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3DMaMa – Locates Multiple Objects in a PointCloud

Rapid 3D pose estimation through
manifold matching and robust optimization

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TORDIVEL AS

November 4, 2009



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Scorpion Vision Software

- Hand-made in Norway
- Based on Industry Standards
- Powerful Machine Vision without programming
- Windows Compatible W7, XP and XPe
- Support SmartCameras, Analog Cameras and Digital Cameras, 3D Cameras, - USB, CameraLink, Firewire and GigE.
- First version in 2000 – Now version 7.3
 - 60 man years development
- Global Software Sales in more than 35 countries
- More than 1500 installed – growing fast



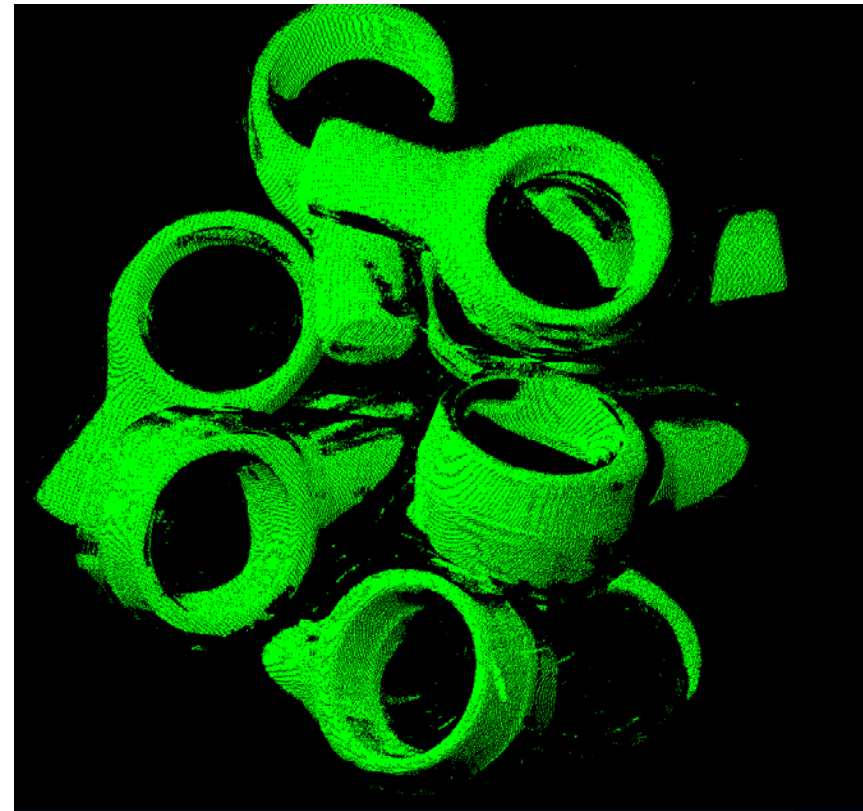


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Product Goal

Scorpion Vision Software
shall be the
best software platform
for making
advanced and robust
2D and 3D
machine vision systems





Auto3D R&D Project

- Auto3D is an R&D project sponsored by Norwegian Research Council
- Started in 2006 – will terminate 12/2009
- Participants : Tordivel AS, Sintef, Conoptica and Kongsberg Automotive
- Strategic Goal:
 - Create a low-cost complete framework for 3D Machine Vision including stereo-vision, stripelight, 3d visualisation, 3d references, do 3d in 2d images, true 3D processing in pointcloud



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Goals for 3DMaMa

- Establish a tool for true 3D imaging
- Works for industrial type of objects
- Intuitively understandable
- Requires minimal user configuration
- Fast and reliable
- Easy to use

