

Research & Technology



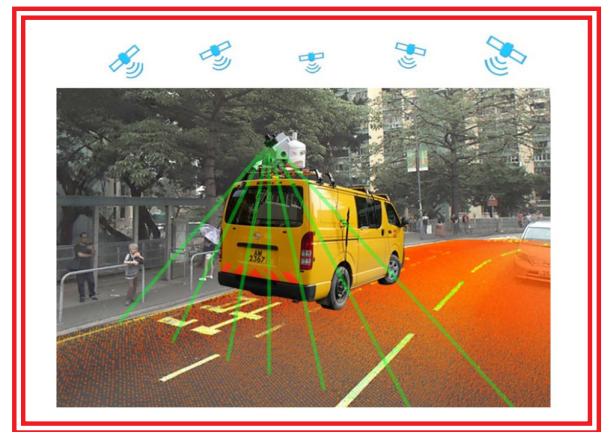
We continue focusing our researches on environmentally friendly technologies, such as adopting Mobile Laser Scanning and Imagery technology for road condition survey.

Road Condition Survey by Mobile Laser Scanning and Imagery Technology

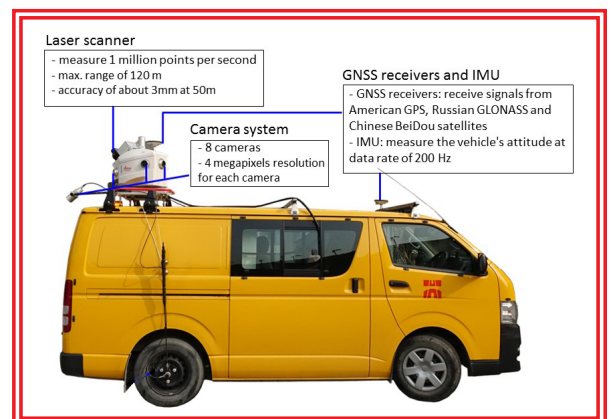
We are continuously exploring long-life bituminous pavement and low noise road surface to reduce large scale full reconstruction of bituminous carriageways and reduce traffic noise. During the site trials of new materials, we also apply the Mobile Laser Scanning and Imagery (MLSI) technology to regularly monitor the deformation of the materials to evaluate their performance under live traffic.

Since the introduction of MLSI in 2017, survey of road surface can be efficiently performed on a mobile platform. It is an integration of the Global Navigation Satellite System (GNSS), Inertial Navigation System, Laser Scanning and Close Range Photogrammetry technologies to efficiently collect large volume of field data.

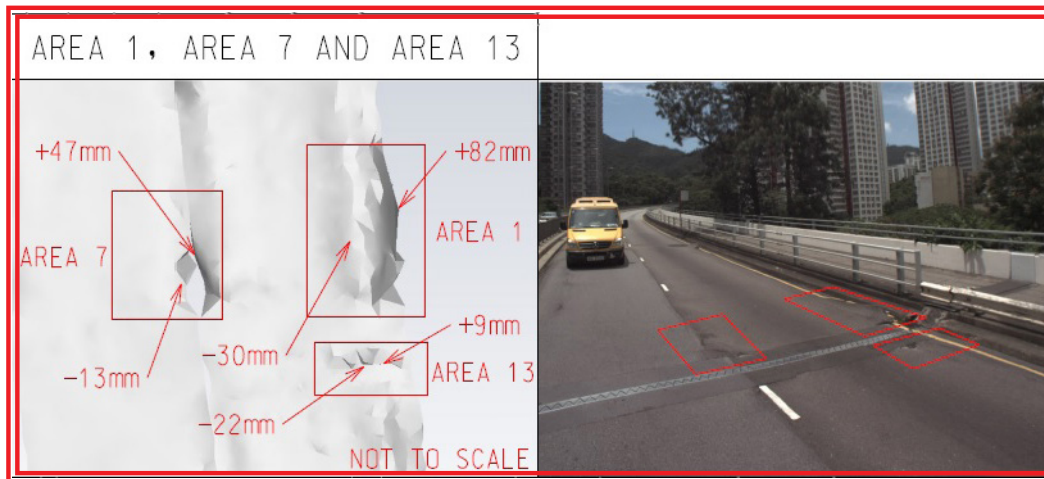
In the MLSI system, while the laser scanner and the 360° camera system collect laser scanning data and images of the road, the two GNSS receivers and Inertial Measurement Unit receive positioning information to determinate the trajectory and calculate the attitude of the vehicle. With the fast scanning rate of 1 million points per second and measuring range of up to 120 m, the MLSI system rapidly captures high density point cloud for a large area. The spacing between the points in the point cloud is about 6 cm at a travelling speed of 40 km/hr and a relative accuracy of +/- 5 mm is normally achieved. The point cloud is then used to form mesh model of the existing road surface. By creating a plane that simulates the original road surface, the magnitude of hole or bulging can be measured. It is suitable for the detailed representation and measurement of road defects like pothole, and road surface deformation, such as rutting and shoving.



The MLSI system



The components of MLSI system

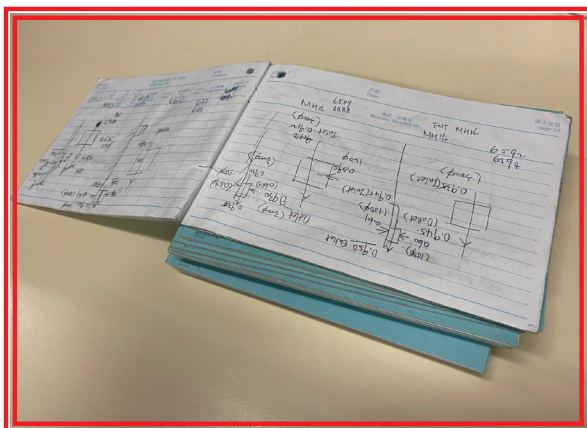


Measurements of road surface deformation

Increasing Efficiency and Effectiveness and Reduction of Fuel Consumption and Paper Wastage

In the past, terrestrial laser scanner or total station was set up on pavement to survey the topography of road surface. However, heavy vehicular and pedestrian traffic often blocked the visibility of the survey equipment and the space for setting up the equipment was very limited. Depending on the length of the road to be surveyed, the number of instrument setups and thus the number of field teams also vary. The introduction of MLSI technology changes the mode of field survey operation. It primarily employs only one vehicle for data acquisition, which greatly reduces the number of field survey teams and field trips to complete the survey of a comparable extent. As the mobile platform itself is running on the road, it also reduces the chance of blockage by vehicular and pedestrian traffic which leads to repetitive surveys. It is an effective means to reduce the number of vehicle deployments for survey and in turn helps reduce fuel consumption, vehicle emissions and air pollutants.

The application of MLSI also changes the mode of data capture. In traditional surveys, paper field books are used for recording both survey data and field notes taken at the sites. In MLSI survey, the photo-textured 3D point cloud with 360° photos are captured and stored digitally for further data processing and feature identification. Taking field notes on paper is therefore not necessary which in turn is an environmentally friendly measure.



Paper field book used in traditional survey



The photo-textured 3D point cloud in MLSI survey