

A Case Study in Robotic Mapping of Abandoned Mines Groundhog

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Introduction

- Inaccurate maps lead to mining accidents
- Abandoned mines are unsafe for human surveyors
 - Unstable
 - Toxic
 - Combustible
 - Flooded



Groundhog



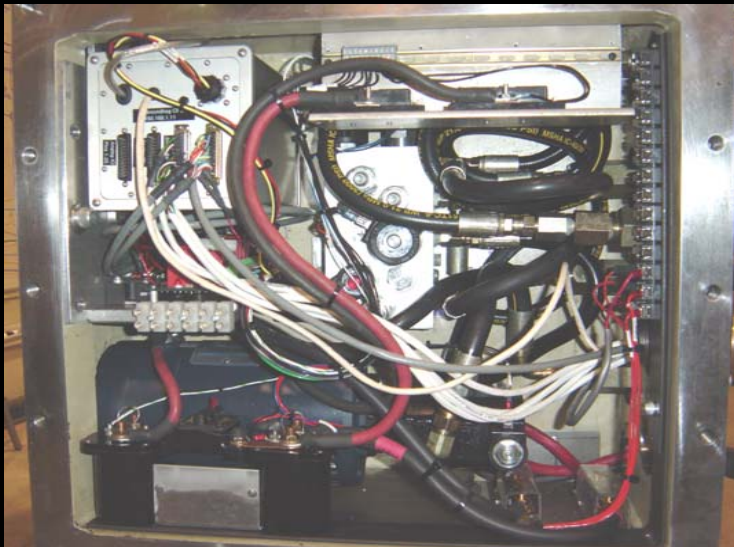
Chassis and Locomotion

- 2 ATV fronts welded together
- 4 wheel drive & steer
- Hydraulic actuation



Electronics and Sensing

- Explosion-Proof Enclosure
- Combustible Gas Sensors
- Scanning Laser Rangefinders



