

# *State of the art 3D desktop simulations for training, familiarisation and visualisation*



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Director of Technology  
3D Visual Simulations Ltd*



# Talk Outline

- *3D Visual Simulations*
- *Simulator types and technologies*
- *Technologies for capturing 3D models*
- *Where we can apply it*
  - *Familiarisation*
  - *Visualisation*
  - *Physical & Behavioural Simulation*
- *Case studies*

# *3D Visual Simulations Ltd*

- Founded in 2007 to develop training applications for regulated industries*
- Team originally spun out of Edinburgh University informatics*
- Models based on image sources*
- Using technology and skills from University background*
- We do business across a wide spread of regulated industries*



# *Types of simulator*

- *Full Motion*
  - *A variety of platforms available from 2DOF to 6DOF*
  - *Required for vehicle driving*
- *Mock-up equipment*
  - *Vehicle cab mock-up with replicated controls*
  - *Can be more expensive than real vehicle*
- *Desktop*
  - *Conventional PC hardware*
  - *Can be more flexible than full-cab – driver can leave the cab and navigate around*



# *Motion platforms*

[www.inmotionsimulation.com](http://www.inmotionsimulation.com)



*2DOF – roll & pitch 25-30degrees*



*6DOF hexagonal arrangement*

*Roll, pitch and yaw 30-40degrees*

*Heave, surge & sway 30-40cm*

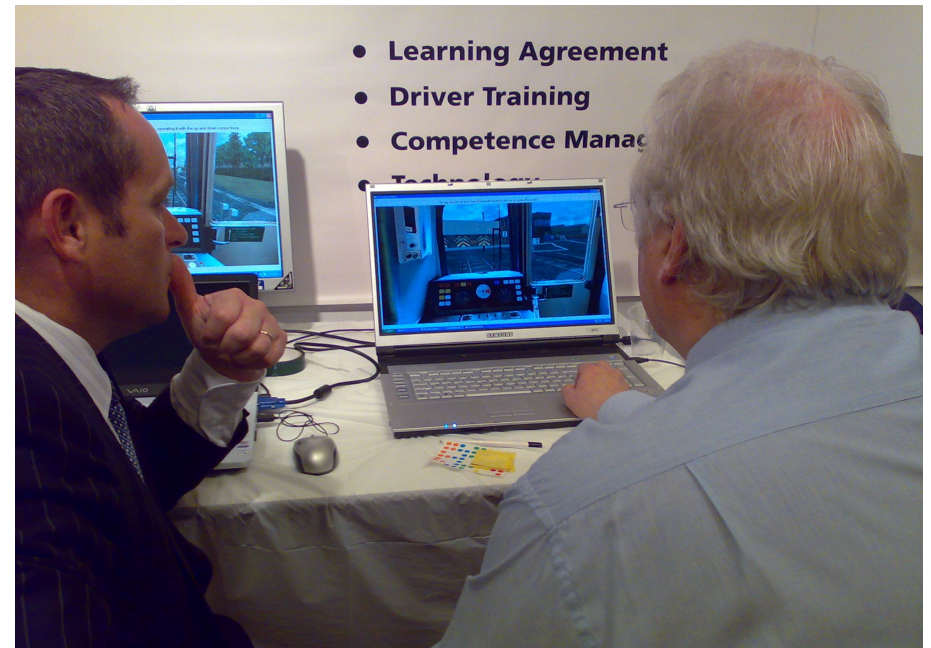
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# Simulators



# *The phases of training*

- *Initial training*
  - *Learn how to operate the equipment and the rules which apply to its use*
- *Advanced training*
  - *Focus on higher level skills*
  - *Spatial awareness*
  - *Strategies and planning*
- *Special procedures*
  - *When things go wrong*
  - *'worst-case scenarios'*



