

# DIGITAL MAPPING TECHNIQUES 2013

The following was presented at DMT'13  
(June 2-5, 2013 - Colorado Geological Survey and Colorado School of Mines  
Golden, CO)

The contents of this document are provisional

See Presentations and Proceedings  
from the DMT Meetings (1997-2013)

<http://ngmdb.usgs.gov/info/dmt/>

# CAE Sirovision

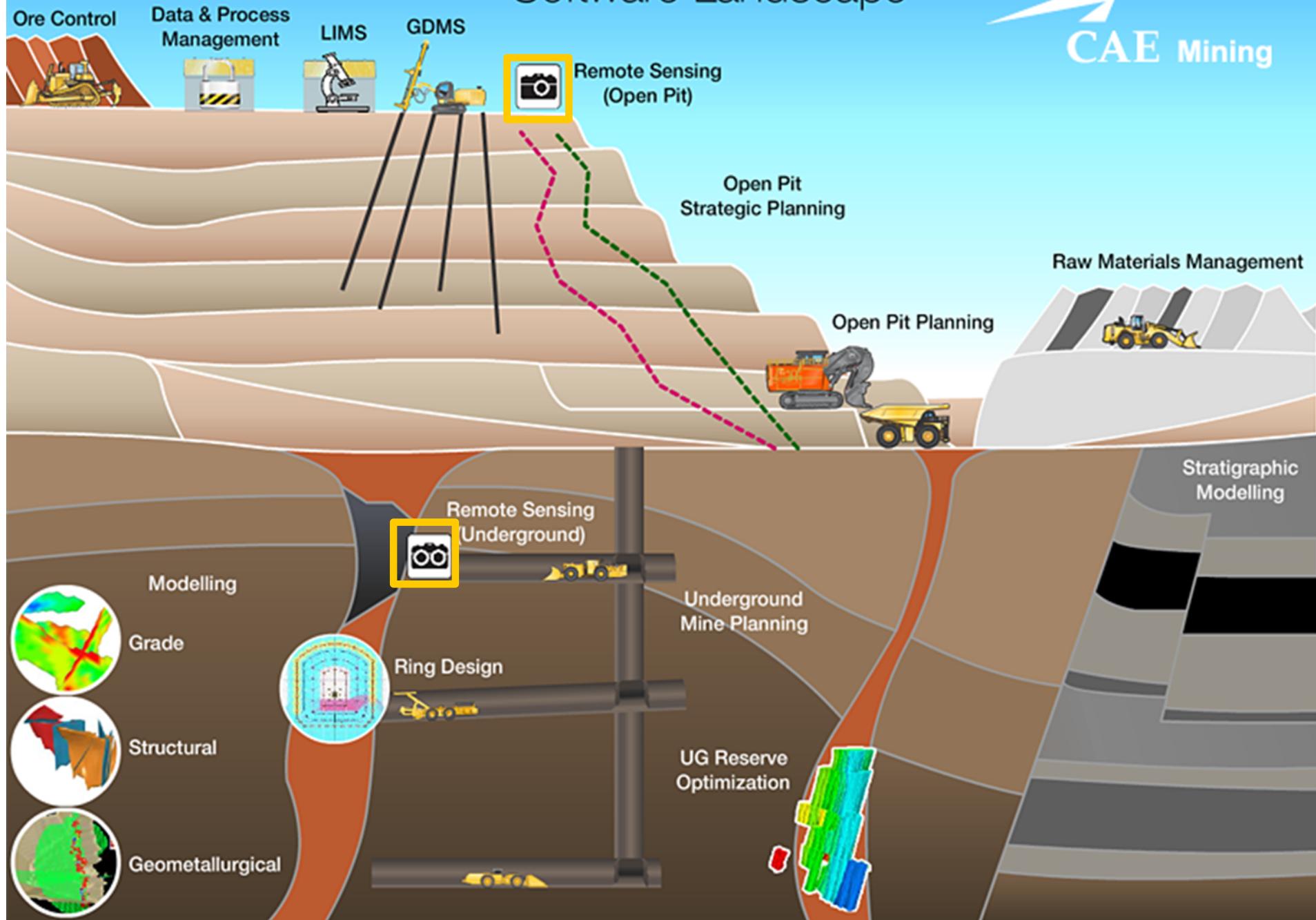
**DMT Workshop  
Golden, CO  
June 3-5**



