Plan Overview

A Data Management Plan created using DMPTool

DMP ID: https://doi.org/10.48321/D1B62411df

Title: Smart Structures Demonstration Project

Creator: Andrew Kosiba - **ORCID:** 0009-0008-3234-6037

Affiliation: United States Department of Transportation (DOT) (transportation.gov)

Funder: United States Department of Transportation (DOT) (transportation.gov)

Funding opportunity number: SMARTFY22N1P1G45

Grant: https://www.transportation.gov/sites/dot.gov/files/2023-03/FY22%20SMART%20Project%20List.pdf

Template: SMART Grants Stage 1 Data Management Plan (DMP)

Project abstract:

As the infrastructure industry advances into the digital age, the availability of emerging technologies coupled with digital access to data holds the opportunity to streamline infrastructure workflows and processes. With a focus on structural inspections, the NYS Thruway Authority intends to reimagine the way data is accessed and integrated for its infrastructure.

Using Unmanned Aerial Systems (UAS) to supplement inspections and making this data accessible on-site, coupled with a mobile inspection reporting app providing access to historic reporting information, our goals are to increase efficiency, safety of inspection personnel, and ease and completeness of reporting.

This proposed project, which is fully aligned with the Authority's strategic goals, will utilize the

most advanced technology available to develop much more robust condition-rating capability.

With the application of seamless data integration, more efficient workflows, more detailed datasets, and better access to historical data, the concept is scalable to any application where repeatable photos and form data are used for condition reporting.

Significant benefits from use of UAS and implemented IT solutions will supplement the Authority's asset management systems, which will improve the safety, efficiency, reliability, and resiliency of the transportation

system. The Stage 1 project will be conducted for immediate benefit for the Authority and the New York State Department of Transportation and will also be fully scalable to other entities locally within New York State and nationally. This demonstration project will also serve the UAS industry by demonstrating areas of proven capabilities and identification of areas where opportunities exist for further technology enhancement.

Start date: 09-01-2023

End date: 03-21-2025

Last modified: 02-19-2024

Smart Structures Demonstration Project

1: Smart Structures Demonstration Project

2: SMARTFY22N1P1G45

3: Andrew Kosiba, PLS

4: 0009-0008-3234-6037

5: Andrew.Kosiba@Thruway.ny.gov 518-603-5048

6: New York State Thruway Authority

7: UAS@thruway.ny.gov 518-436-2700

8: NYS THRUWAY GRANT APPLICATIONS

9: Jan 9, 2024

Datasets may include:

1. Bridge Data for Inspectors (+/- 350 MB): The “Bridge Folder”. Currently each bridge on the Authority system has its own physical folder which contains paper copies of every important informational detail about the bridge. The Authority's inspectors would like to have this information available digitally onsite. Much of the information is already digitally stored but spread into different locations with varying levels of access. A goal of this grant is to build a digital warehouse for this data into an app that will supply the inspectors with all of the information for any bridge, without the need to revisit the office to retrieve the paper files. Data involved with this effort includes:

3 past inspection reports (100 MB).
Load Rating Data (minimal +/- 10 MB).
Contract Plans (+/- 50 MB).
As Built Plans (+/- 50 MB).
Adjacent Utility Info (Not currently digital, minimal file sizes when scanned).
Maintenance History (minimal +/- 10 MB).
Recent Photos (100 MB).
Misc. Email History regarding the Bridge (minimal +/- 10 MB).
Red Flag Items (minimal +/- 10 MB).
Vertical Clearance Data (minimal +/- 10 MB).
2. Bridge Inspection Mobile App (Unknown Size): Data relating to the creation and hosting of the proposed feature-rich inspection mobile app includes photo cataloguing and annotation features, note taking, and integrating access to the new digital bridge folder mentioned above. Quantification of this data will determine the volume of space needed to host the app.

3) Imagry associated with bridge inspection (+/- 5 GB) includes digital images that are collected by the inspectors during their inspection. At some point, while maintainaing conformance with state and federal laws relating to bridge inspecitons, old photos may be purged. However, the duration of time anticpated to retain data is lengthy as there is a need to access several years of photos of the same locations to track long term degradation in the field during the inspection. [jpeg].

4) Scan Data for Digital Twin Model Creation (Estimated +/- 10 GB): This represents all of the data collected in

the field to create the digital twin (images and georeferencing information, up to approx. 5 GB) as well as the files created by the image processing software that creates the model (estimated at an additional 5 GB). This number would represent one bridge for the purpose of testing the concept. Some files may be purged after the model is finalized to save space in the future when more bridges are modeled. Should data constraints become an issue, the Authority will develop a criteria to prioritize which bridges should be modeled, (at scale, estimate approx. 30 bridges being monitored.) [jpeg/tiff/geotiff]

Images for the project will be collected by inspectors using UAS devices or tablet based digital cameras. Condition ratings will be logged to the tablet devices and connected to Thruway servers. Historic records relating to the structures will be compiled from digital files that reside on our current servers within the Thruway system. Information relating to structures for GIS purposes already exists on our GISWeb system.

File naming conventions will conform to standards required by AASHTO for upload to BDIS (Bridge Data Information System).

Data used to create and analyze digital twins will flow through 3D modeling software (Bentley Context Capture, Pix4D or equivalent) to create and display the models.

Much of the data being generated for this project will be centered around images and documents; ie: .jpeg, .tiff, .pdf, .xls, .docx. See data description above for delineations of file types across data classifications. These data formats are utilized by widely available software packages. Any .xls or .docx files that are necessary may also be posted in .csv, .txt or .pdf formats for non-proprietary use. The Thruway Authority will make every effort to provide open-access formats for any posted data.

