



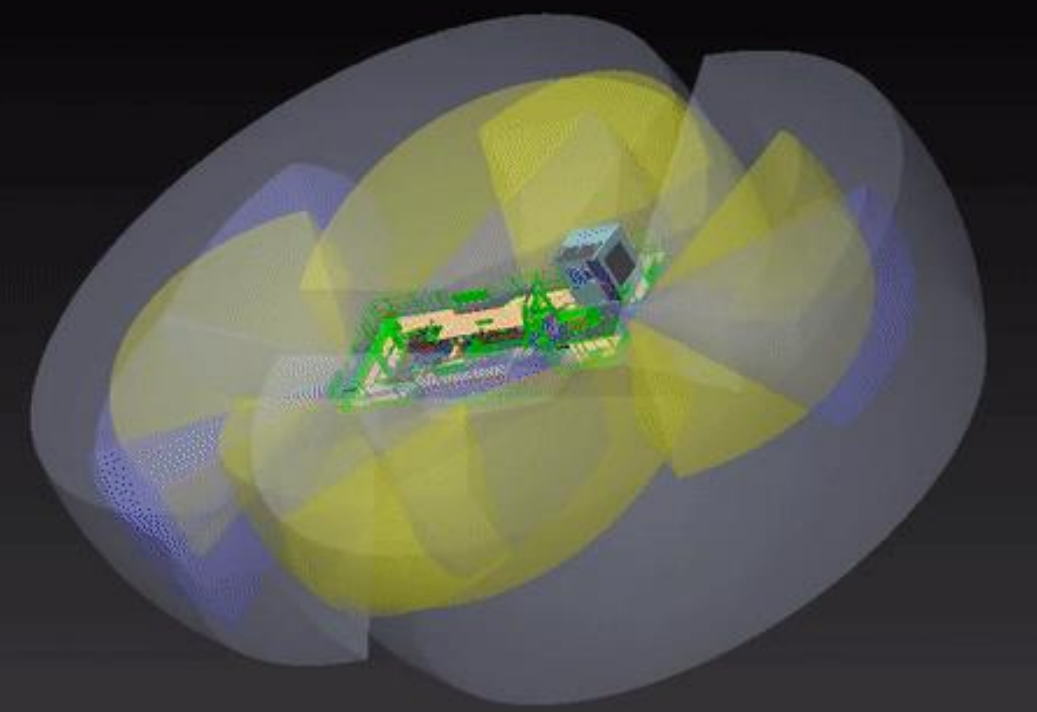
# Obstacle Detection System for Surface Mining Blasthole Drill Rigs



APRIL 2020

## Field of View Analysis

LiDAR  
Thermal  
Radar



## COTS Technology

- Nvidia Jetson AGX (Processor)
- VLP-16 LiDAR (Sensor)
- FLIR ADK Thermal Camera (Sensor)
- TI mmWave radar (Sensor)
- 3-tiered LED light stack (Output)

