

# CAAP Quarterly Report

Date of Report: July 19, 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: 6/30/2020

## **Business and Activity Section**

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

1) **Contract modification:** No contract modification is expected in this quarter.

2) **Material purchased:** N/A

### **(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 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 ~~30%~~ 50% completion.

*Task 1.6 Identify, develop, and test Machine Learning algorithms of corrosion detection using 3D profile channel. Corrosion and defect spots of different sizes and shapes will be marked on the maps automatically after 3D-profile matching corrosion*

*features are found.*

This task is 30% completion.

**Task 1.7** *Develop efficient data fusion approach to generate more reliable detecting result than single channel method (such as using weighted average method by estimating the optimal weight factor of data from each channel)*

This task is 0% completion.

**Task 1.8** *Develop the tool to enable precise overlay of images of the detected corrosion spots in all three channels to assist with corrosion formation monitoring and evaluations.*

This task is 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. Developed new algorithm to precisely locate and map any visual defects on the pipeline internal surface.
2. Improved the performance of the inspection rover in terms of accuracy of pipeline modeling, so the 3D modeling accuracy was reached at millimeter level.
3. Developed improved algorithm and hardware to model curve pipelines

## **4) Next quarter**

1. In the 8<sup>th</sup> quarter the team will focus on further improving the algorithm and hardware of 3D modeling on the curved pipeline.