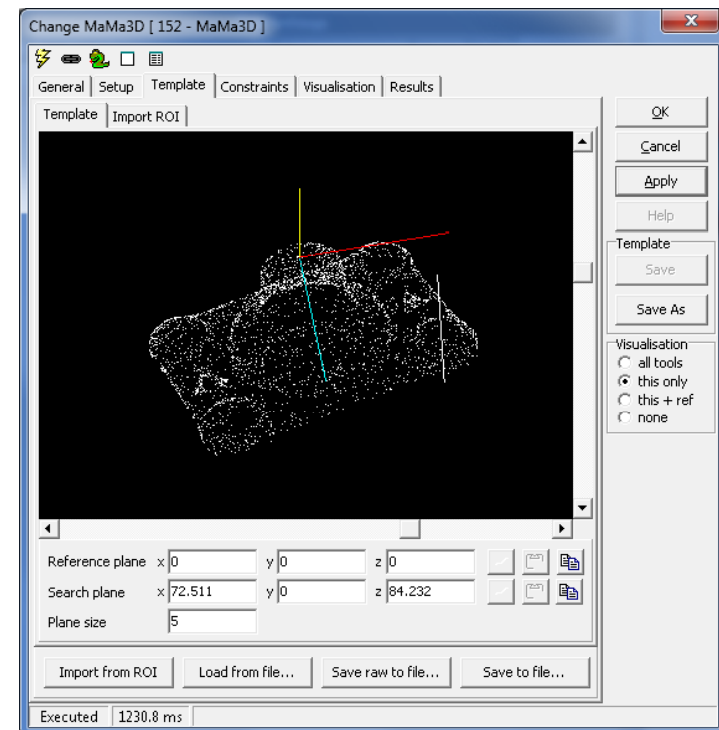


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Template Model Requirements

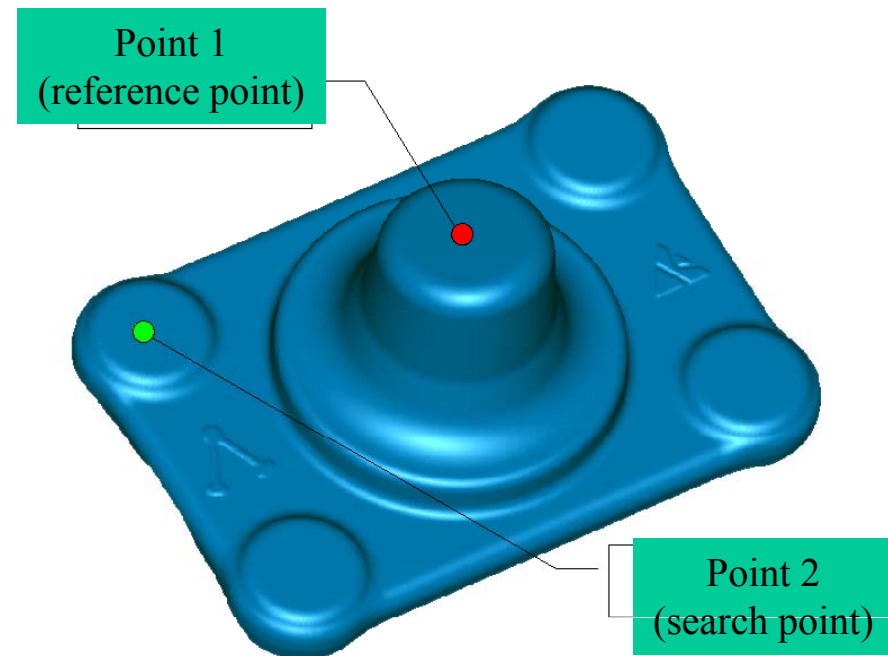
- CAD-model or mesh available
 - Textfile with xyz coordinates
- Two defined surface points on the part will be visible in the scene





How to use configure?

- Specify CAD-model or mesh
- Specify reference point and search point in CAD-model with distance tolerances that will be visible in the scene
- Specify parameters for cost function
 - Maximum allowable distance between template and scene points
 - Minimum % of template that must be supported by scene data





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Random Bin Picking Scene

- Multiple random oriented and part occluded parts
- Pallet / Bin multiple layers



