GLOBAL SURVEY
SURVEY & CONSTRUCTION TECHNOLOGY

The Autonomous Surveyor

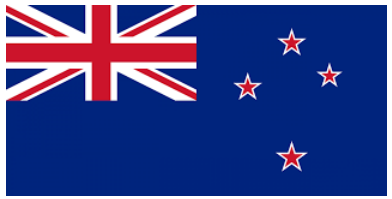
Haydn Bradfield

April 2021

Reality Capture and Construction Solutions Manager

Haydn Bradfield

- Civil Engineer by Education
- Large Infrastructure Projects
- Interest in Engineering Surveying and Construction Data
- Paired with passion for technology
- Digital Engineering
- Joined Global Survey in 2021



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Why Robotics and Reality Capture?

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Laser Scanning

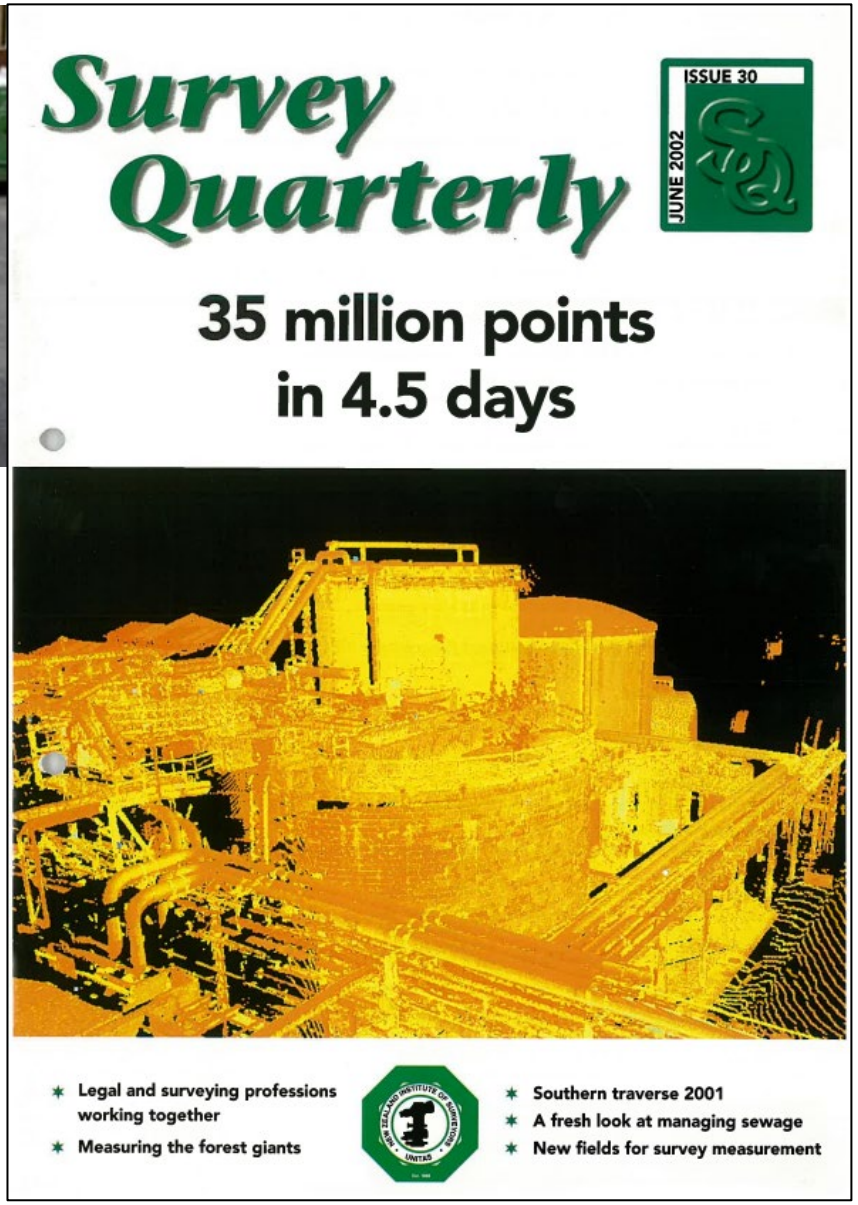
How far we have come

First scanner in New Zealand

- Cyrax 2500
- Accuracy +/-6mm
- 1000 pts/Second
- Field of View 40° by 40°
- 29 kg System (8kg Battery and 21 kg Scanner)
- Required PC
  - 500 MHz Pentium II
  - 256MB Ram
  - 10GB Hard Disk

Revolutionary !