For 3D modeling and mapping, the industry standard file formats include; .las, .laz, .kml, dxf, .shp. Generally speaking, all of these file formats referenced above are non-proprietary and platform independent.

Any identified need for interfaced metadata will be in will be in JSON format adhering to DCAT-US V1.1.

Image data will contain EXIF header information which includes file type, file size, data created, latitude, longitude, altitude, camera type and flight height (Z Value) for imagery processing when necessary to import into ArcGIS.

No sensitive data is anticipated to be collected during the course of the project. Any secure sensitive infrastructure within the Authority's system (ie: The Governor Mario M. Cuomo Bridge) will be excluded from the project.

No PII data will be collected. The nature of our system as a controlled access superhighway ensures that pedestrians are restricted from occupying the highway outside of enclosed vehicles limiting the opportunity for images to include faces or identifying information. Our project focuses on structures with no human participants present in the data collected. Any data relating to traffic or the traveling public is generic and does not contain any personal information.

The main repository for data collected, being the servers managed by the Department of Information Technology within the NYS Thruway Authority, will be accessed by end users through individual accounts, in conformance with NYS-S14-013. Inspection teams will update the data as inspections are completed and reports are filed.

Said IT standard referenced above outlines account types and access, creating a framework for which entities have access to which data, including roles, responsibilities, and permissions.

With regard to public access to this data, as this project does not anticipate collection of PII or secure sensitive data, the Authority does not expect any restrictions on sharing.

Data collected during the term of this project will be classified in accordance with NYS-S14-013, , IT Standard Account Management and Access Control, issued by NYS Office of Information Technology Services. Said standard defines the "Information Owner" as follows:

"Information Owner: Information owners are people at the managerial level within an SE who:

- Delegate Account Managers to ensure the appropriate level of information access is provided. Delegation can be to individual users, groups, or third parties (e.g., another SE).

- Define roles and groups, as well as the corresponding level of access to resources for that role or group.

- Determine who should have access.

- Determine the identity assurance level for the application or data via the NYS-P20-001 Digital Identity Policy.

- Review that accounts and access controls are commensurate with overall business function and that the associated rights have been properly assigned annually, at a minimum.

- Require business units with access to protected resources to notify Account Managers when accounts are no longer required, such as when users are terminated or transferred and when individual access requirements change."

The above-mentioned policy can be found at NYS-S14-013, IT Standard Account Management and Access Control, issued by NYS Office of Information Technology Services. The purpose of this standard is to establish the rules and processes for creating, maintaining, and controlling the access of a digital identity to New York State (NYS) applications and resources for means of protecting NYS systems and information.

All data used or collected during the course of the project will have been generated or owned by the NYS Thruway Authority (No 3rd party data anticipated). No licensing for data citations are expected to be required.

The data management plan will be executed by the Department of Information Technology within the NYS Thruway Authority in conformance with all NYS standards for data management previously cited.

As the Thruway Authority will be the only collector of data and the sole managing agency for the data, consortiums or partnership contracts with regards to data ownership are not expected to be necessary.

Data collected during the funding cycle of this project will be made publicly available.

Internally, data handling for this project will be managed by, and conform to standards set forth by, the NYS Thruway Authority's Department of Information Technology. Inspection teams and the engineering department at

the Thruway Authority will access the data collected as part of this project in perpetuity to continuously monitor our structures and assess their conditions.

At the end of the research term, data collected and created will be shared to "figshare". “figshare” is on the list of repositories that NTL team has evaluated and are conformant with the USDOT’s Public Access Plan.

figshare - https://figshare.com/account/home#/projects/195644

All research made publicly available on figshare gets allocated a DataCite DOI at the point of publication, providing a persistent identifier for the data to confirm compliance with the Public Access Plan.

Planned Research Outputs

Workflow - "Smart Structures Demonstration Project - Infrastructure Inspection"

As the infrastructure industry advances into the digital age, the availability of emerging technologies coupled with digital access to data holds the opportunity to streamline infrastructure workflows and processes. With a focus on structural inspections, the NYS Thruway Authority intends to reimagine the way data is accessed and integrated.

Using Unmanned Aerial Systems to supplement inspections and making this data accessible on-site, coupled with a mobile inspection reporting app providing access to historic reporting information, our goals are to increase efficiency, safety of inspection personnel, and ease and completeness of reporting.

This proposed project, which is fully aligned with the Authority's strategic goals, will utilize the most advanced technology available to develop much more robust condition-rating capability. With the application of seamless data integration, more efficient workflows, more detailed datasets, and better access to historical data, the concept is scalable to any application where repeatable photos and form data are used for condition reporting.

Significant benefits from use of UAS and implemented IT solutions will supplement the Authority's asset management systems, which will improve the safety, efficiency, reliability, and resiliency of the transportation system. The Stage 1 project will be conducted for immediate benefit for the Authority and the New York State Department of Transportation and will also be fully scalable to other entities locally within New York State and nationally. This demonstration project will also serve the UAS industry by demonstrating areas of proven capabilities and identification of areas where opportunities exist for further technology enhancement.

Planned research output details

Title	Type	Anticipated release date	Initial access level	Intended repository(ies)	Anticipated file size	License	Metadata standard(s)	May contain sensitive data?	May contain PII?
Smart Structures Demonstration Project - Infrastru ...	Workflow	2025-03-20	Open	Figshare		Creative Commons Zero v1.0 Universal	DCAT (Data Catalog Vocabulary)	No	No