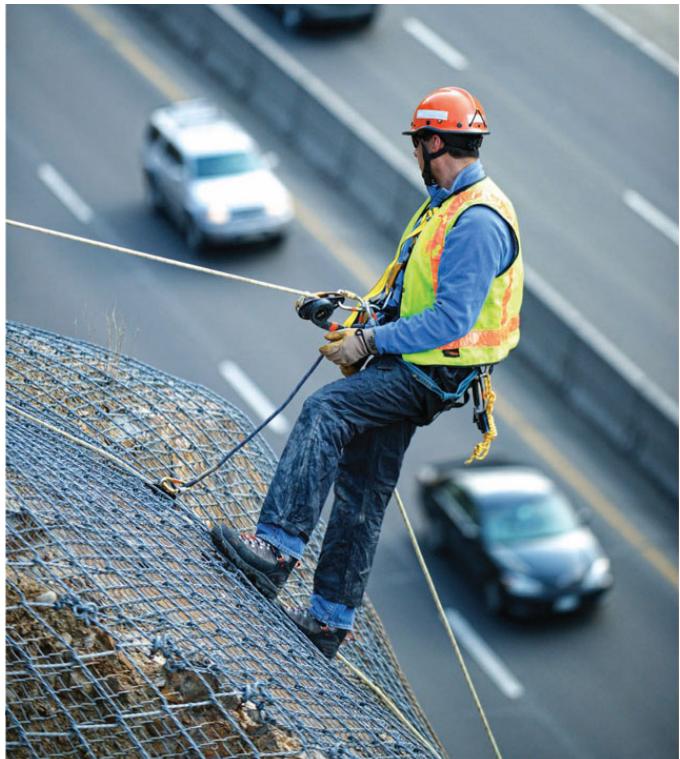
Leading by  
**innovation**



# Software Landscape



## Face Mapping Challenges



- Portions of rock faces are inaccessible and lie beyond the reach of the geologist on foot
- Requires geos to rappel down the rock face or use mechanical lifts in order to map the face
- Fieldwork beneath overhanging, weathered and possibly loose rock exposes field personnel to potentially dangerous conditions.
- Outcrops next to busy highway roads can be dangerous to get to

## Benefits for the Mapper using Sirovision



- Bring the rock outcrops to your desk!
- Provides high resolution 3D records of existing rock slope conditions and digital copy can be accessed for later use
- Gives you the ability to map otherwise inaccessible or dangerous rock faces
- Integrated mapping and structural analysis tools provide instantaneous measurements
- 3D Model and structural data able to be exported to other software programs

# WHAT IS SIROVISION?

## SIROVISION

## What does Sirovision do?



Generates accurate, scaled 3D images of rock faces from stereo photographs taken in open pit, underground and other inaccessible rock faces.

Enables structural mapping directly on to 3D surfaces with immediate geotechnical results.

Joint Set Analysis

Easy export of 3D images and structural data.