- Power unit
- Tripod and mount

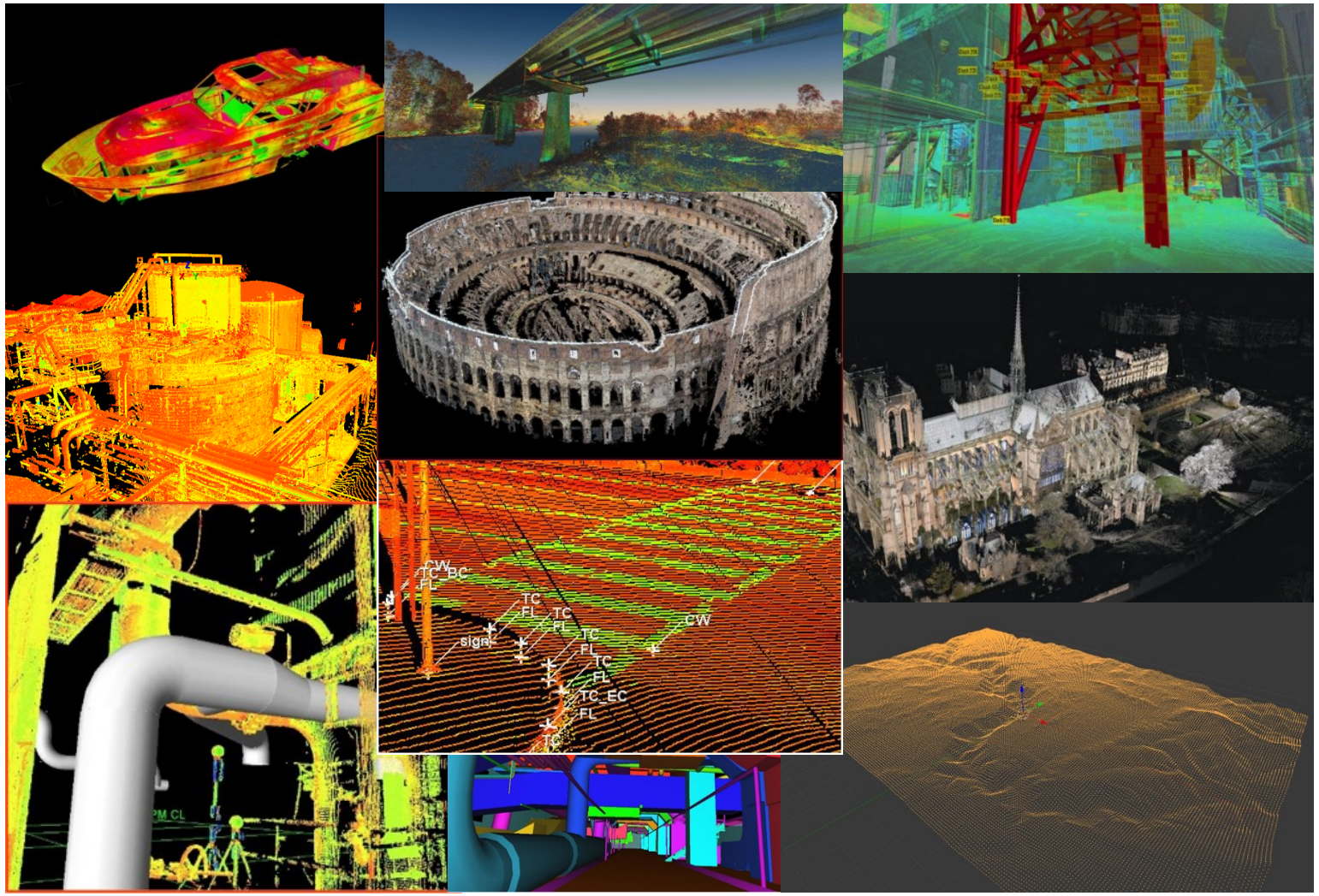


Laser Scanning

How far we have come

Where we are today

- 30-40% Growth in Scanner adoption
- 2 Million Points per Second
- Diversity of Hardware – More industries
- New industries = New Creativity
- More Creativity sparks new ideas
- New Ideas brings more opportunities



