Overview

• Neptec Background
• Key Technology Differentiators
• OPAL Applications
• Spot Assist System
• Future Tasks
Who are we?

• We sell *innovative 3D robot vision products* for intelligent automation applications in harsh environments

• Commercializing *proven* technologies developed for NASA’s Space Shuttle over the past 20 years and representing $100M of investment in technology innovation

• Spin-out of Neptec Design Group, an award-winning Space technology company and NASA Prime Contractor
Products

Building Blocks

OPAL
Obscurant penetrating 3D laser scanners

3DRi
Software Development Toolkit

Apps

3DRi
Application Products

OPAL-360
OPAL-120

3DRi Framework
3DRi Register
3DRi Filter
3DRi Model
3DRi Viewer

Core Plug-ins
3DRi Align
3DRi Segment
3DRi Detect
3DRi Identify
3DRi Track

Advanced Plug-ins

OPAL = Obscurant Penetrating Auto-synchronous LiDAR
3DRi = 3D Real-time intelligence
OPAL-360 3D Laser Scanner

- Eye-safe 1540nm laser
- 360° x 60° FOV
- 200,000 points/sec
- 400m to 2.7km range options
- Patent-pending spinning prism design
- Persitrates obscurants like dust, smoke, fog
- Vibration & shock tolerant
- Rugged cast-Alu housing (IP67)
- Size: 61cm x 23cm x 36cm
- Weight: 53lbs

Harsh environment ready!!
OPAL Dust Performance Testing
DRDC Valcartier → Summer 2012

OPAL-360 scanning a test range while a helicopter is used to generate significant amounts of dust in the “landing zone” (LZ)

This oblique view shows the raw data, with no 3DRi Obscurant processing performed. Ground plan is red. Above ground objects and dust are shown in yellow/green.
OPAL and 3DRi for Intelligent Automation in Harsh Environment Applications

OPAL penetrates dust

3D imaging in dust (problem)

Amount of “dust” filtered by OPAL

Applications:
- Autonomous haul truck guidance
- Automation in the loading area
- Monitoring in harsh environments

3DRi identifies objects in real-time
Obscurant Conditions in Mining
Designed for harsh environments

- -40 C to +65 C operating temperature
- Rugged packaging specifically designed for tough environments like mining
- Designed for significant vibration and shock environments
- Can be “power washed”!

OPAL on a shovel at Teck’s Fording River mine (September 2014)
3DRi Excavator Suite

- 3DRi Bench Mapper
- 3DRi Bench Profiler
- 3DRi Fragmentation
- 3DRi Spot Assist (in development)

- Common platform with remote management via web client
- On-demand data products
- Compatible with 3rd party mine planning and survey software packages
- At point-of-collection processing (no back office post-processing)
- Minimizes WiFi network bandwidth for data offloading
3DRi Stockpiles App

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3DRi Spot Assist: Proof-of-concept testing
(September 2014, Fording River Coal Mine)
Key Features

- Identifying and Tracking haul trucks in real-time through obscurant conditions
- Dynamically guiding truck operators to the loading location using visual cues
- Alarm operators of obstructions in their path to the loading location
- Optimizing the loading location placement to minimize shovel swing angle while avoiding haul truck tire degradation on the active face
- Improves spotting times by minimizing re-spotting and improving operator confidence
- 24/7 operation through all weather conditions
Truck GUI
3DRi Spot Assist Application
Testing at Teck's Fording River Mine
Tests Performed

- Two weeks of activities at Teck’s Fording River Operation from September 8th to 19th
- Two OPAL-360 scanners mounted on electric cable shovels
- Tests included:
  - Hardware and Comms
  - 3DRi Core & Advanced Plugins
  - 3DRi Spot Assist Plugins
  - Shovel and Truck Displays
  - Error Handling
  - System Transitions
  - Performance
  - Various pit scenarios
3DRi Contour Mapper - Load Location
3DRi Contour Mapper - Load Location

Segmented Background
3DRi Spot Assist Application Testing at Teck's Fording River Mine
Next Steps

• Human interface design improvements
• Operator buy-in on machine simulators
• Extended testing and qualification at multiple locations to identify exception cases
• Implement -> Test -> Identify -> Improve -> Repeat
Conclusions

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