SCORPION
VISION SOFTWARE®

Evolving visions

Scorpion Vision Software 3D Stereo Vision

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www.scorpionvision.co.uk

Scorpion Vision Ltd

- Parent company: Tordivel AS, Oslo
- Principle product is Scorpion Vision Software
  - Runs on Microsoft Windows
  - Non programming GUI
  - Full Automation Framework
  - Industry leading 3D Machine Vision
- Scorpionvision.co.uk
  - Machine Vision Components

Content

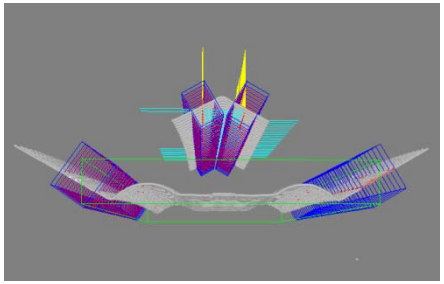
- Scorpion Vision Software 3D
- Camera model - basic principal
- 3D Camera model – 3D calibration
- MonoPose 3D
- Basic stereo vision
- Application and benefits
- New Product News

Why Scorpion 3D?

- All objects have 3D geometry
- Eliminates problems related to varying product position and product dimensions
- True 3D measurements = final verification of correct pose location
- Makes Robot vision and quality inspection systems more accurate and reliable

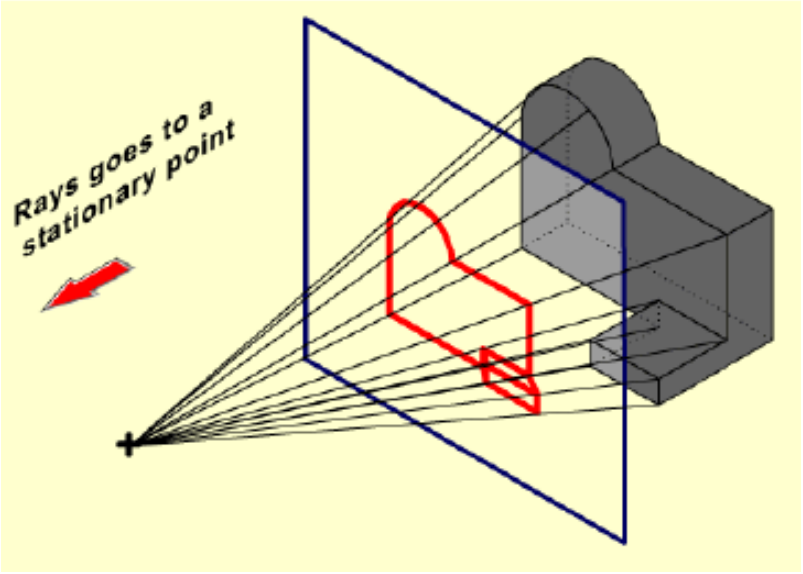
Scorpion Vision Software 3D

- Calibration techniques
  - Camera lens-, 2D- and 3D - calibration
- MonoPose3D – 3D with one camera
- Stereo vision
- Laser triangulation
- Complete Framework for 3D measurements and 3D pose location



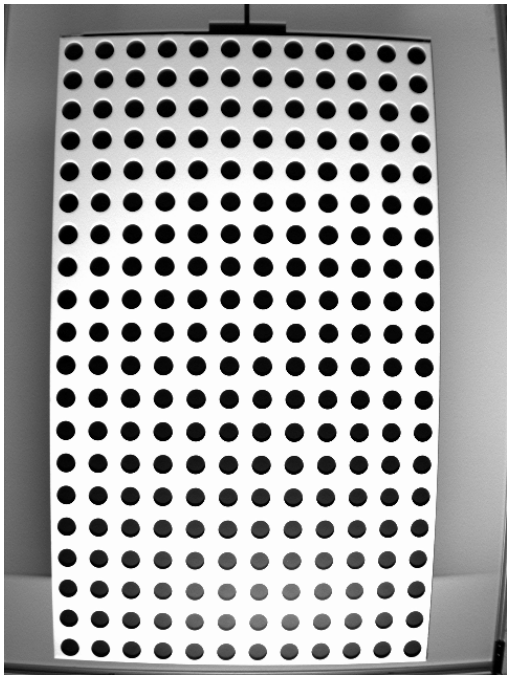
Perspective (Central) projection

- The observer is relatively close to the object, the projectors form a “cone” of projectors.
- Stereo vision is based on central projection

