UTC Project Information	
Project Title	MPC-528 – Hotspot and Sampling Analysis for Effective Maintenance Management and Performance Monitoring
University	University of Utah
Principal Investigator	Xiaoyue Cathy Liu
PI Contact Information	Assistant Professor Department of Civil and Environmental Engineering University of Utah Phone: (801) 587-8858 Email: cathy.liu@utah.edu
Funding Agencies	USDOT, Research and Innovative Technology Administration
Agency ID or Contract Number	DTRT13-G-UTC38
Project Cost	$50,000
Start and End Dates	September 30, 2013 to September 30, 2018
Project Duration	September 30, 2013 to September 30, 2018
Brief Description of Research Project	Field inspection is critical to the effective performance monitoring and asset maintenance. Given the constraints on budget and time, the inspection activities thus require significant attention for planning and monitoring. Particularly, sampling technique is needed for each asset item to determine the portion of population to be inspected, frequency at which the inspection should be conducted, and method to be used to collect the information. The new Maintenance Management Quality Assurance (MMQA) Mobile, a mobile application developed for the Utah Department of Transportation (UDOT) maintenance crew to automate the field inspection process, provides an innovative solution for accurately recording and tracking the asset conditions through geotagging the information during inspection. It also provides great data sources and new dimensionality for uncovering the maintenance condition with great level-of-details that was previously impossible to achieve. For example, the signage inventory was collected from September 2014 to March 2015 through MMQA Mobile. There is a total of 67,259 sign assemblies statewide. More than 8,500 defect observations were recorded in the database. Figure 1 illustrates the maintenance network with segments color-coded to represent Level-of-Maintenance during this data collection effort. A snapshot which is a sample zoom-in inspection on the signs in desire/deficient conditions is also shown.
Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	By using the high-dimensional clustering-based stratified sampling (HDCSS) method, DOTs can save resources and time for asset inspection, due to the fact that inspection is carried out on the segment basis, and the similarity identification introduced through LSH algorithm. The method can be further applied to any high-dimensional sampling process, e.g. in selecting corridor segments, intersections, or

	traffic assets where multiple types of features, e.g., traffic condition, geometric design, assets, need to be considered.
Impacts/Benefits of Implementation (actual, not anticipated)	The HDCSS method can also incorporate various features of the asset network, such as asset condition, geographic information, traffic condition, and geometric design, as the information upon which samples can be selected. The method is adaptable to any asset changes, as sampling process is constantly updated with former inspection results and maintenance records.
Web Links • Reports • Project Website	https://www.ugpti.org/resources/reports/details.php?id=955