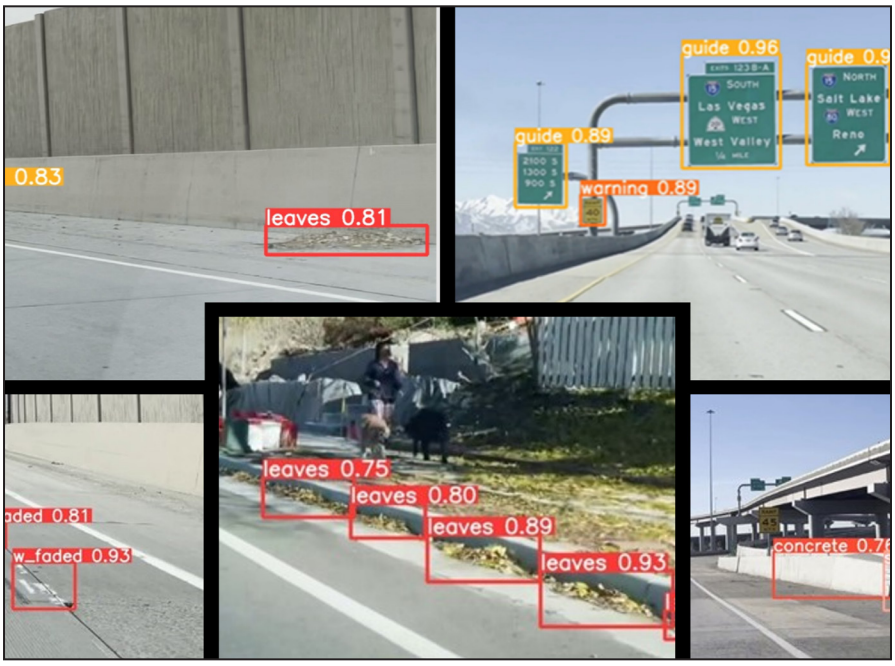
MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 24-533 (project 668 | June 2024

Mobile Phone-Based Artificial Intelligence Development for Maintenance Asset Management



the ISSUE

Timely information collection and assessment of transportation assets are essential to guide the daily maintenance practices of state departments of transportation. Low-cost automated alternatives are needed in place of traditional transportation asset assessment methods that often rely on labor-intensive manual data collection or employ costly devices, which are prohibitive in periodic inspection.

the RESEARCH

To achieve the research objectives of this project, four specific tasks are involved:

Task 1: A comprehensive literature review is conducted to explore and examine existing technologies and practices related to transportation asset collection and inspection, including emerging AI technologies.

Task 2: A mobile phone mounted on a vehicle is used to collect data by recording videos while driving on Utah highways and streets. The capability of AI in transportation asset identification and condition assessment is pre-evaluated.

Task 3: Based on self-collected images and utilizing AI algorithms, multiple AI models are developed to inspect and identify transportation assets, including assessing pavement marking conditions, identifying the various traffic signs, and detecting common litter on the roads. The performance of each model is evaluated.

Task 4: An AI prototype model is also developed to identify concrete barriers and steel guardrails.

MOUNTAIN-PLAINS CONSORTIUM REGION 8

A University Transportation Center sponsored by the U.S. Department of Transportation serving the Mountain-Plains Region. Consortium members:

Colorado State University
North Dakota State University
South Dakota State University
University of Colorado Denver
University of Denver
University of Utah
Utah State University
University of Wyoming

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Project Title

Mobile Phone-Based Artificial Intelligence Development for Maintenance Asset Management

Sponsors | Partners

Utah Department of Transportation (UDOT)

USDOT, Research and Innovative Technology Administration

the **FINDINGS**

Based on self-collected images, we developed three AI models for the automatic detection of pavement marking issues, traffic signs, and litter and trash. Specifically, the AI model for pavement marking issues can detect faded white and yellow pavement markings. The traffic sign model can identify regulatory signs, speed-related signs, warning signs, and guide signs. The litter and trash model can detect white litter, black litter, dirt, and leaves on the roadside.

Additionally, we developed a prototype AI model to identify steel guardrails and concrete barriers. Iterative training and tuning ensured the robust performance of these algorithms. The results show that the developed AI models achieved good performance, with over 85% accuracy in transportation asset identification.

The mobile phone-based AI package developed in this project offers an accurate, efficient, and automated approach to collect and analyze transportation asset data, with over 85% accuracy in transportation asset identification. This enables more frequent inspection of transportation assets, ultimately improving road safety.

the **IMPACT**

The mobile phone-based AI package developed in this project offers an accurate, efficient, and automated approach to collect and analyze transportation asset data. Using these data, road agencies can target timely maintenance activities to extend the life of road assets and improve safety for road users.

For more information on this project, download the Main report at https://www.ugpti.org/resources/reports/details.php?id=1178

For more information or additional copies, visit the Web site at www.mountain-plains.org, call (701) 231-7767 or write to Mountain-Plains Consortium, Upper Great Plains Transportation Institute, North Dakota State University, Dept. 2880, PO Box 6050, Fargo, ND 58108-6050.