Research in Progress

Detecting Subsurface Voids in Roadways Using UAS with Infrared Thermal Imaging

Research Need

The opening of soil voids below pavement caused by the failure of culverts and drainage piping creates a safety hazard. More accurate and cost-effective new non-destructive approaches are sought to inspect roadways.

Goals/Objectives

The study focuses on the experimental validation of rapid aerial infrared thermography (AIR_T) and unmanned aerial systems (UASs) for detecting soil voids and assessing the conditions of culverts and drainage piping underneath public roadways. Specific goals include:

- Determine the accuracy of IR imaging for field inspections to detect soil voids as a function of depth and to detect underground structures;
- Characterize the smallest size and severity of defects that can be detected with IR thermography;
- Define operational problems associated with its field deployment and suggest operating procedures to optimize the use of IR imaging on UAS platforms;
- Outperform currently used techniques such as visual inspection and GPR.

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Project Information

This project is being conducted as part of the Massachusetts Department of Transportation (MassDOT) Research Program with funding from Federal Highway Administration (FHWA) State Planning and Research (SPR) funds.

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Project Champion:
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Project Start Date:
11/15/2020
Expected Project Completion Date:
02/15/2022

Methodology

The methods for this project will include:

- Extensive literature review of UAS-IR inspection to determine limitations in detecting subsurface voids in roadways;
- Advanced laboratory testing campaign using handheld IR cameras to characterize the AIR_T system's capabilities to detect defects in a controlled environment (e. g., function of camera distance and tilt, depth, moisture content, light intensity, and temperature difference);
- Field and outdoor tests will be used to validate the novel AIR_T in a real-world environment by using a UAS embedding a high resolution IR camera.

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