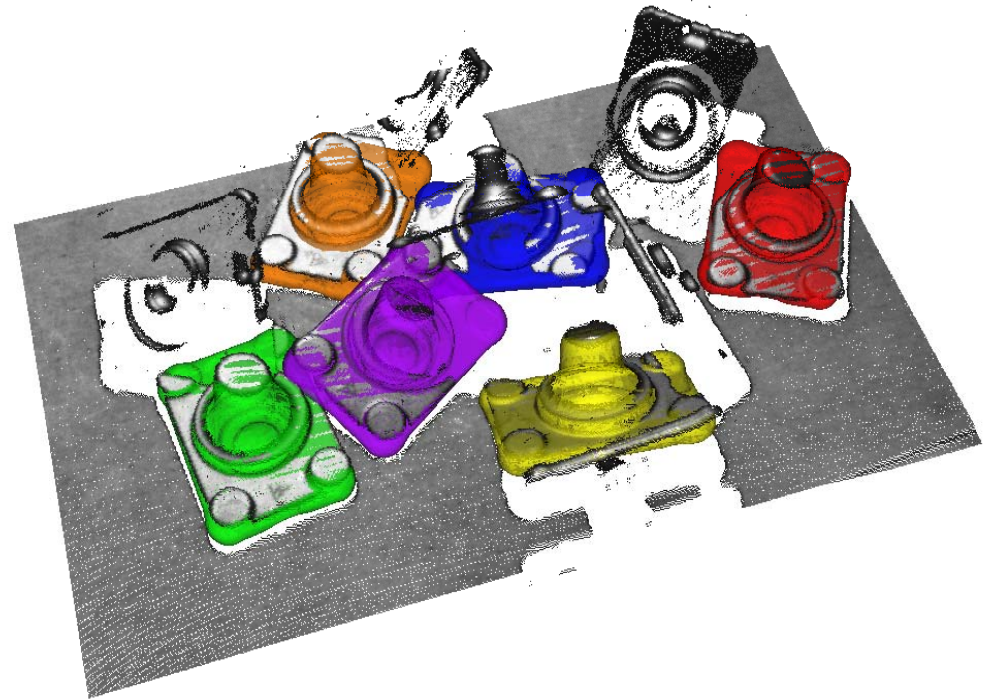


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3MaMa In One Second

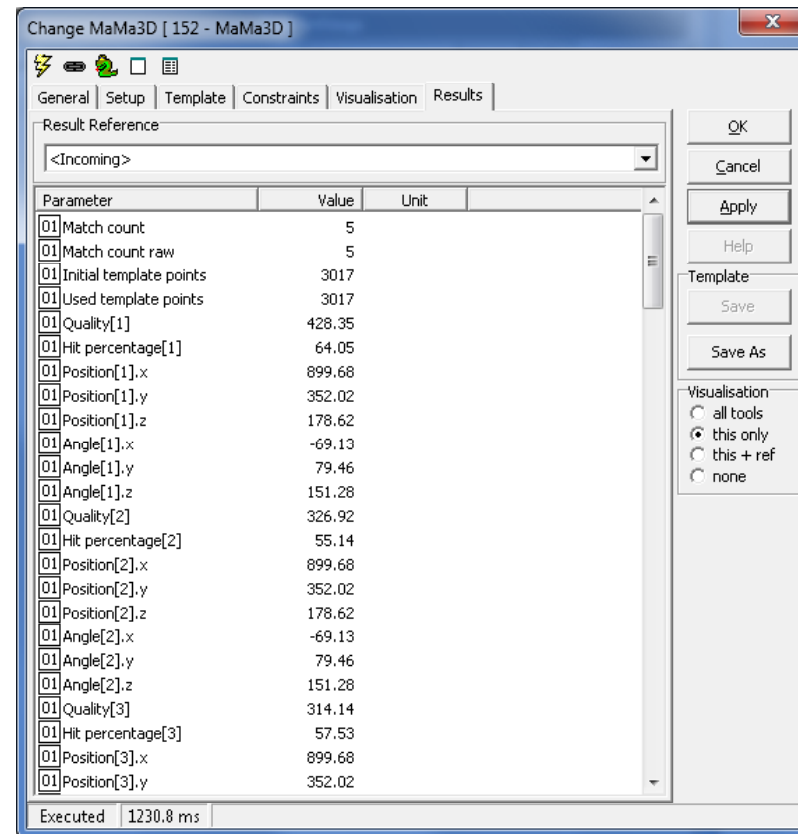
- Six parts located
- PointCloud 1.2 x,y,z
- Created by Scorpion GCPS – stripelight system





Results

- Number of parts found
- For each part:
 - Location 6DOF
 - $x, y, z, \alpha_x, \alpha_y, \alpha_z$
 - Quality of match
 - Hit percentage
- Outgoing 3D Reference

