ADVANCED INFORMATION MODELING AND VISUALIZATION FOR RISK ASSESMENT OF EMBANKMENT DAMS

US Army Corps of Engineers
Pittsburgh District

Carnegie Mellon

Graduate Student: Varun Kasireddy, CEE, CMU
Research Advisors: Semiha Ergan, Prof., CEE, CMU.
Burcu Akinci, Prof., CEE, CMU.

Civil & Environmental ENGINEERING

Motivation

- There are over 85,000 dams in the U.S. with an average age of 50+ years (ASCE, 2012)
- Current grade for U.S. dams is "D" (ASCE, 2012)
- Risk assessment is challenging as it requires extensive current and historical data from instrumentation, design, construction and operation

Problem Statement

- Risk assessment of an embankment dam requires gathering dam specific historical documentation (e.g., instrumentation data, historical reports, geo-location characteristics, dam structure) and analyzing them in detail
- Document based nature limit the capabilities of risk assessors to gather, analyze and visualize the data flexibly from various engineering perspectives
- 2D static instrumentation plots do not help risk assessors to observe changes in the structure

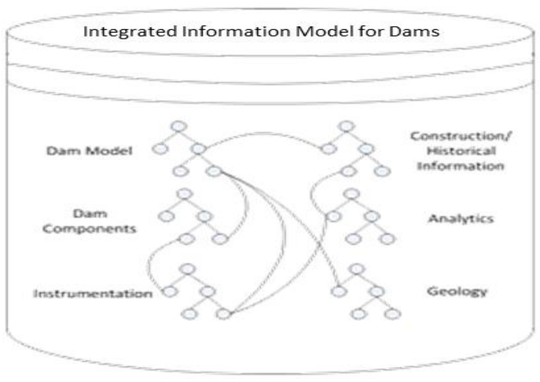
Research Objectives

- Develop a representation schema for a schematically rich integrated data model that contains information requirements of multi-stakeholders (engineers, risk assessors) in dam risk assessment
- Identify visualization requirements of multi-stakeholders in dam risk assessment process and develop reasoning mechanisms to generate required displays
- Developing reasoning mechanisms to generate views for engineers

Vision

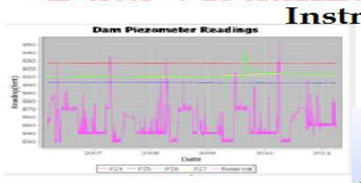
Prototype

- Boring Log Information
- Drawings
- 3D model
- Reports
- Photos
- Instrument information

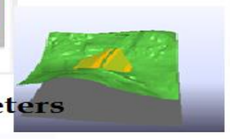


Data Visualization

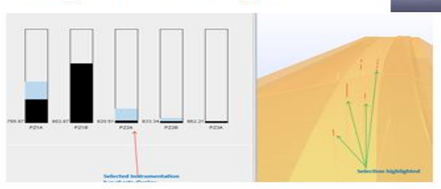
Instrumentation



3D model



Comparison of piezometers

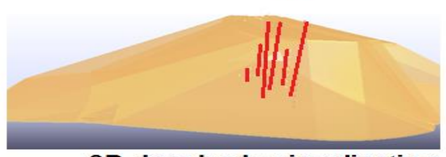


Information Modeling

- Geometric Representation
- Features
- Historic data
- Boring Log Information
- Instrumentation
- Tests

...

Highlighed piezometers



3D dam body visualization

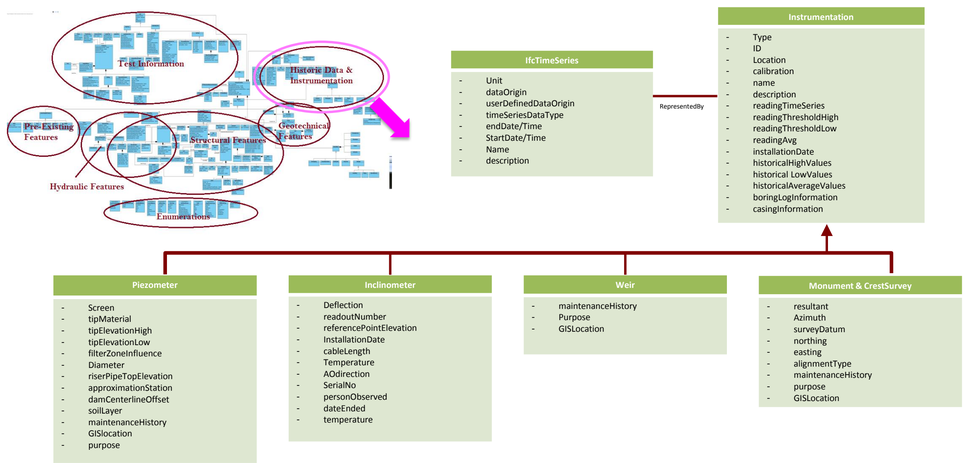
Participants

Carnegie Mellon University
US Army Corps of Engineers
PSII Pennsylvania Smart Infrastructure Incubator

Graduate Student: Varun Kasireddy
Advisors: Semiha Ergan and Burcu Akinci

Findings

- Information needed by engineers from various domains during risk assessment for internal erosion modeled using UML



- Developed a prototype to integrate the identified information and provide them in required views