Floodbusters

Project HydroCams

The Team

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Our Client

- Professor of Computer Science and researcher - SICCS NAU
- Cofounder of the FloodAware Project, overseeing the development of HydroCams
- Dr. Doerry's Goals for HydroCams:
  - Easy to Install
  - Affordable
  - Solar Powered
  - Cell-Connected

Dr. Eck Doerry

Current Process

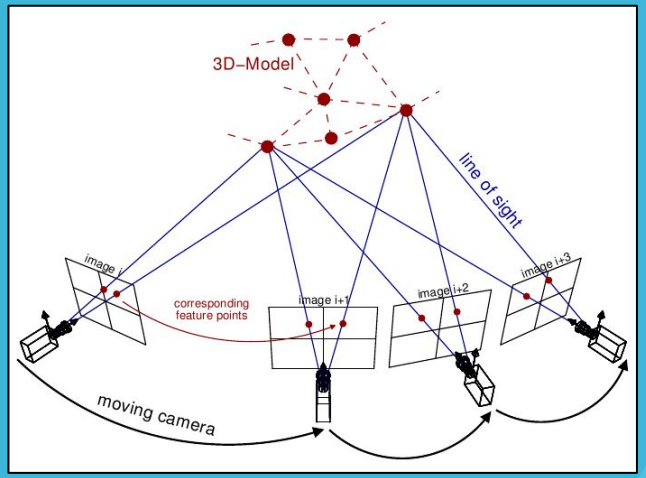
Camera Installation → Marker Installation → Sketch of marker location → Survey equipment to measure marker locations → Handwritten notes of marker values → Return to office → Annotation of camera image → Manual input of field measurements → Upload configuration file to server

Problem Statement

- Current flood monitoring systems require expensive and labor-intensive processes to generate calibration files
- Specialized, expensive surveying equipment
- Highly trained installation technicians
- Relies on hand drawn images and notes
- Manual input and annotation
- Prone to user error requiring repeat trips back to camera site

Solution Overview

- Online Image Workbench
  - Manually select markers and input measurements
- Computer Vision (CV)
  - Enables automatic detection of markers and zero point
- Structure from Motion (SfM)
  - Automatically calculate all 3D measurements
- Mobile Application
  - Take and upload images on-site



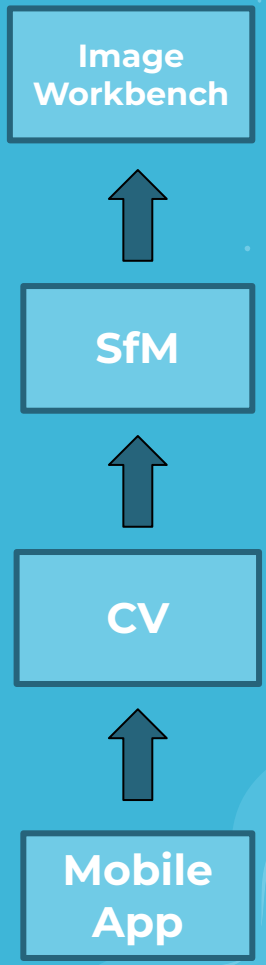
Key Requirements

After some deliberation with our client, and a review of the project documents, we settled on the following key requirements:

- Browser-agnostic image workbench front end
  - For marker identification
- Supporting back end
  - To handle image fetching and storing
- Basic CV marker identification program
- Depth measurements using SfM
- Mobile application
  - Take images; Send and receive data in the field

Functional Requirements

- Image Workbench Front End
  - Image Upload
  - Navigation
  - Markup
  - Calibration / Annotation Output
- Automatic Marker Identification via CV
- 3D Measurements via SfM
- Mobile App
  - Camera Functionality
  - Server Communication

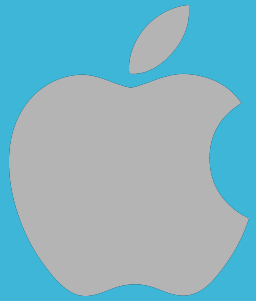


Performance Requirements

- Quick computation times
  - CV / SfM should take < 2 minutes total
- Long-term data storage
  - Images and calibration files should be stored until no longer necessary
- UI/UX
  - Non-technical users should be capable of using the interface
- Reliability
- Maintainability

Environmental Requirements

- HydroCam installation hardware
  - Limited camera resolution
  - Limited network connectivity
- Mobile OS compatibility
- Browser compatibility
- Limited hardware compatibility