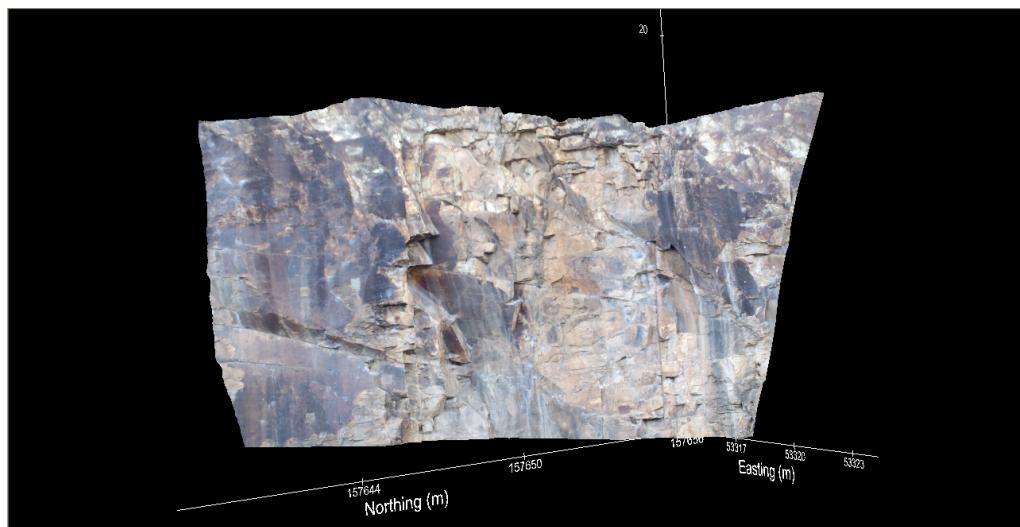
## How does Sirovision Work?

- Two photographs of the same rock face are taken from left and right camera positions
- Adjacent stereo pairs are taken with at least 30% overlap.

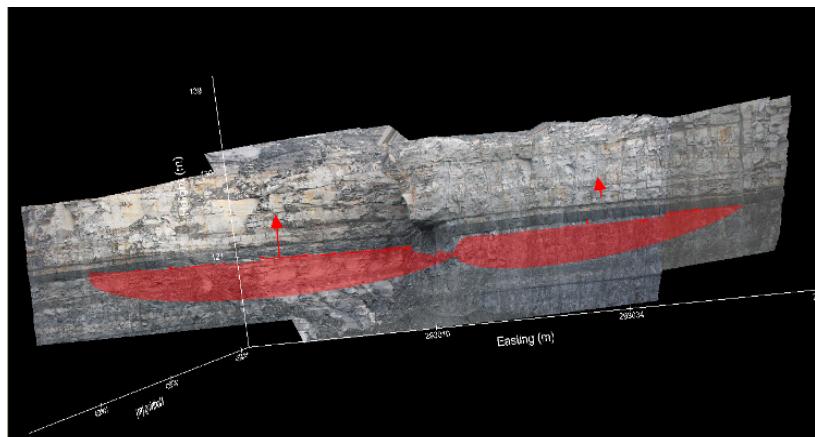
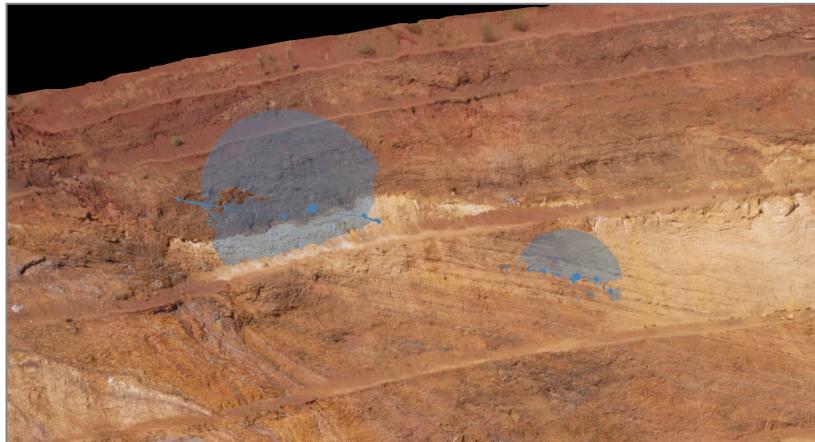


## How does Sirovision Work?

- Sirovision software processes the stereo pair using mathematical algorithms...
- To create a 3D Image
- The 3D image can be
  - Relatively Orientated
  - Georeferenced using a flexible range of methods.