## Business Case

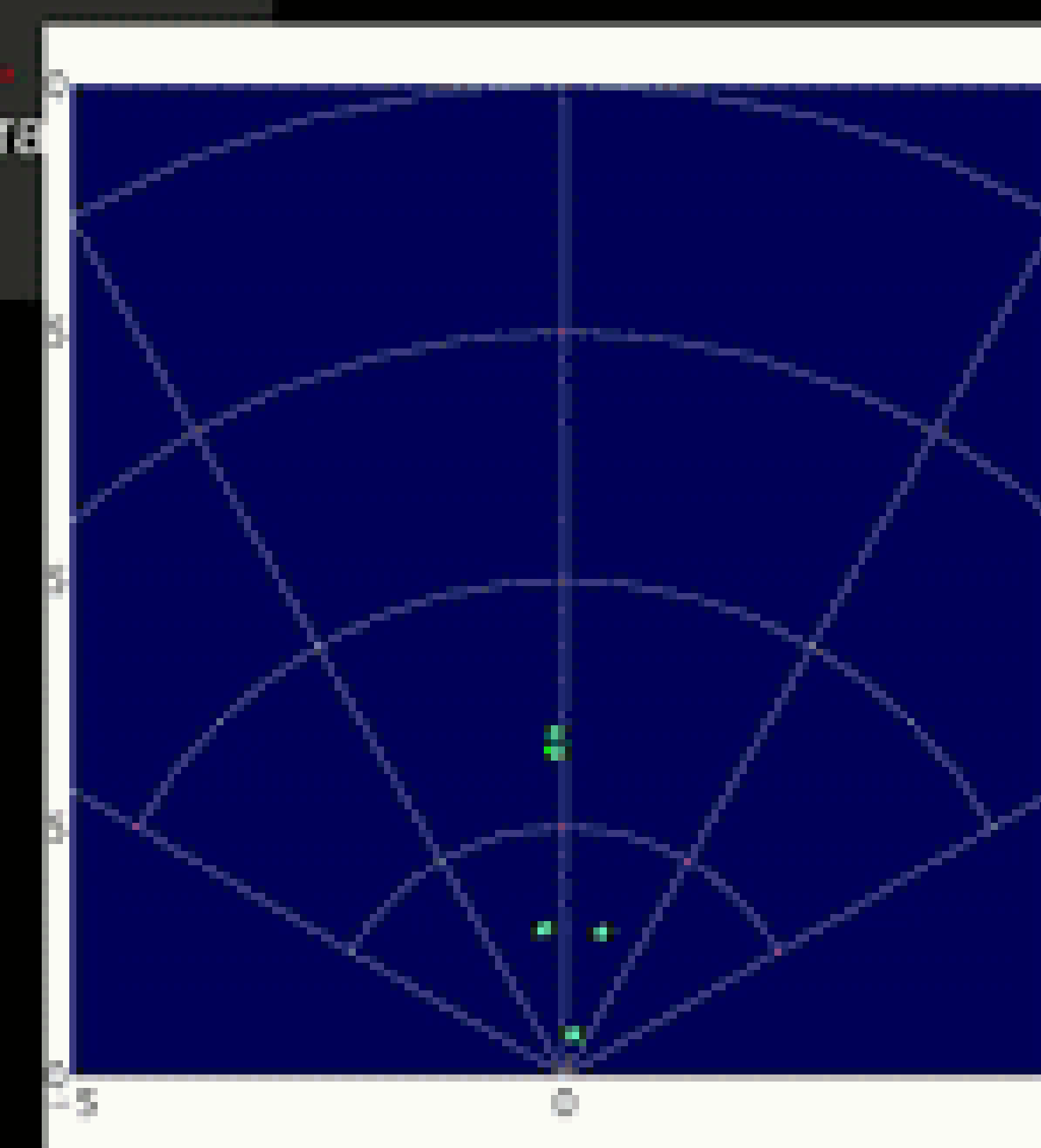
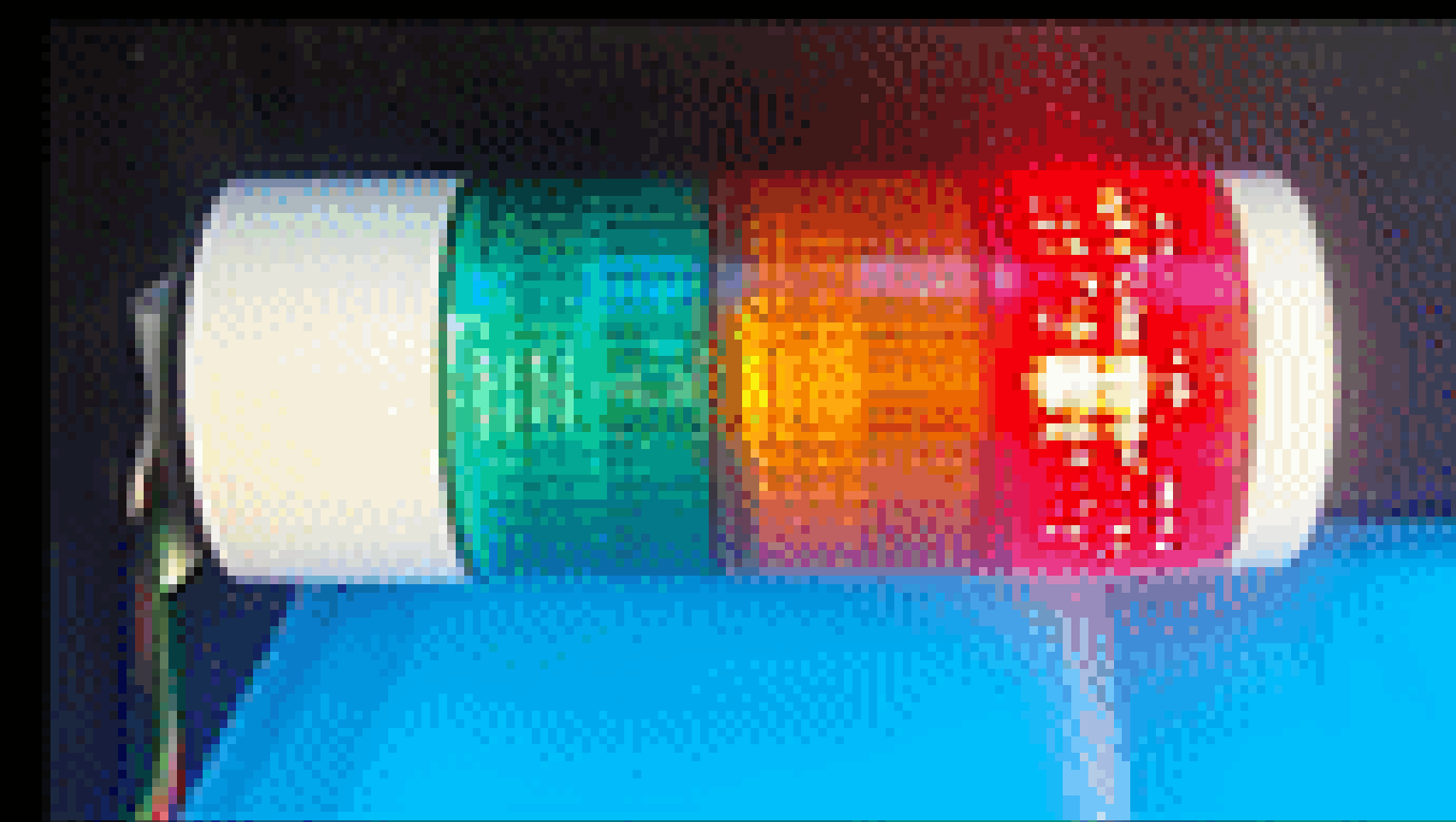
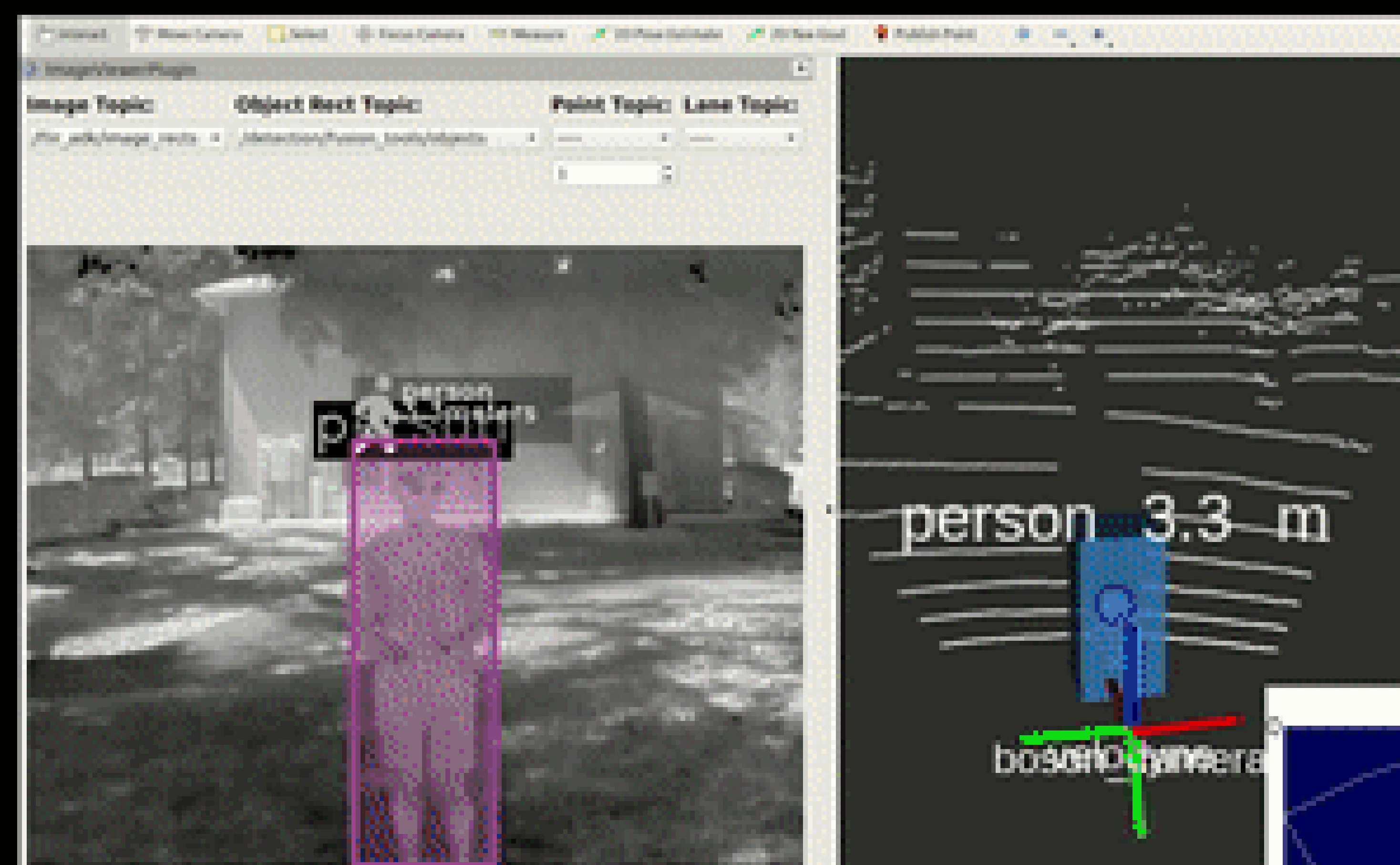
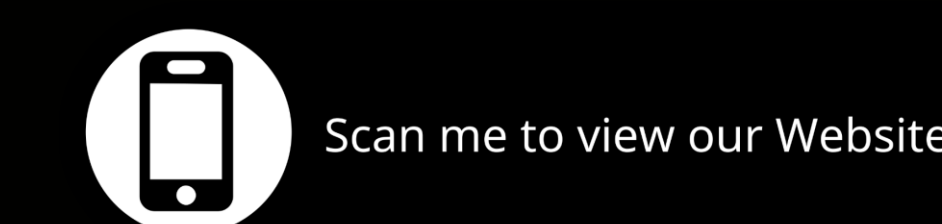
Prototype Cost	\$12,000
System Cost	\$45,000
Cash Flow from Operations	\$121,965
Internal Rate of Return	65%
Net Present Value	\$95,618
Payback Period	1.84 years