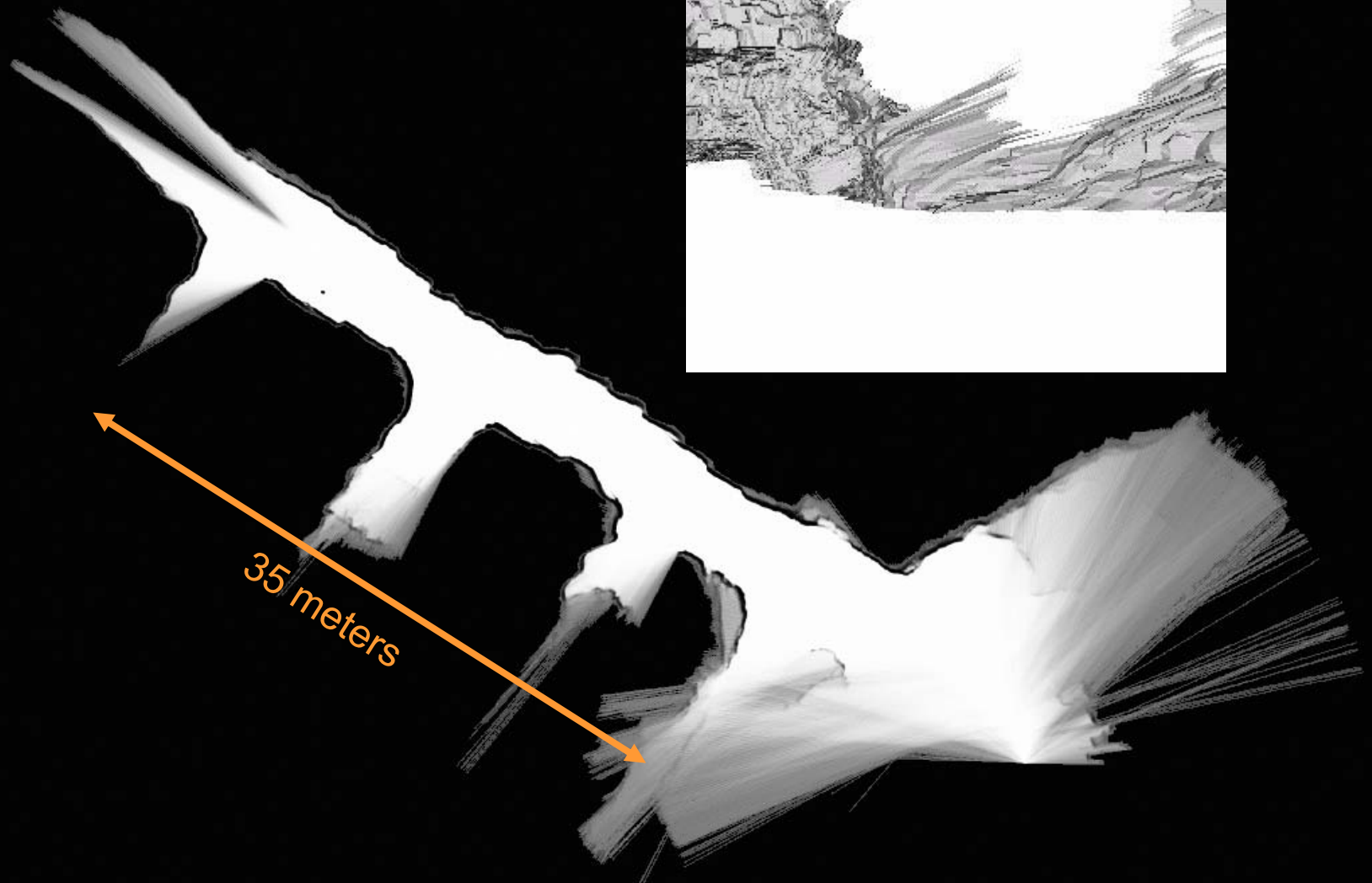
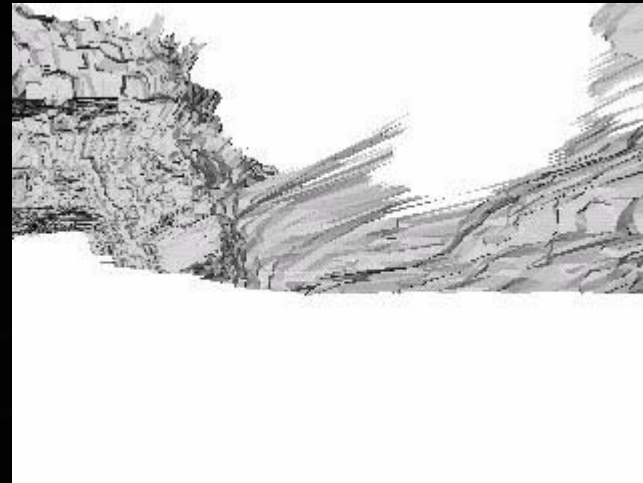
Field Deployment 1