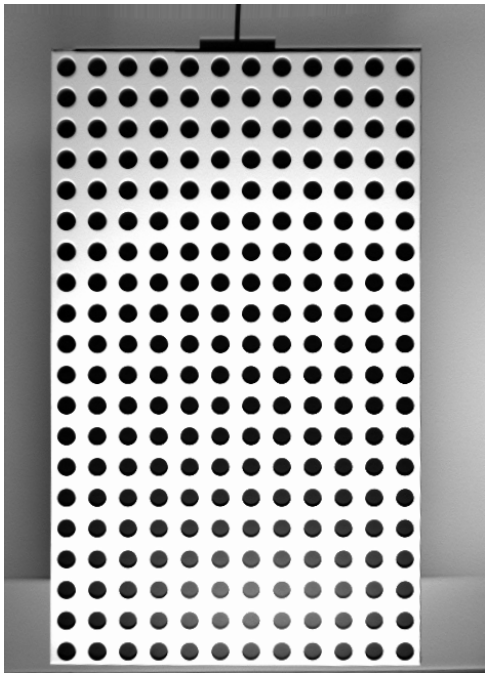


Lens Calibration

- Original image

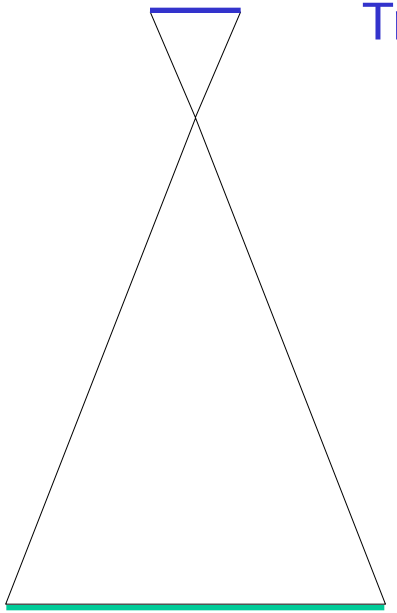


- After eliminating lens distortion



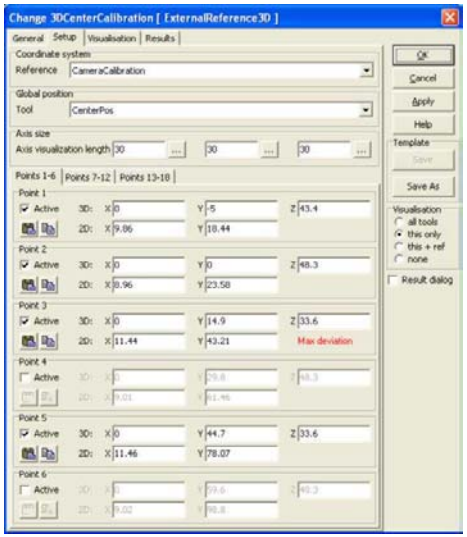
2D Camera model

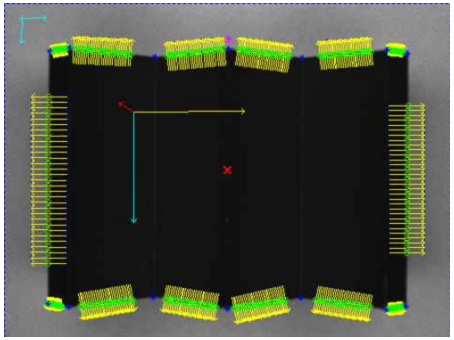
- Object points in calibration plane is correctly presented in the image plane

