Sun, Wei, “A 3-D Scanning Laser Imaging System”

Advisor: R. Liu

Pavement marking materials provide delineation on highways around the world. The condition of the marking materials is very important for the driver’s safety as well as for comfort and driving costs. Currently, thermoplastic pavement marking materials (TPMM) are widely used in many states. Measuring the thickness of TPMM on pavement is an essential index for monitoring the contractors, calculating the durability of marking materials and providing better information for the pavement marking evaluation.

In recent years, to measure the thickness of TPMM, a procedure involving pre-embedded plates sprayed with the marking materials has been widely accepted. This method is labor intensive and cannot provide a continuous-thickness profile. Therefore, there is a demand for developing a high-speed automatic measuring system for determining the thickness and uniformity of marking materials.

In this dissertation, a 3-D laser scanning imaging system based on auto-synchronized scanning is developed for the thermoplastic pavement marking materials thickness measurement. Compared to the classical triangulation technique, this approach does not sacrifice the system resolution for the large field of view. To achieve high-speed measurement, a PSD (Position Sensitive Detector) is used in the prototype system instead of a CCD (Charge Couple Device), which is usually used in the common imaging system.

By using a galvanometer scanner, the system can scan 100 lines per second. Compared to the previous push cart mechanical scanning thickness measurement device (developed by Yuanhang Chen in the Subsurface Sensing Lab), which gives two scan lines per second, the new system is more suitable for highway speed measurement. The system is tested both in the lab and on the real highway pavement with different marking materials. The result shows the great potential of this system to be applied in TPMM thickness measurement.