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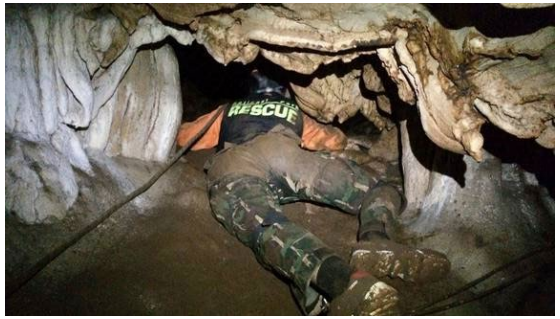
Robotics

Our current best approach?

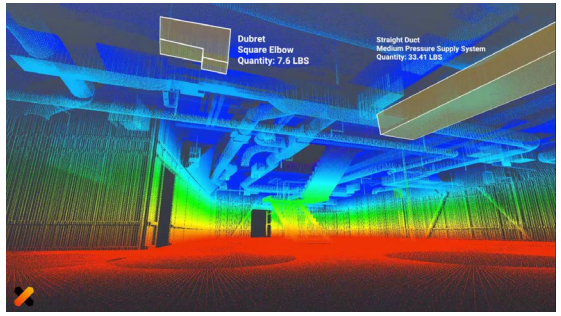
Disaster

Hazardous Environment



Repetition

Repeatability



https://www.doxel.ai/

Case 1

Global Survey’s Heavy Payload Vehicle

Case Study 1

Global Survey's Heavy Payload Vehicle

- Built for a Customer - scan dangerous sandy caves
- Rugged Design
- Long Range Wi-Fi with Yagi Antenna
- 360 Camera Wi-Fi Camera
- Payloads of up to 100 kg
- Scan and Go for Automatic Leveling at any inclination
- Built over 3-4 Weeks

Case Study 1

Global Survey's Heavy Payload Vehicle

- Challenges
  - Purchased Comms Solution on illegal Radio Freq
  - Latency of Wi-Fi Video Feed
  - Ground Clearance
  - Mass of System

- Lesson Learnt
  - Components and customization
  - Increase ground clearance
  - Maintain Ruggedness and Capability

Case 2

BECA – Marcus Hall

Case Study 2

BECA – Marcus Hall

- Innovative Journey Starts back in 2014 in WA, Australia

- Further Opportunities in 2019 & 2020

  2019
  - 40m Long, 2m Dia. Culvert
  - Under a live Highway
  - Confined space inspection
  - Remote Location with little to no records

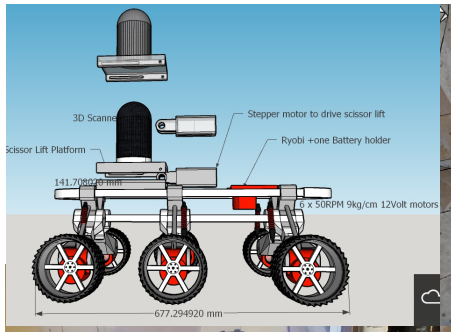
  2020
  - 100 Year-Old Cathedral underfloor area
  - Seismic structural strengthening project
  - Prohibited from entry-being a confined space, and the risk of asbestos
  - Revealing a previously recorded redoubt est. 1864