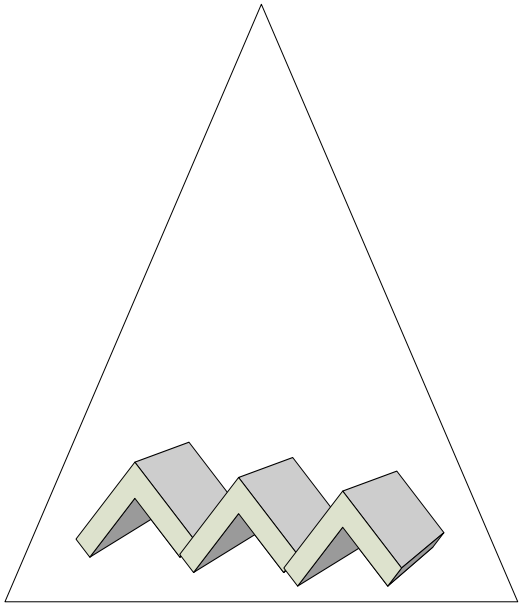


3D camera calibration

- Measure points in the 2D image with different x, y and z

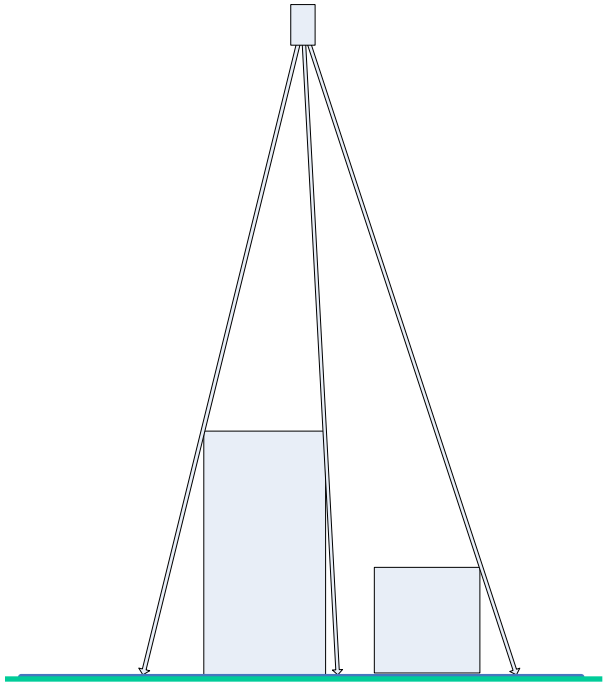






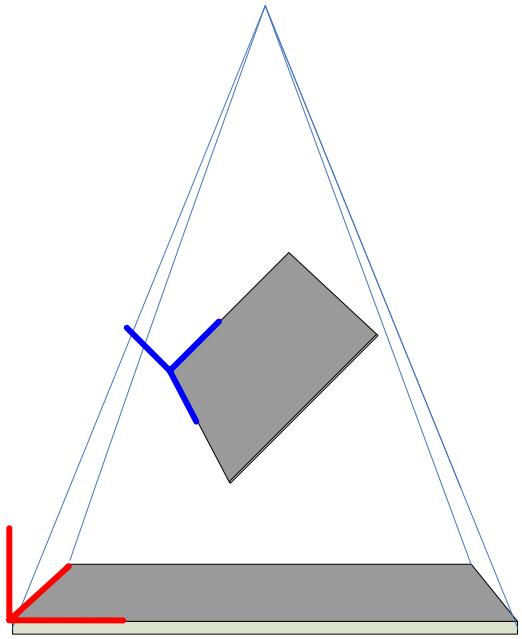
3D camera model

- True central/perspective projection to 2D image plane
- Each point in the 3D will be projected correctly to the Image Plane



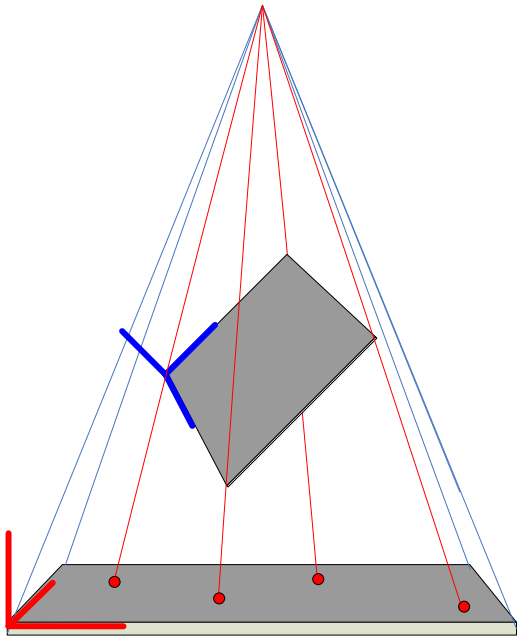
3D planes and the object pose

- 3(4) x 3D points defines a 3D plane
- Object 3D pose is a 3D Reference System
- Object pose result is relative to the base 3D reference
  - Translation: x, y, z
  - Rotation around x, y, z axes: Rx, Ry, Rz



