MΛXVIEW™ Crane Guidance Systems Using Laser Scanners

By Paul Blaiklock

TM GE's Maxview™ Crane guidance and positioning systems make extensive use of laser scanning devices. This article describes how laser scanners are used by the Maxview system to accurately locate the container load and position the crane spreader for pick up. It also describes how the system guides trucks into position and locates them for loading and unloading.
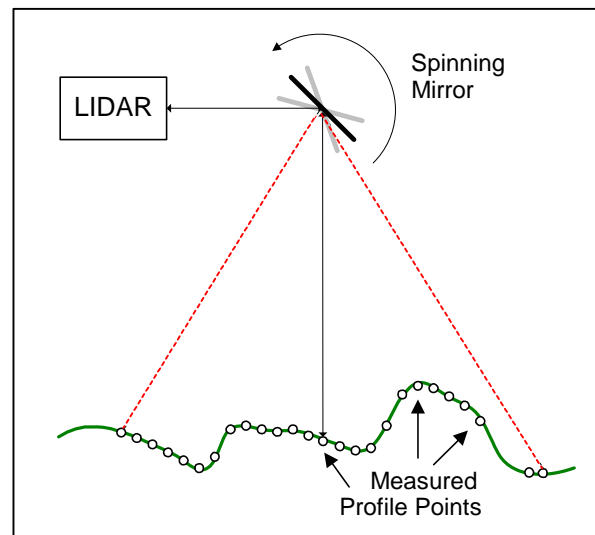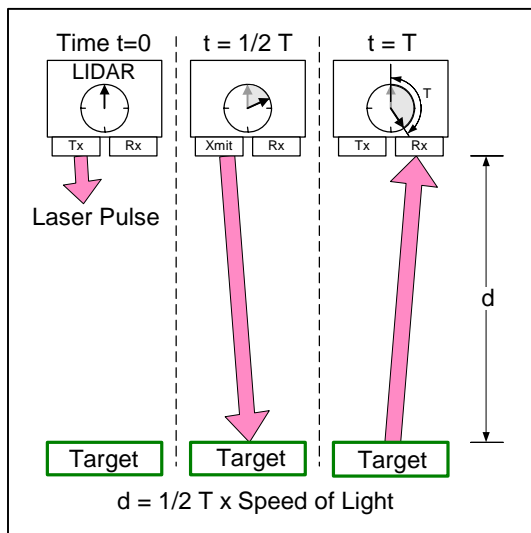
LMS Laser Scanner

LIDAR Scanner

The scanners use LIDAR (Laser Radar) to measure the distance to an object. The distance is proportional to the round trip time of flight of the laser beam pulse to the object and the reflection back to the receiver. Rapidly repeated pulses from the scanner are bounced off a rotating mirror to generate a two-dimensional profile of the object (see the diagram below).

Since the time of flight is measured in nanoseconds, pulses can be sent very quickly, and an object completely scanned in a fraction of a second. This allows moving objects to be accurately located.


