

# CAAP Quarterly Report

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

Contract Number: 693JK31950006CAAP

Project Title:

AN AUTONOMOUS UAS INSPECTION PLATFORM FOR HIGH-EFFICIENCY 3D PIPELINE /ROUTE MODELING /CHANGE-DETECTION AND GAS LEAK DETECTION-LOCALIZATION

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For quarterly period ending: **12/31/2019**

## **Business and Activity Section**

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

Contract modifications:

No contract modification is expected at this point.

Discussion about materials purchased:

A DJI Ronin-MX gimbal and accessories were purchased to mount the 10-lb thermal camera on the drone for inspecting above-ground pipelines and tanks.

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

High level summary of the work performed for the reporting period.

### **(c) Cost share activity**

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

### **(d) *Task 1: Develop a prototype of pipeline/tank inspection data management and the integration module (PIDMIM).***

**Subtask 1.1.** Design and implement the proposed PIDMIM, which utilizes Google Maps as user interface to access, retrieve, and visualize inspection data (in image, point cloud, and text data formats).

Sketchup was identified as the implementation platform for the PIDMIM. 3D pipeline models, 3D/4D visualization, data queries and inspection data input will all go through the web-based graphical user interface as shown in Figure 3 in the proposal.

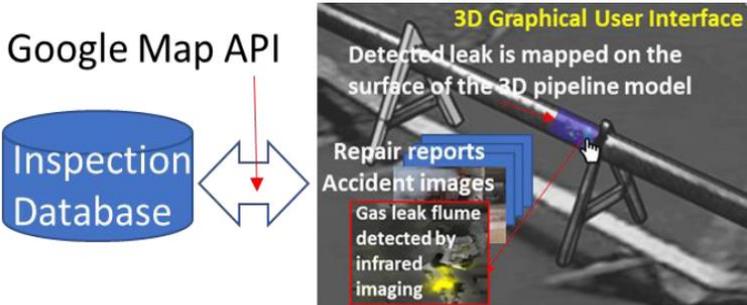
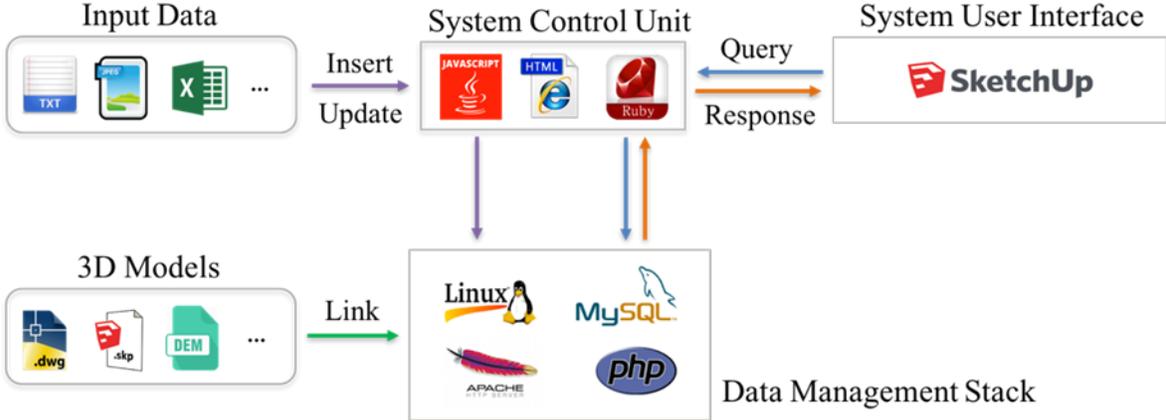


Fig. 3. Google map-based 3D PIDMIM

The identified implementation framework of the PIDMIM is illustrated in the following Figure:



The system is developed with three major segments, they are (1) data management stack; (2) graphical user interface; and (3) system control unit. Graphical user interface is the major component to visualize the 3D model and provide user intersection. Trimble SketchUp is selected as the base engine for 3D model representation. System control unit is the core component of this system. It is developed as a set of callback functions such that the interaction between data management stack and system user interface can be achieved. A screenshot of the system’s UI is shown in Fig. 3 of the proposal. System control unit is a web-based API. The API files are developed with Ruby language where the major functions to query the database, interact with web interface, and manipulate the 3D model are developed.

**Future work**

In Quarter 2, the team will further explore the implementation details of the PIDMIM, and conduct a small-scale pilot implementation to understand the challenges in developing this module.

**References**

N/A