height.

- forklift_lab_person_moving_forklift_person_moving_forklift

A person walks back and forth in front of a short-loaded forklift where imager 2 can see over the load. The operators' field of view, however, can still be blocked in this situation by the forklift framing so as to not see the passing pedestrian.

- forklift_crane_hook2_crane_hook

Imager 3 detects an overhead crane hook as the forklift load is raised and lowered.

- forklift_lab_pallet_pallet_opening

An unloaded forklift is raised and lowered in front of a pallet sitting on a shelf. The lower wooden pallet openings and the thin shelf frame are clearly seen. However, the small pallet openings in the upper pallet are not seen in the video mainly due to the data being displayed as large pixels, but could be intermittently detected in reality. Also note that the ceiling truss is also detected by imager 3 where the operators focus is typically on the pallet and not on the ceiling.

- forklift_loading_dock_angled_loading_dock_angled

The forklift approaches the loading dock opening at an angle, instead of straight on, with a short load. The floor is blocking the operators straight on field of view who may not see that there is not truck at the dock. Imager 1 detects that the floor falls away when the forklift approaches the edge of the dock.

- forklift_loading_dock_backwards_loading_dock_backwards

A loaded forklift approaches a loading dock from behind where imager 4 detects that the floor falls away.

- forklift_loading_dock_gap_forward_loading_dock_gap_to_truck_images

A loaded forklift approaches a truck at a loading dock where the truck is not completely against the loading dock. Imager 1 detects the gap where the floor falls away.

- forklift_loading_dock_to_door_two_doors__one_open

A short-loaded forklift approaches and detects a half-opened set of doors. The data is shown from above. Overlaid onto the data is a white box which marks a potential load size being carried. This load size can be adjusted to the forklift size up to a large load. The upper left displays a green light meaning all is clear, a red light meaning stop the forklift and an upper right (yellow) door frame meaning the load is shifted to the right and should be carried to the left to (possibly) fit through the door. The short load allows imager 2 to see over it to sense the closed door.

- forklift_loading_dock_no_gap_loading_dock_truck_close

A fully loaded forklift approaches a truck at the loading dock. The truck is backed up and ready for loading as detected by imager 1 on the forklift. No gap is detected as in the "forklift_loading_dock_gap_forward_loading_dock_gap_to_truck_images" video.