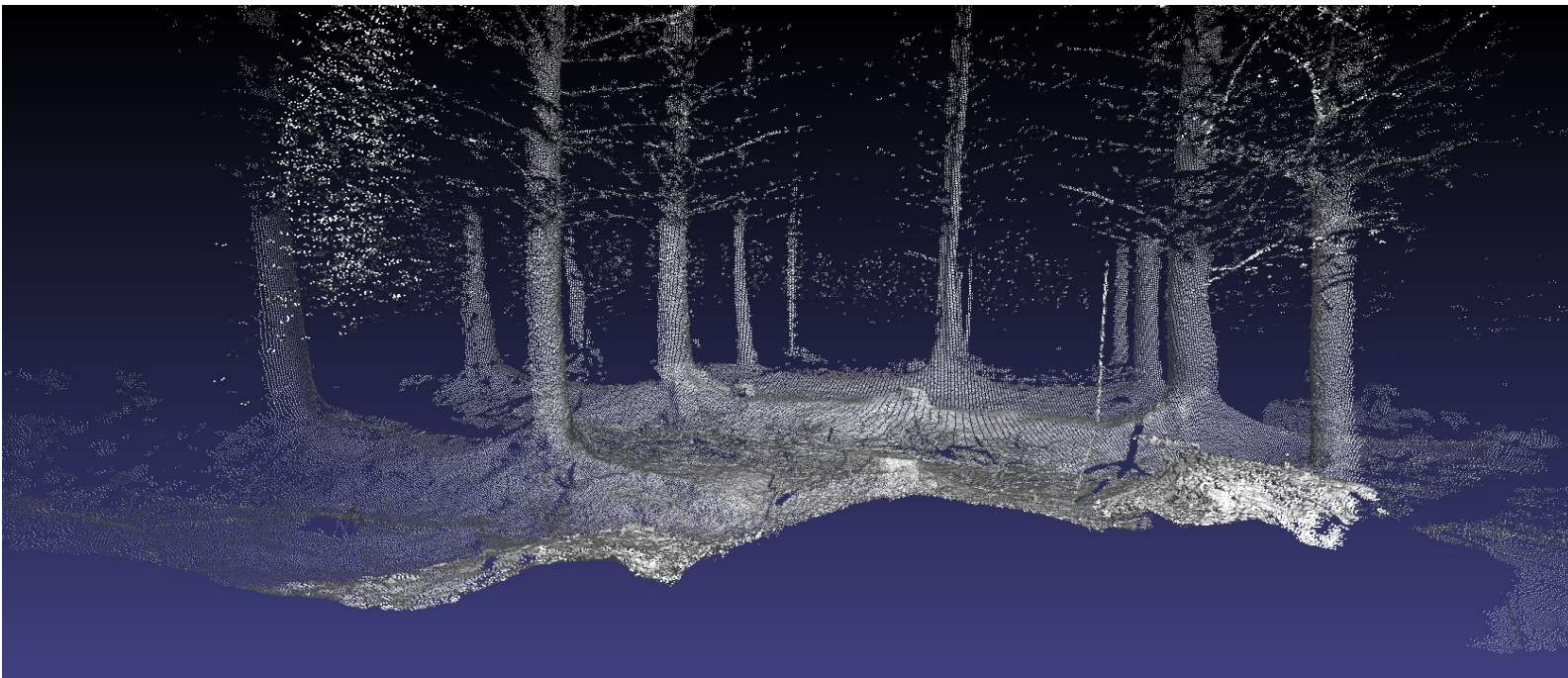
# *Use of Visual Simulation in training*

- *Initial training*
  - *Can be used to familiarise with equipment*
  - *Applies to new equipment or upgrades*
  - *Low requirements on simulator realism*
- *Advanced training*
  - *High degree of realism required*
  - *Part-task trainers can be effective*
- *Special procedures*
  - *Difficult to train for using real equipment*
  - *Simulation is often the only way*