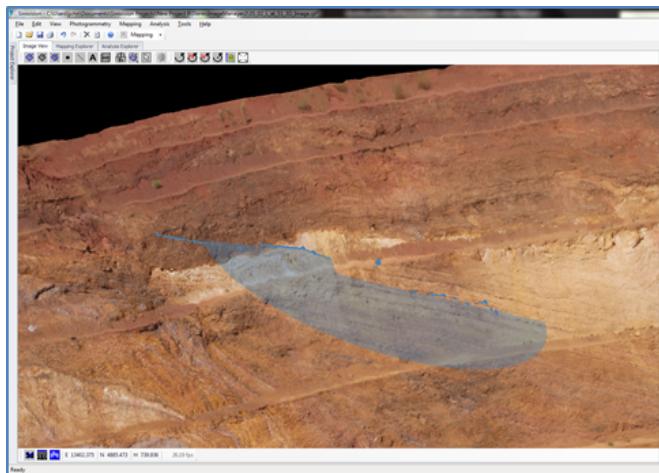
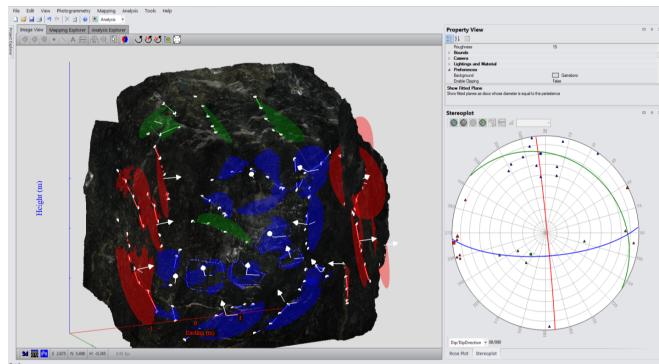
# Sirovision Geological Mapping



Whilst you map..

- Visualise fitted planes, normals and persistence of traces and planes in real time.
- View instantaneous geotechnical characteristics such as
  - Dip
  - Dip Direction
  - Roughness Indicators
  - Chord Length

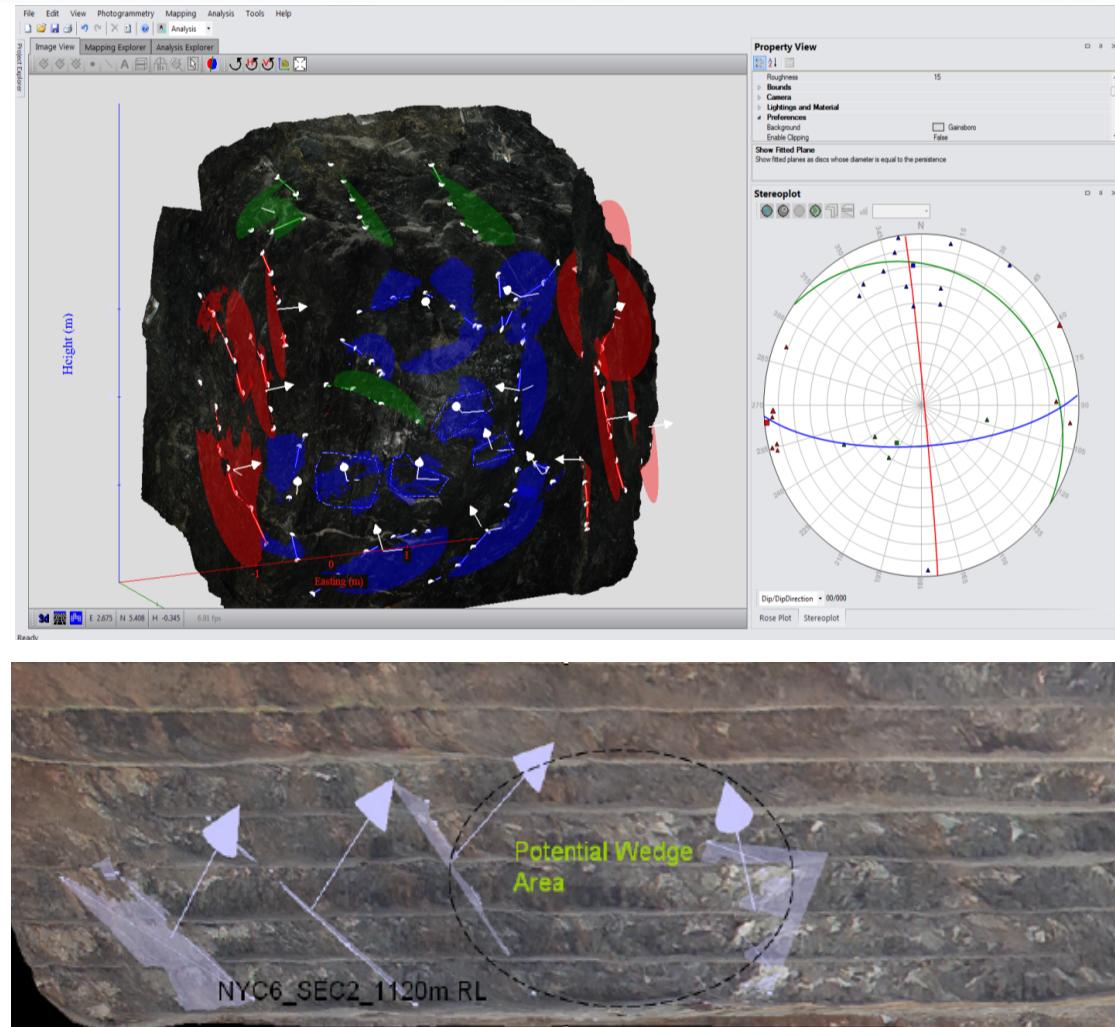
## Software – New features.