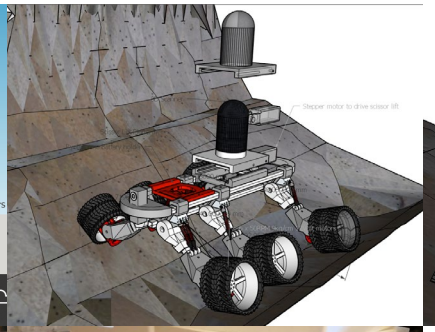
Case Study 2

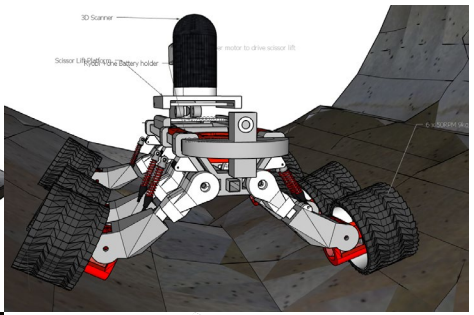
BECA – Marcus Hall

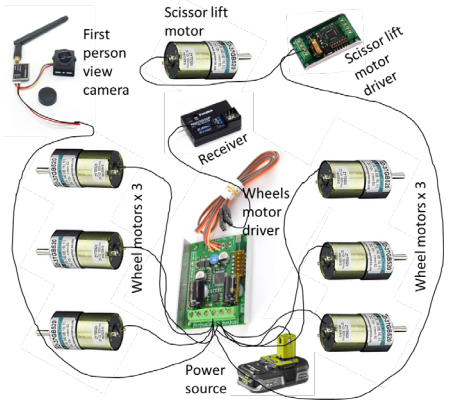
Complete Manufacture!

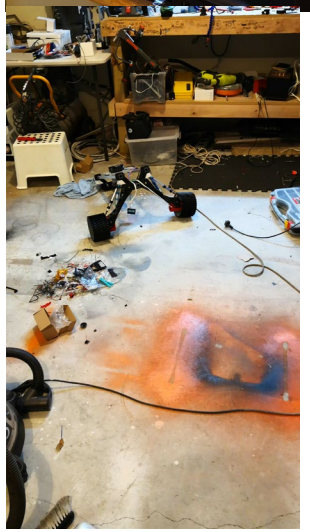
- Modelled all his components
- 1.2km of 3D Printing Filament
  - Even the Wheels! Specialized Rubber Filament
  - 34 parts to print
  - Average time 10hrs/part.
- Scissor Lift for Elevated Scan Positions
- FPV Radio Camera on controllable Gimble
- 1 month to design and build.
- Budget < $1,500

