Infrastructure Condition Assessment and Monitoring with point cloud, images, 3D models

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Introduction

Ali Afrasiabi, PE, SE
- Multi-discipline projects
- Grass root evolution
- Integrated Project Delivery (IPD)

Vincenzo Melchiorre, PE
- Drone
- Multi-discipline projects
- Structural assessments
Water infrastructures
Division of Safety of Dams (DSOD) data sets

- **87,000** dams in the United States
- **1,205** dams in California
- **1/3** pose a "high" or "significant" hazard to life and property.
- **> 180** dam failures in USA since the 1880’s.
- **2,209** fatalities on May, 1889, South Fork, Johnstown, Pennsylvania
- **37’** high wall of water hits Johnstown
Johnstown, Pennsylvania – May, 1889

This photograph was taken of the destruction of Main Street in Johnstown.
Folsom Dam Radial Gate Failure – July 1995
Oroville Dam Spillway Failure – February 2017

Photo credit to Barbara Rich/Getty Images

Photo credit to AP Photo/Rich Pedroncelli

Photo credit to William Croyle/California Department of Water Resources via AP.
Zoned Earth Embankment Dam
Anderson, California
Concrete Dam
Folsom, California
Condition Assessment - Traditional Workflow
Field Operations
Field Operations
Condition Assessment - Traditional Workflow

FIELD OPERATIONS

WATER INFRASTRUCTURE → TRADITIONAL WORKFLOW → DELIVERABLE

ROPE, IMAGES, FIELD NOTES
Condition Assessment - Traditional Workflow
Traditional Assessment Workflow

The Problems and Challenges

- Site accessibility
- Data collection
- Data processing
- Manual process
- Data accuracy and consistency
Traditional Workflow
Enhanced Workflow
Field Operations

Safety

Site accessibility
Data collection
Automated process
Data accuracy
Consistency
Enhanced Assessment Workflow

The Advantages

- Site accessibility
- Standardized data collection
- Data processing
- Data accuracy and consistency
- Automated process
How to utilize an early alert system using Enhanced Workflow?
How to implement Monitoring system using Enhanced Workflow

- Define benchmarks specific to structure
- Establish sets of rules and regulations
- Perform Automated process in pre-defined time intervals
- Early alert system
2017 Inspection Deficiencies

Photo: November 14, 2017
2018 Inspection Deficiencies

Photo: November 14, 2018
Monitoring using Enhanced Workflow
Enhanced Assessment / Monitoring Workflow
The challenges and path forward

- Client policies and regulations
- Initial cost
- Learning curve
- Client collaboration
- Deliverable
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