- A fully integrated software solution combining the Siro3D and Sirojoint modules into a single program.
- Fully automated 3D image generation and georeferencing workflows using project wizards.
- New discontinuity set analysis tools
  - Automatic wedge detection tool
  - User defined schemas

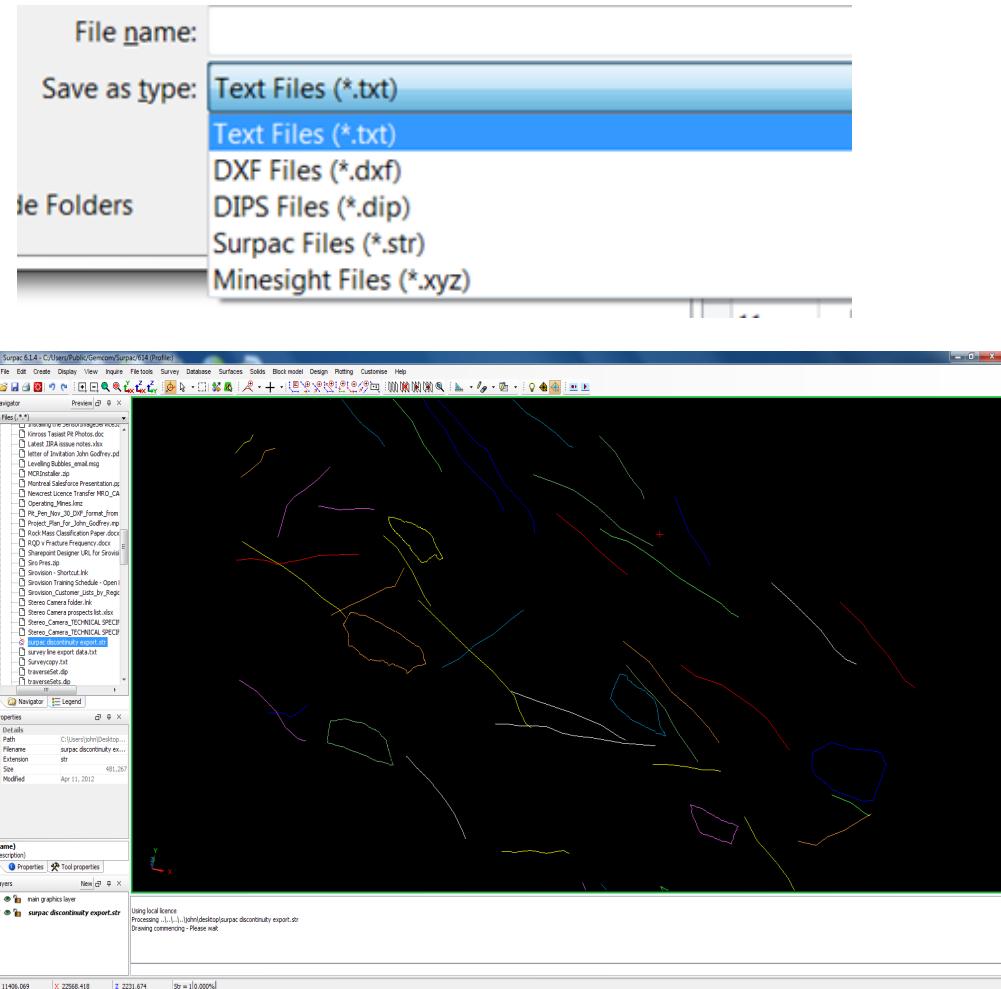
# Analysing Discontinuity Sets

- Add your own Schema data
- Define Analysis Sets using queries
- Analyse sets on Spherical Projections and 3D Images simultaneously
- Slope Stability Analysis tool detects wedges between joint sets
- Display charts, histograms, tables and 3D models in reports



# Exporting digital data.

- Discontinuity Set Data can be exported in to most major geological software packages
  - DATAMINE STUDIO
  - VULCAN – DXF + module to import DTM's
  - DIPS – DIPS format file
  - SURPAC - .STR file as discs or nodes. Module to import DTM's
- Mapping can be integrated with existing survey, drillhole, ore wireframes and block model data
- 3D models exported as DXF



## What Equipment is Required?

- Open Pit
  - No specialized camera equipment
  - All available commercially “off the shelf”
- Equipment
  - Cameras – Nikon
  - Fixed focal length lens
  - 1GB or 2GB memory card
  - Industrial strength tripod
  - Geared head
  - Industrial strength carry case / bag
  - Laser range finder



## Hardware – The CAE Underground Stereo Camera.



**This is a unique product!**

- ❑ Its the only product in the world which takes effective stereo photographs underground.