## The Team



**UF** Herbert Wertheim  
College of Engineering  
Department of Engineering Education  
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# Sensor fusion combines 3 sensor types to detect obstacles in the harsh mining environment



**Object Detection**



Object: person  
Distance: 3.25355581451

0-5 Meters  
5-7 Meters  
7-10 Meters

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Dr. David Cheney – Coach  
Atif Khan - Liaison

## PROBLEM STATEMENT

Design and test an object detection system for Sandvik's surface mining drill rigs that can operate (detect) in harsh conditions and low visibility using commercial off-the-shelf (COTS) parts.

## METHODS

1. Determine capabilities of individual sensors
2. Select COTS sensor types to meet specifications with minimum number of sensors
3. Test individual sensor capabilities
4. Software fuse sensor data
5. Test sensor fusion capabilities

## Results

TPM	Target	Success Color Code				
S07 Visible Light	y/n	Red	Red	Red	Yellow	Green
S17 Operational in snow, fog, dust, rain	y/n	Red	Red	Red	Yellow	Yellow
S18 Screen with the location of objects	y/n	Red	Green	Green	Green	Green
S14 Zone1	0.5 - 5 m	Red	Green	Green	Green	Blue
S15 Zone 2	5 - 7 m	Red	Green	Green	Green	Green
S16 Zone 3	7 -10 m	Red	Red	Yellow	Blue	Blue
Milestones:		PDR	SLDR	QRB1	QRB2	FDR
Red Not met	Yellow In Progress	Green Met	Blue Exceeded			