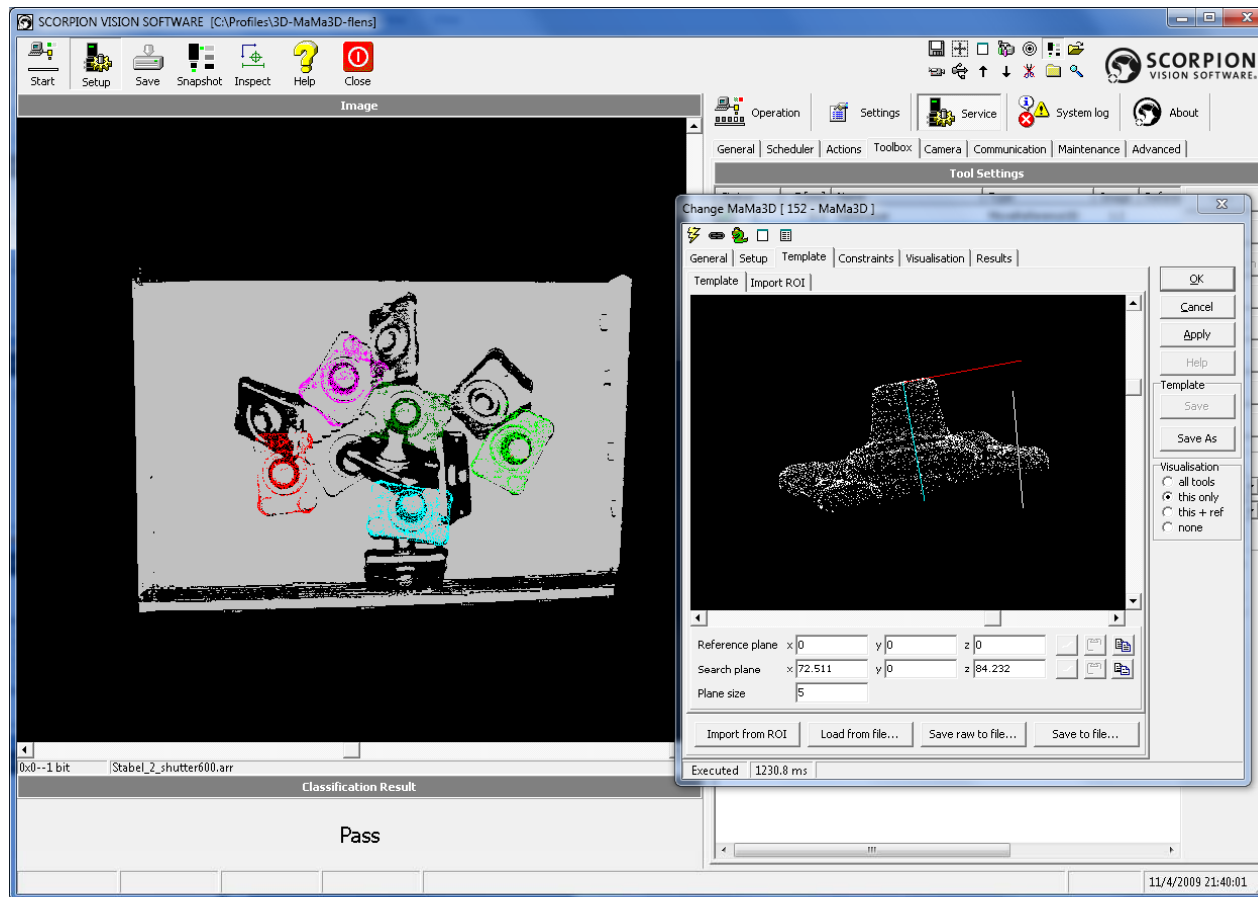


Parameter	Value	Unit
01 Match count	5	
01 Match count raw	5	
01 Initial template points	3017	
01 Used template points	3017	
01 Quality[1]	428.35	
01 Hit percentage[1]	64.05	
01 Position[1].x	899.68	
01 Position[1].y	352.02	
01 Position[1].z	178.62	
01 Angle[1].x	-69.13	
01 Angle[1].y	79.46	
01 Angle[1].z	151.28	
01 Quality[2]	326.92	
01 Hit percentage[2]	55.14	
01 Position[2].x	899.68	
01 Position[2].y	352.02	
01 Position[2].z	178.62	
01 Angle[2].x	-69.13	
01 Angle[2].y	79.46	
01 Angle[2].z	151.28	
01 Quality[3]	314.14	
01 Hit percentage[3]	57.53	
01 Position[3].x	899.68	
01 Position[3].y	352.02	

Executed 1230.8 ms



Demo – Preview Scorpion 8.0





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Summary

- Summary
 - Works well to locate multiple parts with full 6DOF in a 3D image
 - Requires that two defined parts of the object must be simultaneously visible
 - Cost function allows for robustness wrt parameter settings and object pose
 - Made to target 3D Bin Picking and Random Bin Picking
 - Available to beta-tester Now – Released in Scorpion 8.0 – 01/2010
- Questions and Answers Session



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More Information

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