LIDAR Laser Scanners use Time of Flight Measurement

Locating the Spreader, Load, and Target

- Three scanners are mounted on the overhead trolley

- The scanner region of interest is centered on the expected object position

- Scanned points are converted from polar to rectangular coordinates

- Scanner coordinates are converted to world coordinates

- The front edge and both sides of the spreader and container are detected

- Scan points are segmented into lines

- Edges and lines are reported to the crane control system

The following diagrams illustrate how the system picks up the edges and surfaces required to position the load over the target container. This application stacks containers in designated locations.
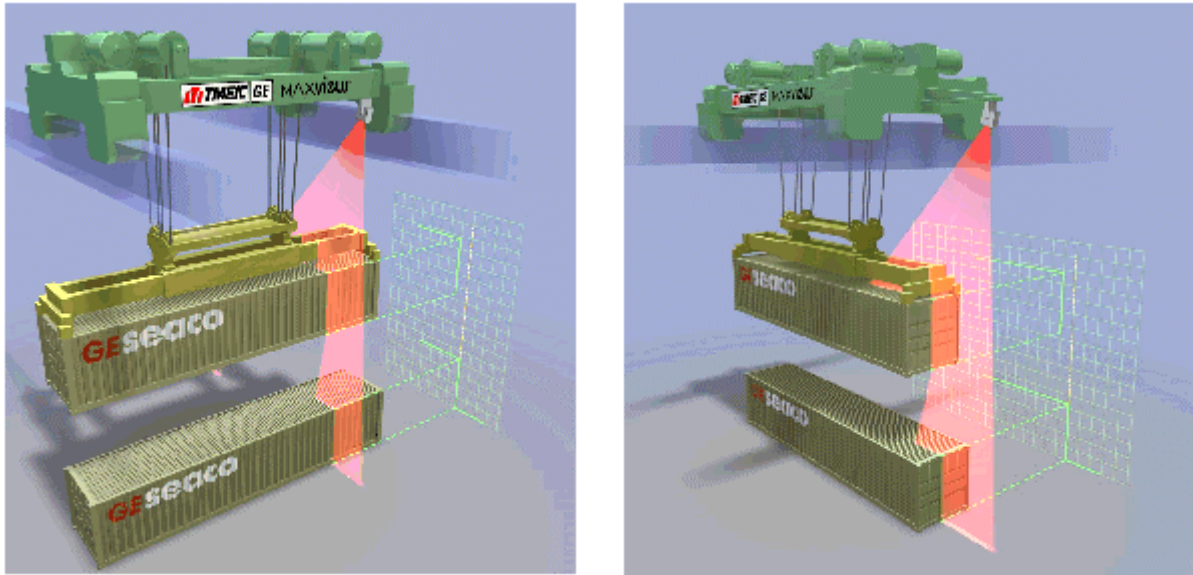
Two-Axis Scan of Spreader, Container, and Target

Maxview Automatic Landing System

An example of the use of Maxview is in automatic landing systems such as rail-mounted gantry cranes at a terminal. These cranes load and unload containers onto special trucks, shown on the next page with the yellow cabs and open chassis. The cranes move containers between a stack of containers and the truck lanes in the center. Loaded trucks then leave the dock and empty ones enter the line.

All the laser scanners are mounted on the portal beam of the gantry, one for each truck lane below. In the resulting computer image, the front and rear of the truck, the absence of a container on the chassis, and the ground level are identified.

There is also a scanner that scans across the lanes to identify the edges of the truck chassis.

Maxview Chassis Guidance System

When entering the loading zone, truck drivers are provided with various types of indicators and safety features to guide them into position under the cranes. In the photograph (next page), the red line indicates the overhead scan, which identifies the two ends of the chassis so the crane can position the container.

Computer- controlled signs guide the truck driver into the loading zone under the crane. Direction arrows help locate the truck in the center of the lane, and the stop light controls the distance through the lane.
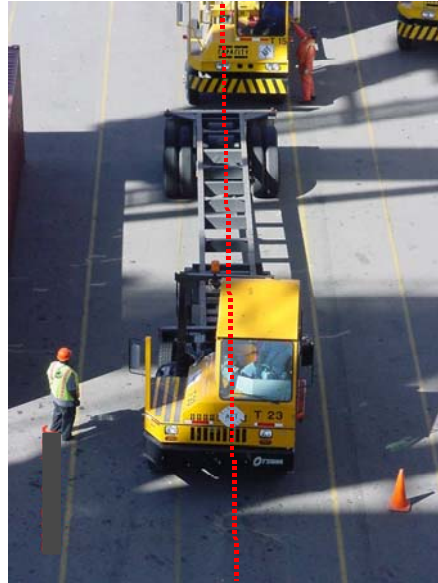
These two examples illustrate that Maxview and laser technology have advanced to enable many applications on container cranes. These applications enhance productivity, reduce operator stress, and protect equipment against collisions.

Industrial applications include the automation of slab yard cranes in steel mills, discussed in our April, 2005 Newsletter. Maxview technology is in operation at a number of container terminals and industrial plants around the world. The technology is proven, very effective, and indispensable to modern facilities.