- Florence Mine, Burgettstown, PA
 - First successful map of an abandoned mine



Florence Maps



The Limiting Factors



Tele-Groundhog



Bruceton Mills



←→
100 Meters



Sensor Reconfiguration



- Single laser on a tilt unit.
- Low Light Camera
- Gyroscope
- Sinkage Sensors



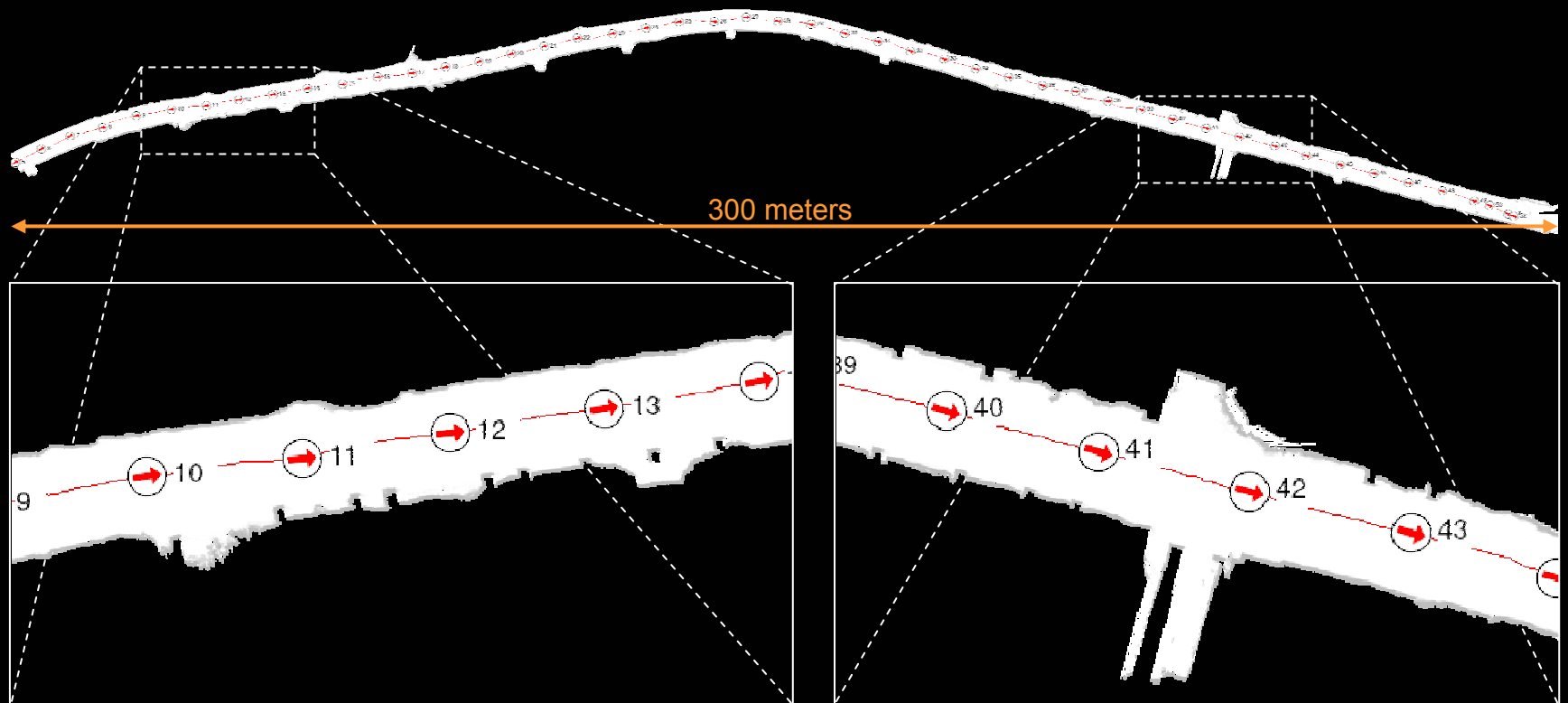
Field Deployment 2



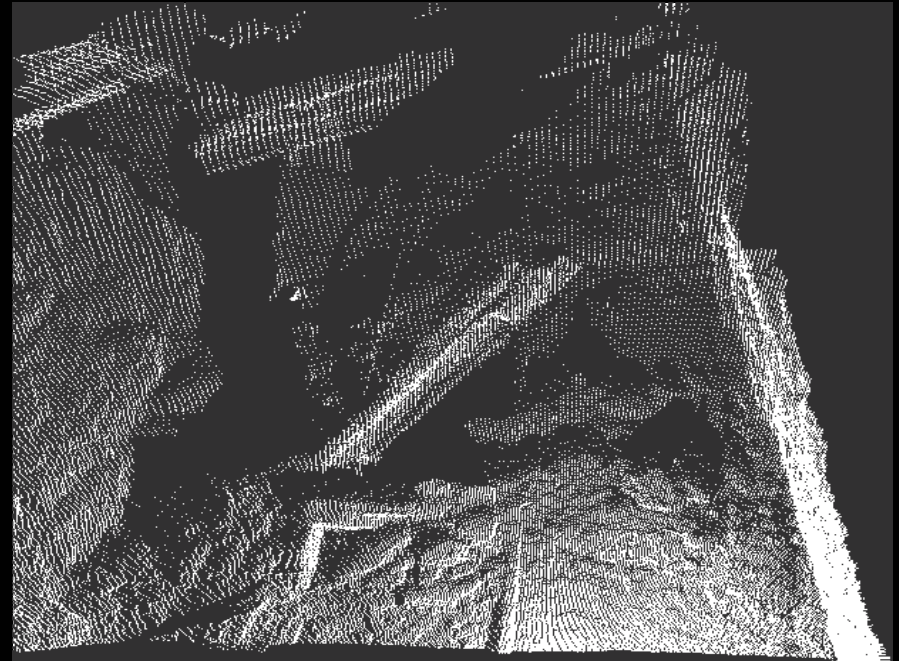
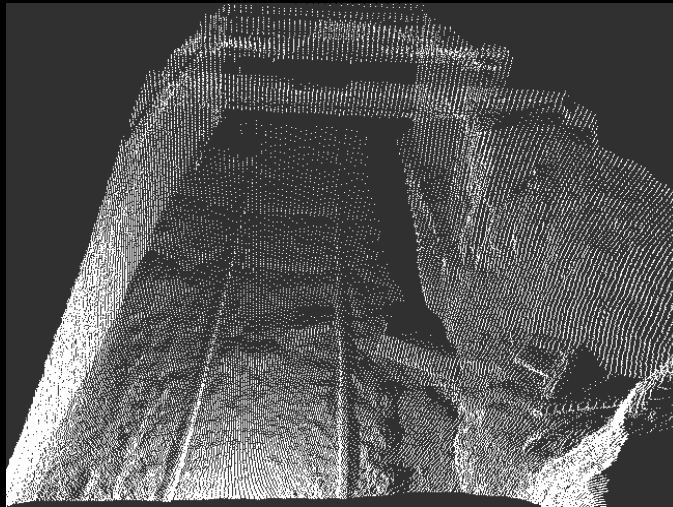