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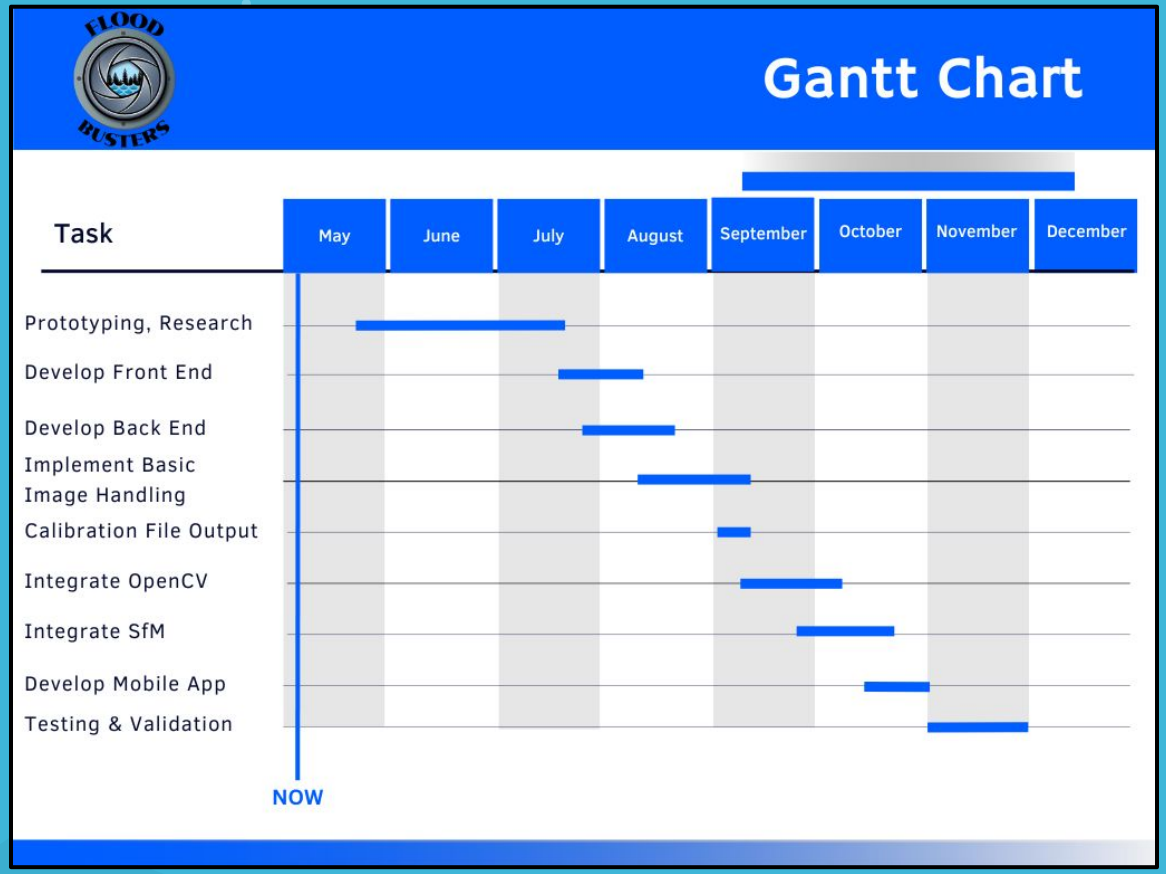
Risks and Feasibility

- Calculation Inaccuracies
  - Potential inaccuracies from CV or SfM could lead to misidentification of floods
- Injury during HydroCam Installation
  - Requirement of multiple images for SfM can introduce physical risks for technicians on rough terrain
- Destruction of Markers
  - Markers may be damaged or displaced by weather, wildlife, etc.
  - Renders the on-site camera useless

Schedule


FLOOD BUSTERS
Gantt Chart
Task
May
June
July
August
September
October
November
December
Prototyping, Research
Develop Front End
Develop Back End
Implement Basic Image Handling
Calibration File Output
Integrate OpenCV
Integrate SfM
Develop Mobile App
Testing & Validation
NOW

Conclusion

- Flooding regularly wreaks havoc on lives and property
- Current flood monitoring systems are too cumbersome and expensive to be practical or effective
- Our solution involves an online image workbench that utilizes a live network of cameras, computer vision, and structure from motion to automate flood detection
- Our next steps include prototyping and thorough testing / research
- We are confident that our efforts will revolutionize the world of flood detection, saving lives and millions of dollars in the process

Thank you!

Questions?