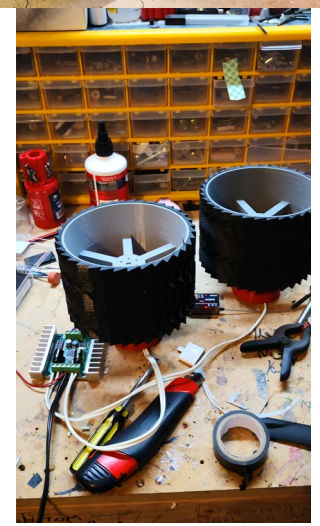










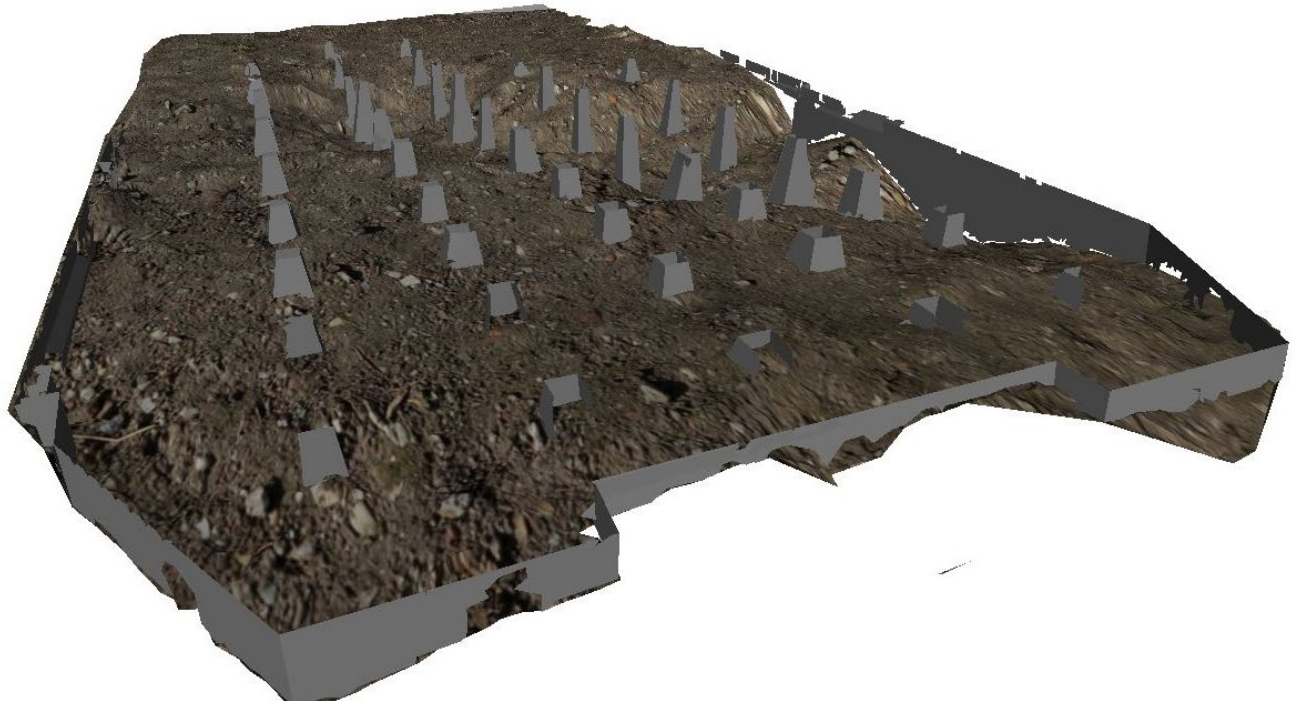


Case Study 2

BECA – Marcus Hall

Case Study 2

BECA – Marcus Hall



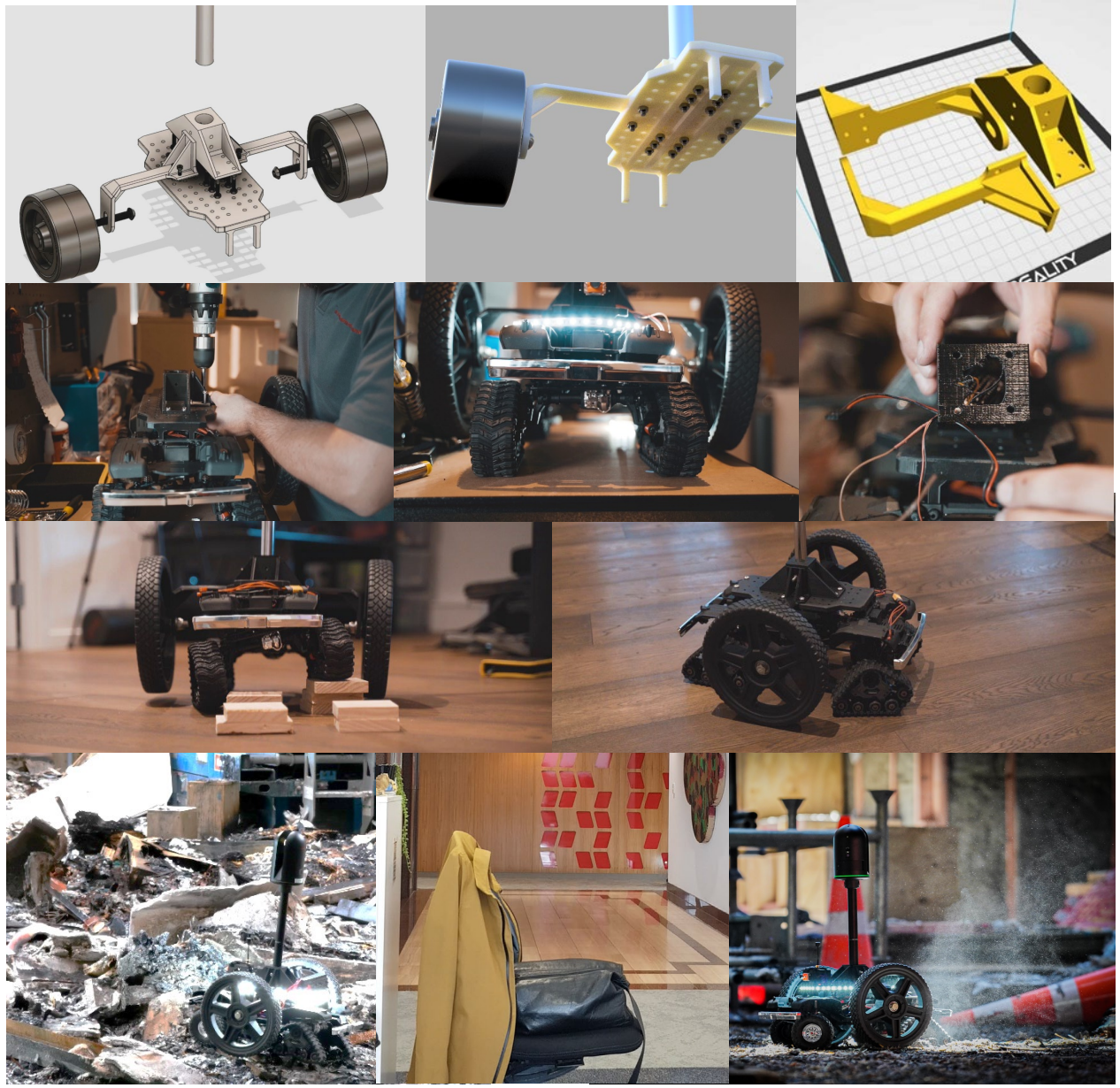
Case 3

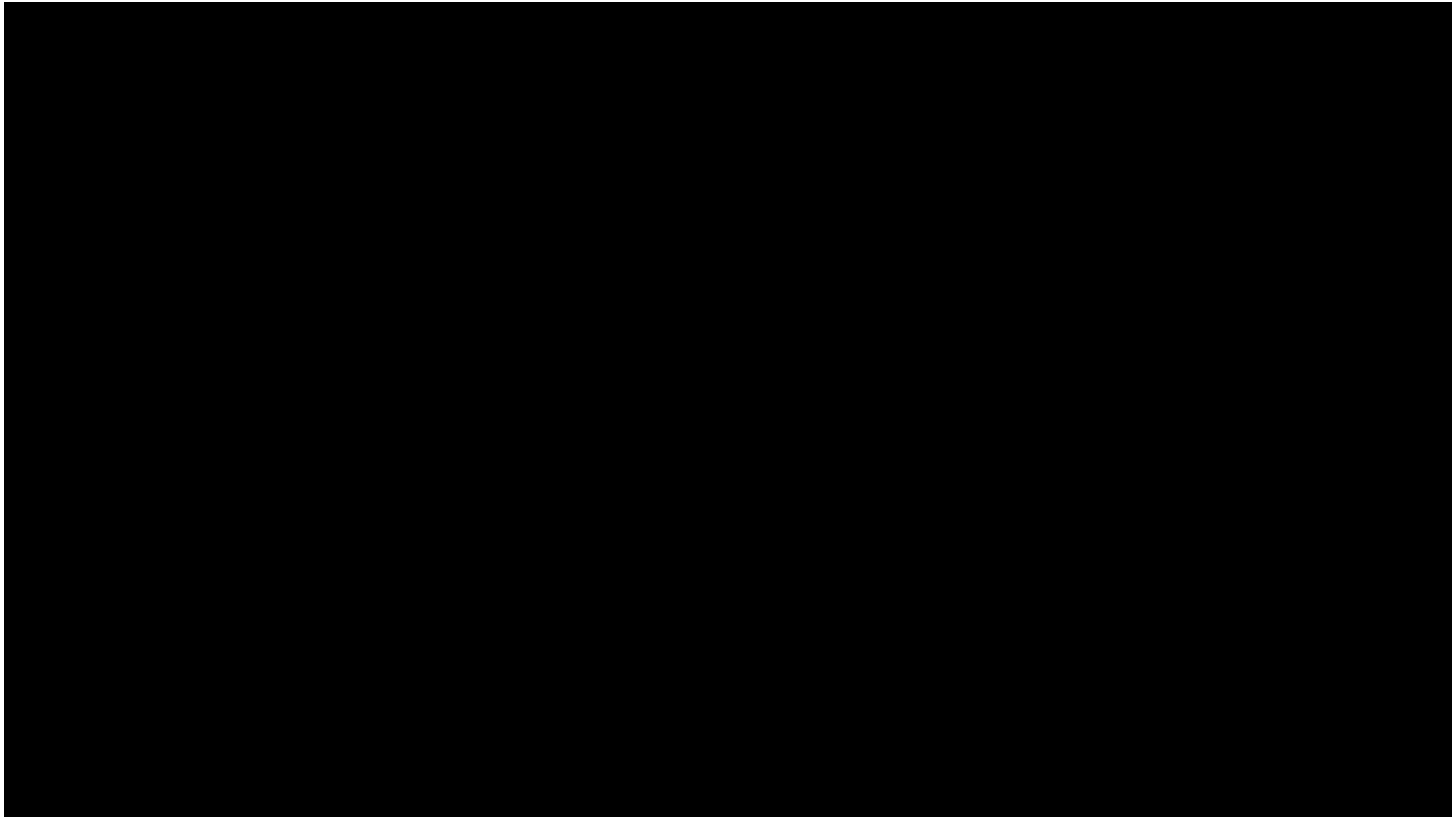
Reality Capture Rover

Case Study 3

Reality Capture Rover

- Built for an area subjected to Fire Damage
- RC Hobby Vehicle Stripped for Chassis
- Modelled in Fusion360 and 3D Printed
- LED lighting and Drone FPV camera feed