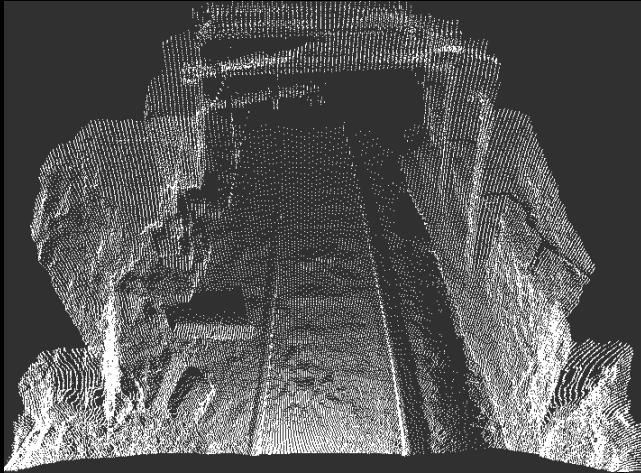
- Autonomously explored 300 meters of the abandoned Mathies Mine.



2D Map of Mathies



3D Scans of the Mine



From the Depths



Autonomous Robotic Exploration of the Mathies Mine

Summary

Robust, versatile
experimental platform.

Delivers high-fidelity maps
of otherwise inaccessible
spaces.



Future Plans

- Groundhog deployments in Fall 2003 and beyond.
- Subterranean Robotics Initiative

Questions

