ET-ALS

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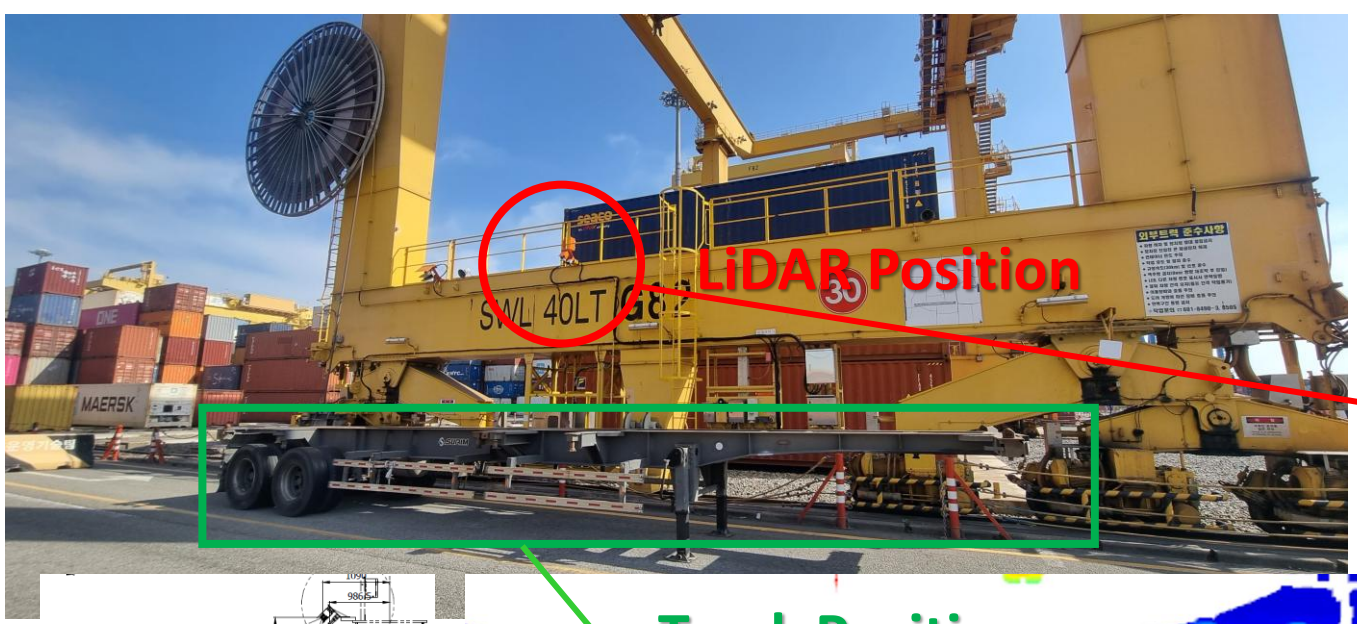
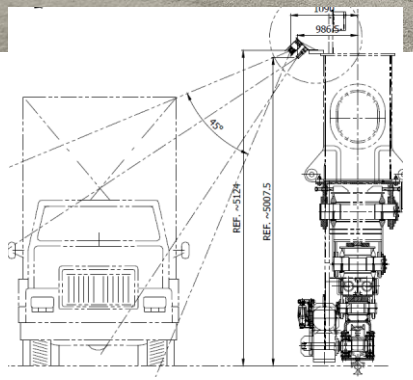
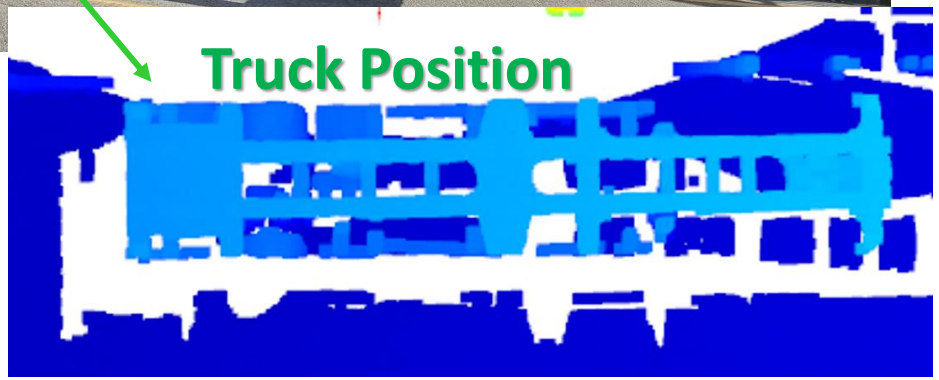
Development of 3D-LiDAR-based Auto Landing System

