

# CAAP Quarterly Report

Date of Report: April 15, 2020

Prepared for: *U.S. DOT Pipeline and Hazardous Materials Safety Administration*

Contract Number: 693JK31850013CAAP

Project Title: A Fast and Low-cost Method to Automate Detecting, Locating, and Mapping Internal Gas Pipeline Corrosion using Pig-mounted Thermal and Stereo Cameras

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For quarterly period ending: 3/31/2020

## **Business and Activity Section**

### **(a) Contract Activity**

- 1) **Contract modification:** No contract modification is expected in this quarter.
- 2) **Material purchased:** An Intel NUC small form computer was purchased and with accessories (memory, camera connectors etc)

### **(b) Status Update of Past Quarter Activities**

#### 1) Part 1 Technology / platform development

✓ ~~*Task 1.1: Design, prototype, and test the pig device with all the mounted devices and cameras*~~  
This task is ~~100%~~ completion.

✓ ~~*Task 1.2 Setup the testing pipe platform in the working space of UNL Structural Lab.*~~  
This task is ~~100%~~ completion.

✓ *Task 1.3 Identify, develop, and test algorithms for internal pipe surface RGB-D mapping*  
This task is ~~70%~~ 100% completion.

*Task 1.4 Identify, develop, and test algorithms for internal pipe surface thermal image mapping*

This task is ~~20%~~ 50% completion.

*Task 1.5 Identify, develop, and test Machine Learning algorithms of corrosion detection using multispectral channels.*

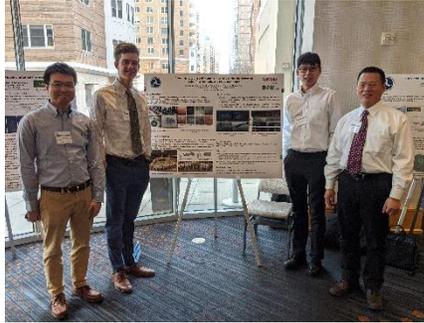
This task is ~~20%~~ 30% completion.

#### 2) Cost share activity

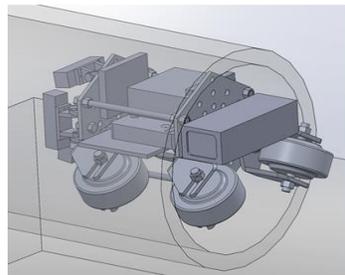
The PI dedicated 0.2 FTE in this quarter to the project.

**3) The major research activities and outcomes in this quarter include:**

1. The research team presented partial research outcomes of this quarter in the 2020 PHMSA R&D Forum at Washington D.C on February 19-20, 2020. (from left: Chongsheng Cheng, Gabriel Clark, Zhexiong Shang, and Zhigang Shen)



2. Created 3D simulations in a game engine to simulate the inspection rover's travel in the pipeline testing bed. The simulations will help with improving the performance of the modeling and mapping algorithms.



3. Identified and developed 3D modeling and mapping algorithms which were utilized by the inline rover inspections. A major milestone was achieved by successfully creating the full loop pipeline model.



**4) Next quarter**

In the 7<sup>th</sup> quarter the team will focus on improving the performance of 3D modeling and mapping algorithms, including inspection speed, accuracy and robustness.