- ❑ Uses the correct geometry to produce accurate 3D images.
- ❑ Half a days training.
- ❑ Technicians can be trained to use it.
- ❑ Its fast
- ❑ Rapid payback

## Stereo Camera – User Interface look & feel



# WHY USE SIROVISION?



## Why Use Sirovision?

### IT IMPROVES SAFETY

It's a remote digital data acquisition system:

- ❑ Personnel do not have to approach the rock face.
- ❑ The WHOLE face can be photographed and mapped.
- ❑ Rock faces can be photographed up to 1500 meters away.



## Why Use Sirovision?

### IT'S FAST

- ❑ Photographs can be taken easily and rapidly.
- ❑ Different focal length lenses can be used from same positions giving flexibility in level of detail.
- ❑ Range of georeferencing methods allows flexibility e.g. RTK quality survey support, GPS , Hand Held techniques.
- ❑ Multi core technology, Graphical Processing Unit support means constantly improving processing times.
- ❑ Automated project wizards are reducing user input.



## Why Use Sirovision?

### IT'S HIGHLY ACCURATE

- ❑ Typically produces accuracy of 3cm to 5cm every 100 meters distance to the face.
- ❑ Angular accuracy of +/- 0.5 ° dip and dip direction.
- ❑ Ranges from 3m to 1500m
- ❑ Mathematics is objective not subjective – no measurement bias
- ❑ Extremely flexible system -
  - focal length of lens used
  - distance to rock face
- ❑ How much accuracy do you need?



Thank You!

Questions?



Check it out at:  
[www.Sirovision.com](http://www.Sirovision.com)