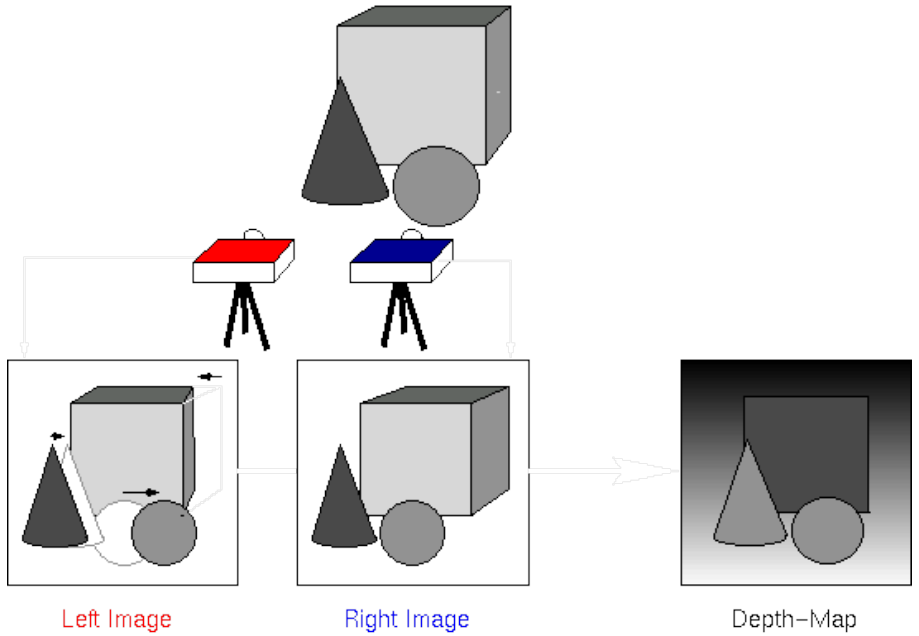
Mono Pose 3D

- Locate 4(3) or more points in the 2D image
- All points must have a fixed interrelated geometry
- Mono pose will calculate the 3D translation and rotation



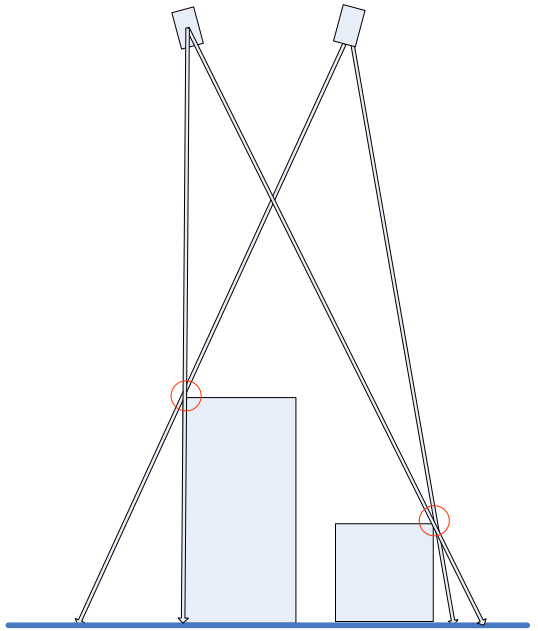
Stereo Vision

- The slightly different perspectives from which 2 or more cameras perceive the world, lead to different images with relative displacements of objects (disparities) in the two monocular views of the scene
- The size and direction of the disparities of an object is a measure of its relative depth



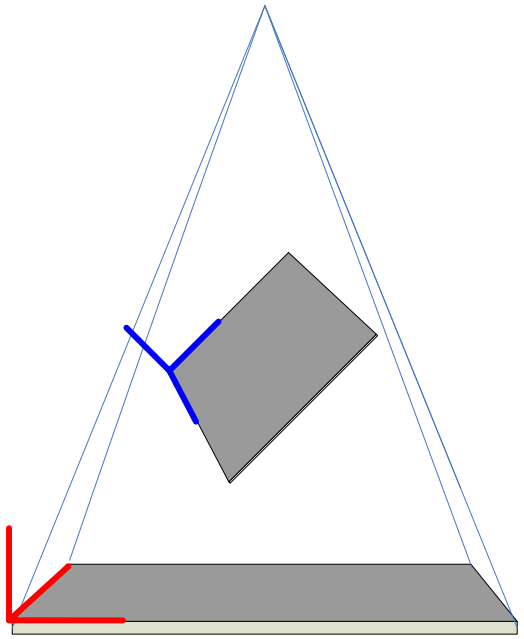
Stereo vision = multi 3D camera models

- 2 or more cameras
- Each camera is individually 2D calibrated
- All cameras are 3D calibrated with the same 3D object simultaneously
- Calculate crossing point gives x, y and z coordinates



