NDSU UPPER GREAT PLAINS TRANSPORTATION INSTITUTE

PIPES

Pipeline Infrastructure Performance Enhancement Solutions

Regular pipeline monitoring has become critically important to the United States. Low-cost and easy-to-use solutions will enhance early pipeline incident detection, mitigate catastrophic damages, facilitate response, and quantify remediation. Early detection of potential incidents provides major benefits to multiple stakeholders. Corporations will minimize loss by expediting

solutions. Government agencies will organize and coordinate efficiently to facilitate early responses. In addition to rapid spill detection capabilities, information about their size and composition would benefit emergency services and public health agencies. Subsequently, public confidence in property and ecosystem security will increase. Existing ground-based visual inspections or the use of imagery from manned aircraft cannot provide the frequent and continuous monitoring needed because of their relatively high cost and the long delays in obtaining results of the analysis. The use of small Unmanned Airborne Systems (UAS) coupled with new remote sensing techniques such as hyperspectral imaging and 3D data visualization techniques provides a powerful set of tools.

NDSU X5 Fixed Wing

Concept: NDSU and its partner, Michigan Technological Research Institute (MTRI), have demonstrated the value of such an approach.

North Dakota State University • Fargo
Upper Great Plains Transportation Institute
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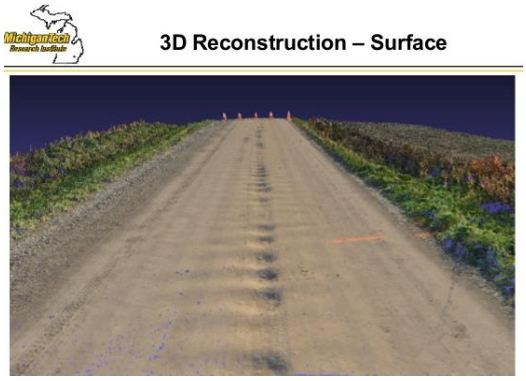
Our capabilities include:

- Detecting risk factors such as encroachments, early leaks from fatigue and corrosion, and spills containing high levels of hydrocarbons or sodium as found in crude oil and brine, respectively
- Identifying potential threats such as unusual or illegal activities such as pilferage

The NDSU UX5 is a fixed-wing UAS that regularly observes agricultural targets in visible RGB and thermal infrared. The NDSU and MTRI Bergen Hexacopters feature easy takeoff and landing and high-resolution imagery suitable for creating 3-D point clouds.

MTRI/NDSU Bergen Hexocopter



Our approaches are to:

- Utilize flight and mission-ready UAS to obtain and/or relay data from low-cost/embedded/in-situ terrestrial sensors
- Implement a demonstration of color, near infra-red, and high-resolution broadband visible imagery using existing flight systems and sensors
- Follow-up with a demonstration of hyperspectral and multispectral remote sensing by purchasing optimized sensors and more capable flight systems
- All phases of the research and demonstrations will include 3-D point cloud renderings such as the sample digital reconstruction for unpaved roads shown above.

We offer

- Team members who are subject matter experts and national leaders in the proposed technologies, including hyperspectral sensing and decision-support frameworks
- Agile and responsive teams that are ND-savvy
- Expertise with an innovation-deliverable focus to develop the technologies with customized capabilities that would address the client's present and future needs
- Liaison with industry partners who would commercialize the technologies for large-scale deployment, including information services

NDSU Research and Technology Park (RTP) is a proven asset for technology incubation, transfer, and commercialization. The PI was a former RTP board member, and a former member of the ND Economic Development Foundation. Our clients will also have access to UGPTI's exceptional liaison capabilities that are highly regarded by many state and federal agencies, and an extensible framework for future R&D to promote economic development.