

Vehicle Framing

As a vehicle travels through a toll lane various sensors count axles, determine dimensions, read ETC tags etc. Vehicle framing refers to insuring that all this sensor data is attributed to the correct vehicle. Common vehicle separators used in toll lanes and their faults regarding vehicle separation are...

Loop Detectors

These have been around a while, and are very good at detecting vehicles but not very good at separating them. Cars bunched close together, as happens in a toll lane, cause the loop to remain on between vehicles. Vehicles pulling trailers (with very little ferrous mass for the loop to detect) may have a dropout between the vehicle and trailer therefore spoiling the vehicle separation. Hi-tech motorcycles made mostly of aluminum can cause the loop to miss them completely. Very high vehicles such as tractors pulling trailers may also cause the loop to "drop out" while the vehicle is still in the lane.

Sonic Sensors

These are normally mounted looking down on traffic. These sensors often miss the space between vehicles, as the sound sent from the sensor covers a such wide area. Much like the loop, they are good for detecting the presence of vehicles but no vehicle separation

Through Beam Sensors

These do a much better job at separation since the light beam is emitted from one side of the lane and received on the other side. This creates a pencil thin beam which when broken detects vehicles. The problem comes with different height vehicles not triggering the beam. If the beam is too low, it will not detect high trailers (except for the axles). If it is too high it may miss lower vehicles such as a flatbed truck with no load on it. These sensors are susceptible to inclement weather such as snow or rain. In addition, they degrade in performance as they collect dirt and dust.

Light Curtains

Essentially a vertical array of through beam sensors.

These have all the advantages of the trough beam sensor and eliminates most of the disadvantages. The trouble with light curtains is the price. Since it is based on the through beam sensors, the light curtains also susceptible to inclement weather such as snow or rain. In addition, they degrade in performance as they collect dirt and dust. Since the array starts very close to the ground it tends to be affected by snow accumulation and snow plowing.

Laser Sensors

These sensors bounce a beam of light off a vehicle and read the returning beam. This works well in a controlled environment such as a production line where the target will always be the same shape and size unlike in a toll lane. These sensors are also susceptible to inclement weather such as snow or rain. In addition, they degrade in performance as they collect dirt and dust. In addition, a laser sensor has high precision moving parts and optics which will eventually need replacement, calibration, etc.

What is needed:

A dream sensor would be one with these qualities...

- Accurately separate vehicles which are as close as 12 inches apart (closer is better).
- Recognize a very small target such as the trailer hitch of a vehicle pulling a trailer.
- Impervious to weather and temperature extremes.
- A simple interface (IE switch output indicating vehicle presence).
- Simple mounting.
- Low Maintenance.
- Error reporting.
- Reliable through design or cost effective redundancy.
- Reasonable Cost.