Creating a 3D plane and calculate the object pose

- 4(3) or more 3D points defines a plane
- Plane definition relative to base 3D reference system
  - Translation: x, y, z
  - Rotation around x, y, z axes: Rx, Ry, Rz



Benefits – 3D Calibration

- For fixed geometries object pose can be measured with only one camera using MonoPose3D
- Based on basic 2D feature recognition in more than 2 cameras, 3D points can be calculated directly
- Easy to implement and low cost solution

Applications – Robot Vision

- Pick a product from a pallet with products in multiple layers
- Pick or measure products with different heights
- Pick or measure product with inclining geometry or varying tilting
- Pick a product from disorganised bin or pallet
- Do true 3D measurement of a product

Application examples

Scorpion 3D Stinger

- Stereo vision demo system
  - Based on live installation at Stellana
- Robot bin picking
- Robot picking from pallet

3D Stereo Vision Robot Guidance System

Press Release – December 2010

Tordivel, the company behind the Scorpion Vision Software suite, has completed a 3D automation project for Stellana, a major industrial manufacturer headquartered in Sweden.

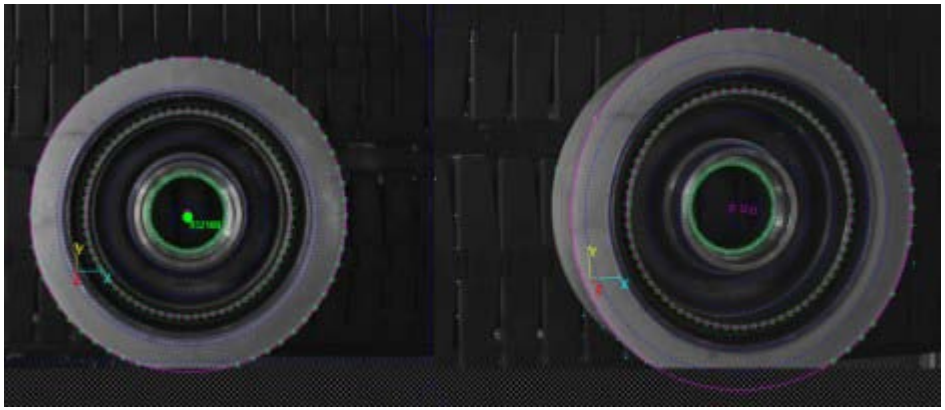
Thor Vollset, founder and CEO of Tordivel said: “They produce 30 – 40 different wheels types in a production batch and these products are placed random on a conveyor line. To automate the machining of each wheel they wanted a robot to pick the wheels from the conveyor and place it in machining tool. The machining process requires that the product ID is known. We were asked by Stellana to deliver a system that could both identify the wheel and measure the position of the wheel of the conveyor.

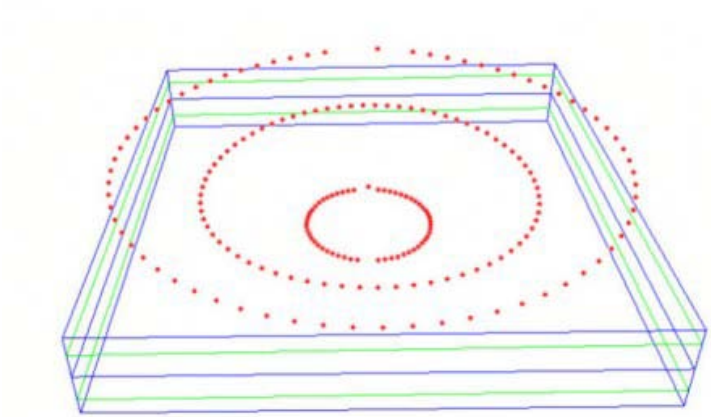
“We started the project using a Scorpion 2D system, but it quickly became apparent that the system was it not be able to distinguish all the information necessary to reliably gauge the type of wheel being scanned. The 2D system was only partially successful because teaching the system was labour intensive.”

“Upgrading the sorting system to a true Scorpion Vision 3D solution solved the labour intense teaching and enabled more reliable identification and location. In the 3D system all dimension, radius and heights are measured in mm. This makes the system easy to understand and the data from the CAD drawings can be entered directly into the system when defining the sorting criteria.”
According to Thor, the majority of machine vision projects place an emphasis on small physical size, accuracy, reliability and “naturally, cost is an important factor too”.