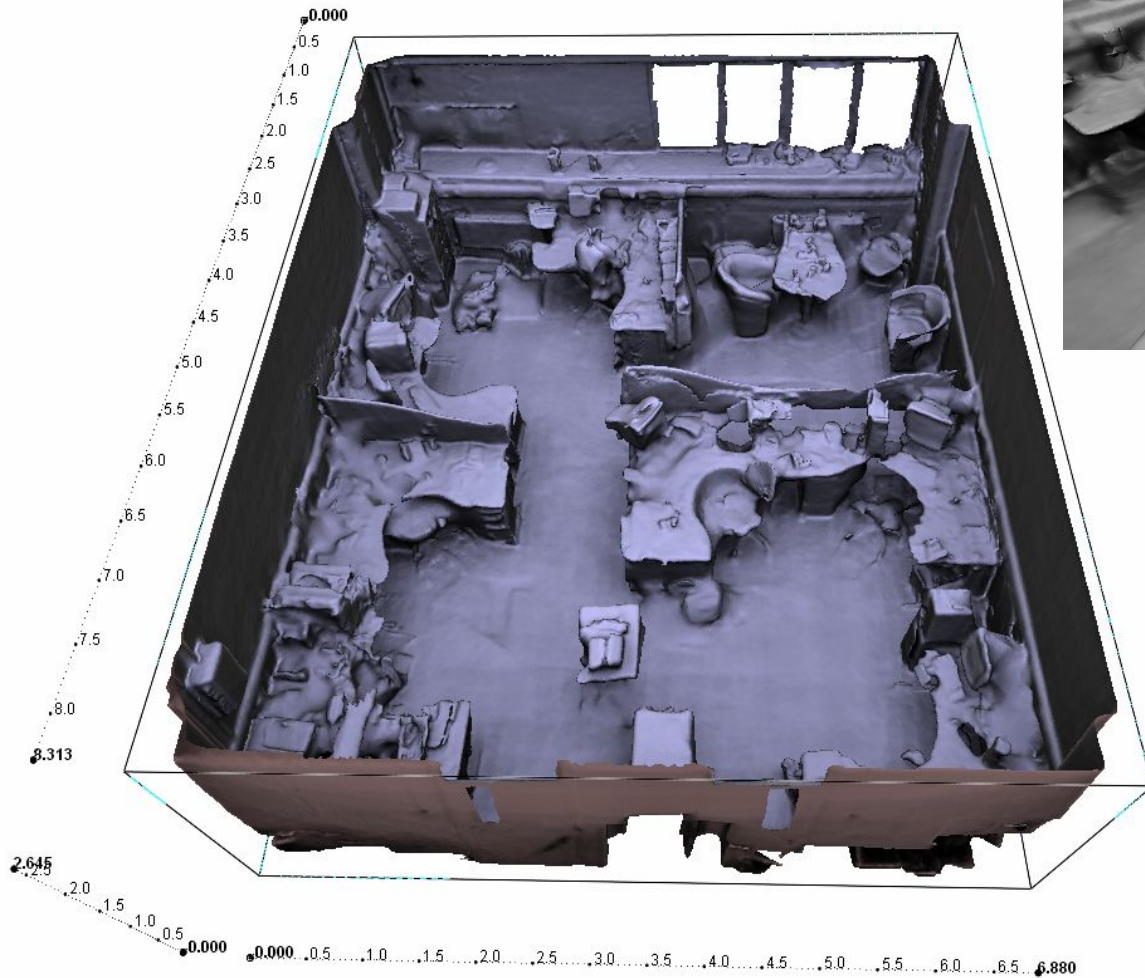


# *Technology for making 3D models*

- *Laser scanning*
  - *Millions of 3D points measured by rotating laser*
  - *Problems with noise, shadows and dark surfaces*
  - *Difficult to reconstruct useful models for interaction*



