Brinster Thesis Abstract

INDOT maintains more than 29,000 lane miles of highways in Indiana. Good visibility of lane markings is important for all road users, particularly autonomous vehicles. In general, nighttime retroreflectivity is one of the most challenging marking visibility characteristics for agencies to monitor and maintain, particularly in cold weather climates where agency snowplows remove retroreflective material during winter operations.

Traditional surface-applied paint and glass beads typically only last one season in cold weather climates with routine snowplow activity. Recently, transportation agencies in cold weather climates have begun deploying improved recessed, durable pavement markings that can last several years and have very high retroreflective properties. As a result, several dozen installations may occur in a state in any calendar year. This presents a challenge for states that need to program annual re-painting of traditional waterborne paint lines, but not paint over the much more costly durable markings.

This study reports on the utilization of mobile mapping LiDAR systems to classify and evaluate pavement markings along a 73-mile section of westbound I-74 in Indiana. Although research shows a very strong, near linear correlation between retroreflectivity and LiDAR intensity, the ASTM E3320 − 21 standard does not provide guidelines for using LiDAR intensity. Consequently, retroreflectometers in accordance with the ASTM E3320 – 21 standards should be used for contract enforcement. Based upon this research, mobile LiDAR measurements are an excellent screening tool for identifying sections of markings that fall below the thresholds defined in MUTCD Section 3A.05 as well as classifying marking types as preformed tape, non-tape, and sections requiring maintenance. RGB images collected during the LiDAR intensity data collection were used to validate the LiDAR classification. These techniques can be used by agencies to develop accurate pavement marking inventories to ensure that only painted lines (or segments with missing tape) are repainted during annual maintenance. Repeated tests can also track the marking intensity over time, allowing agencies to better understand material lifecycle.