The Stellana system utilises two stereoscopically linked machine vision cameras. Scorpion Vision 3D software is used to analyse the data and the 3d location is used by an ABB robot to pick the wheels.” “We used a Sony smart camera, which has an integrated FPGA processor and thus eliminates the need for an additional PC. This not only cuts down significantly on cost, it also allows you to work more easily within the space constraints demanded by a given project.”

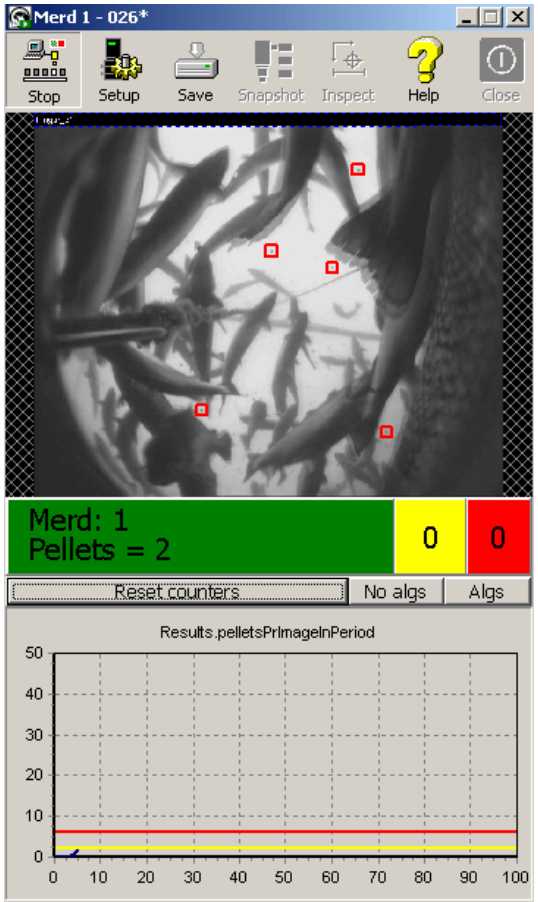
Scorpion Smartcam Stereo Vision Demo

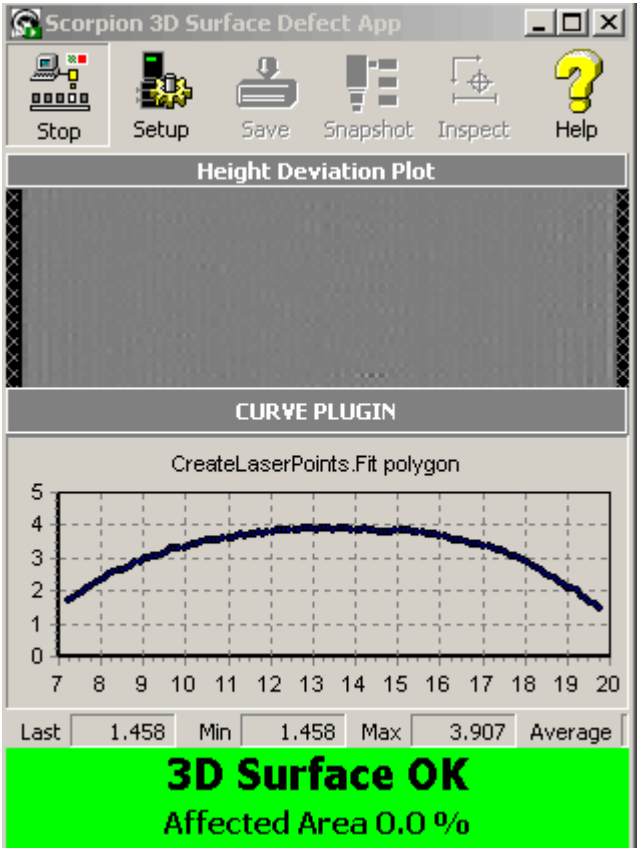




The 3D Image generated by Scorpion Vision shows the three radiuses and the centre point of the wheel

New Product Announcement
Scorpion Vision Apps





Mono Stinger Camera

Scorpion Vision Apps Concept

- Simplifies machine vision for the user
- Off the shelf apps for barcode reading, etc
- One simple operator screen
- Three operations – start/stop/configuration
- Easy installation and deployment
- VERY low cost

Do it yourself

- Download the software
- Get a free demo license
- Study the tutorials and specifically the Stereo Vision tutorial

- Visit our support web: http://scorpion.tordivel.no/

Questions ?