- Raw LiDAR data alone cannot achieve accurate object detection or auto landing
- Our proprietary technology enables reliable detection and landing for both YT (internal) and ET (external) truck
- Optimized for real-time application and seamless integration into port operations



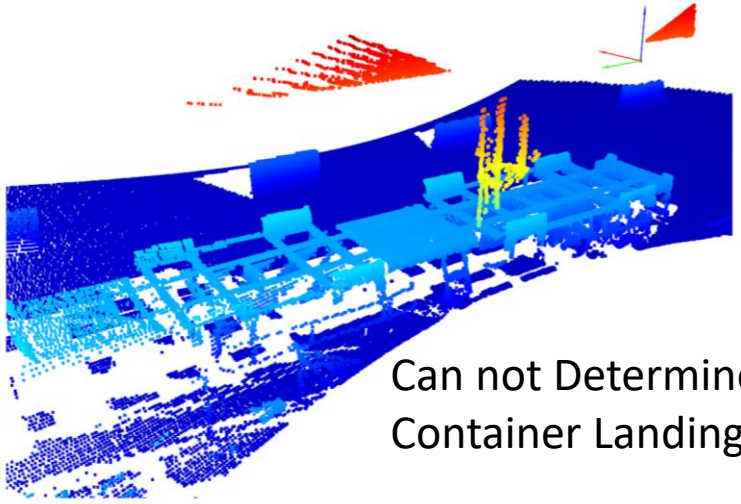




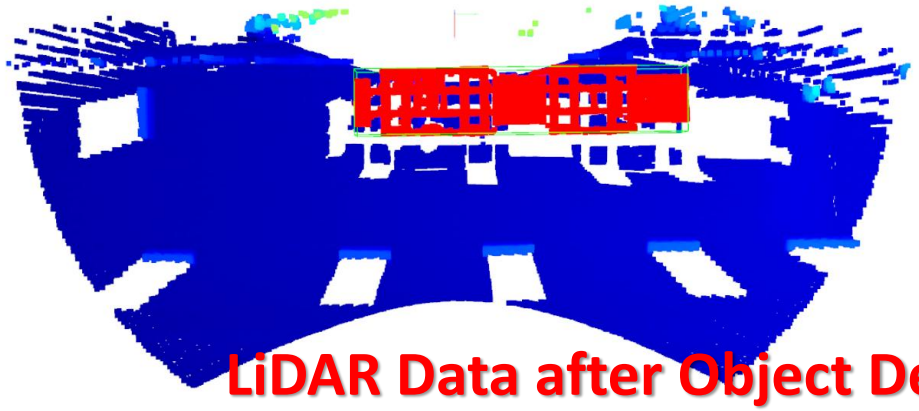
Parameter Optimization for Internal Trucks (YT)

- Defined ROI (Region of Interest) to filter unnecessary point cloud data
- Container lower points extracted and compared with chassis reference
- Implemented multithreaded, list-based frame processing for real-time performance