- Payloads included BLK360 & 360 Video Camera
  - 3/8th & 1/4th Tread
- Easy to Deploy and Operate
- Built over 1 Week and cost < $ 2,400





Case Study 3

Reality Capture Rover

- Challenges
  - Radio Feed for FPV Camera – Interference
  - Wi-Fi Range for Scanning Field App
  - Front and Rear Tip over angles
  - More Weight + Traction – Stress on Steering
    - stronger steering servo required
- Lesson Learnt
  - Keep the design simple and modular – allows for future modification and customization
  - Collaborate with Creatives outside of the industry

The next steps…

What does the future hold

GLOBAL SURVEY

How do we Teach a Robotic Solution to Capture Reality?

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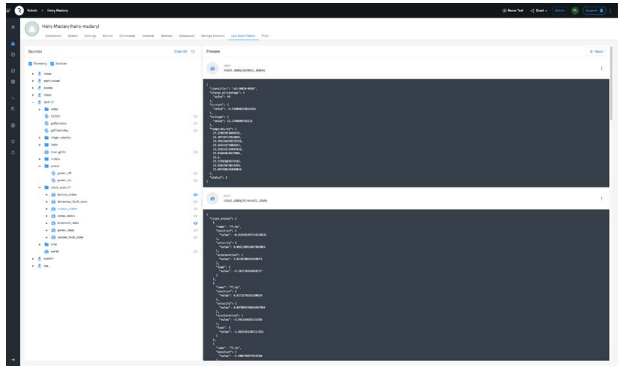
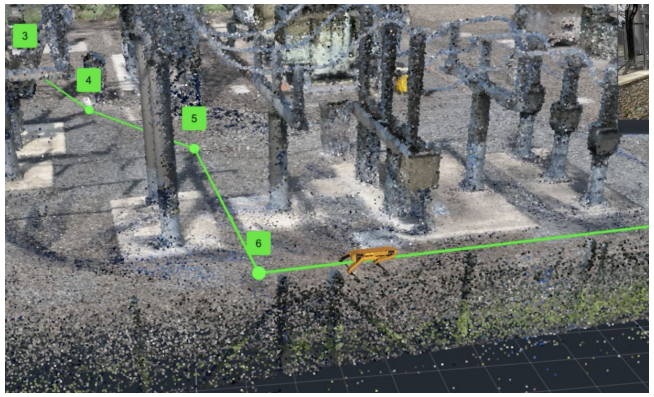
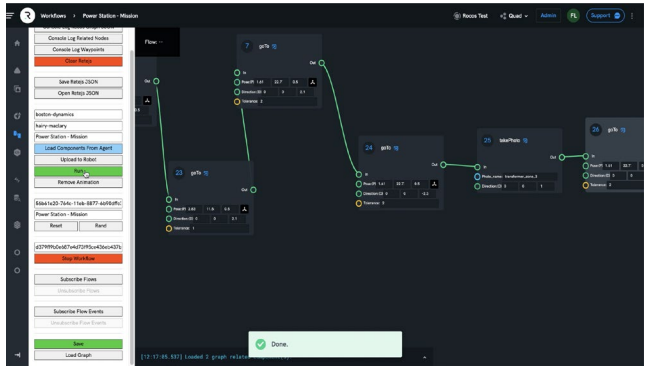
The Rocos Factor

Integrate Sensors



Automate Scanning Missions





Live Feedback