LiDAR Raw Data
Object Detection Required

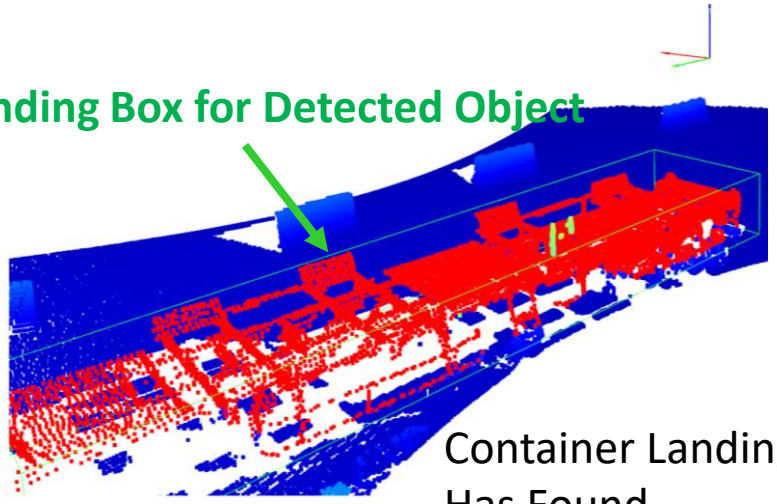


Can not Determine
Container Landing Position



LiDAR Data after Object Detection

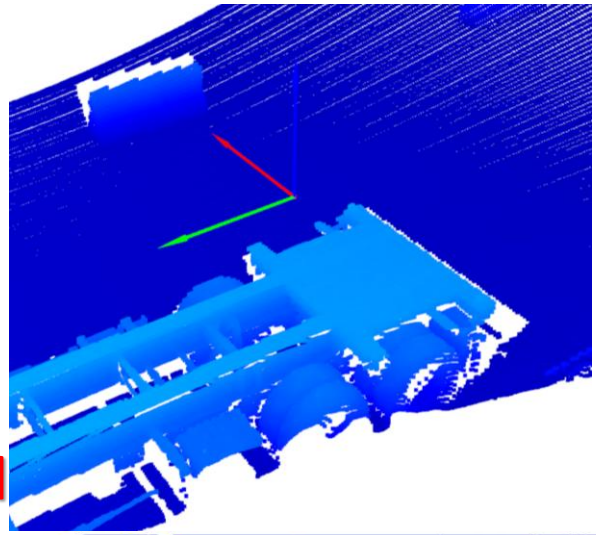
Bounding Box for Detected Object

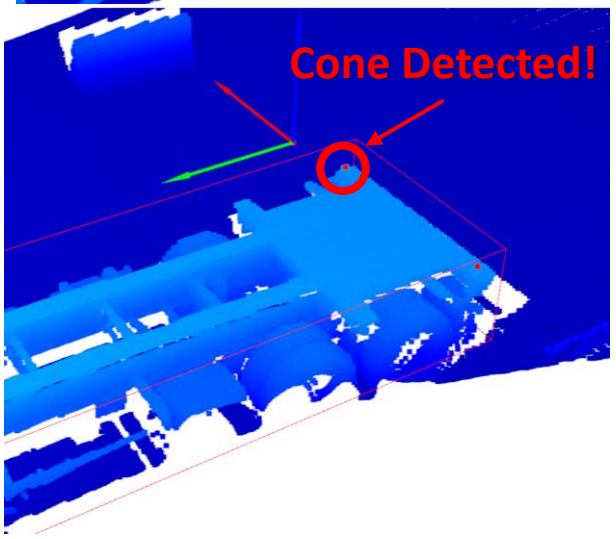


Container Landing Position
Has Found

External Truck ALS Performance Highlights

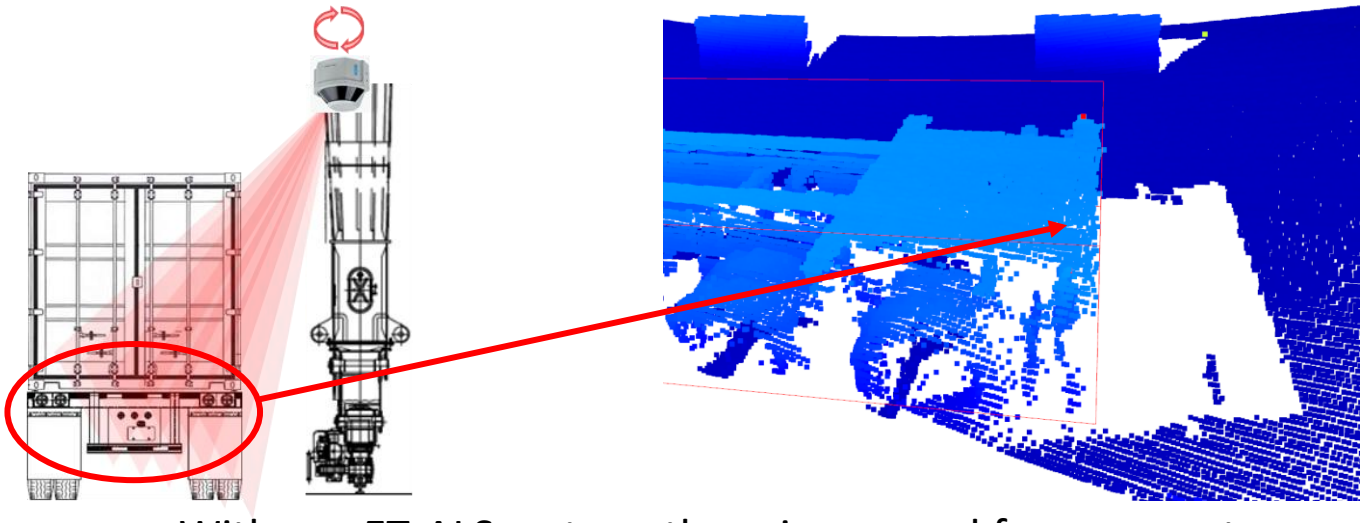
- Successfully identified external truck chassis using real data
- Noise reduced via stacking/integration method
- End-to-end process completed within 100ms suitable for real-time deployment



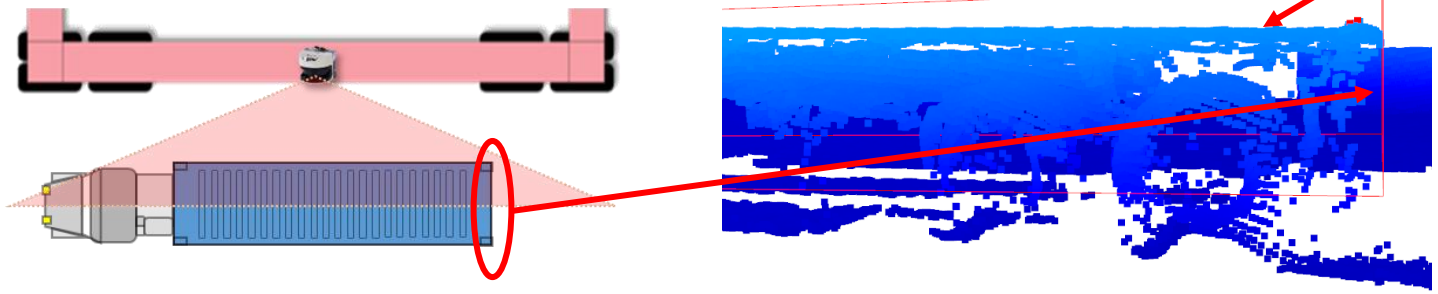


Future Applications – CPS & Anti-Lifting

- Technology can extend to CPS (Chassis Positioning System) for precise trailer alignment.
- Also applicable to anti-lifting systems to prevent unsafe lifting conditions.
- Reuses core components: Object detection, and real-time tracking.
- Enhances safety, reduces errors, and expands automation potential.



With our ET-ALS system, there is no need for a separate CPS, Anti-Lifting — its capabilities are already integrated



Conclusion & Next Steps

- **GSI**’s proprietary technology overcomes complexity of raw 3D LiDAR data.
- Both YT and ET solutions are tested, accurate, and real-time capable.
- Ready for integration with existing gantry systems.
- Next steps: full deployment, expansion into CPS and anti-lifting, and continuous performance tuning.