# *Automatic reconstruction*



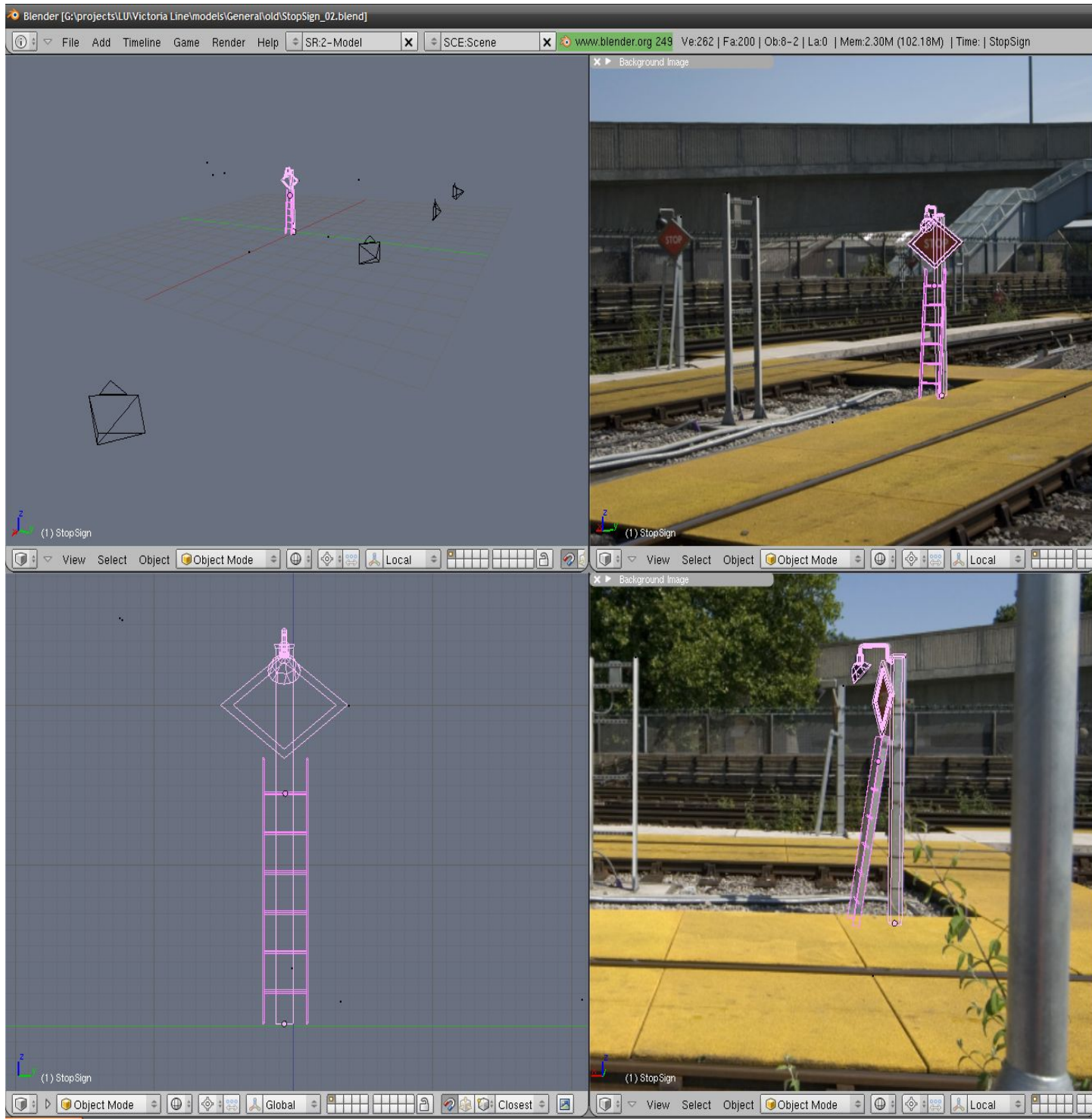
*Office from 5 scans*

*'Melted' appearance  
due to automatic  
algorithm*

# *Technology for making 3D models*

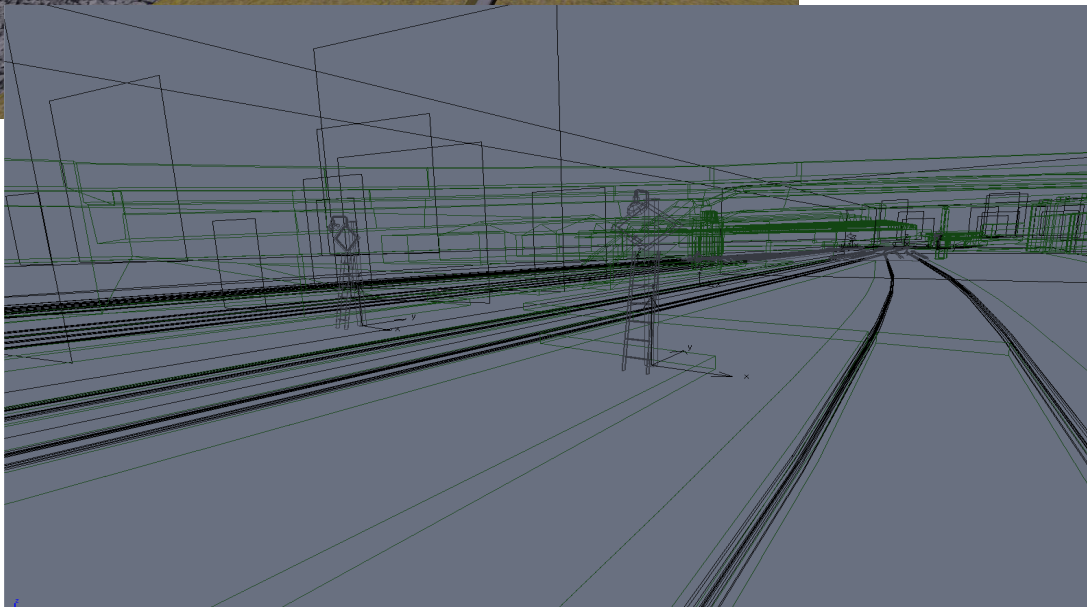
- *Photographs*
  - *Need to calibrate location, direction and focal length*
  - *Can get accurate measurements and assist manual model creation*





*Screenshot from our 3D modelling application*

# 3D Modelling with Photos



# 3D Modeling with Photos



*Copehill Down,  
UK Army training village*

# *Applications of Visual Simulation*

- *Familiarisation*
  - *Train familiarity before a situation requires access*
  - *Most applicable to inaccessible or logistically difficult locations*
- *Physical simulation*
  - *Integrate physical simulation or expert data into the simulation*
- *Visualisation*
  - *Diverse data sources can be combined in 3D*





# Familiarisation

- *To train familiarity with a location before visiting*
- *Usually an inaccessible or logistically difficult location to visit*



- *Case study – aircraft familiarisation*

# *Physical and Behavioural Simulation*

- *Simulation of processes in realtime during the training application*
  - *Such as crowds, fire, smoke etc*
  - *Outcome is not pre-determined but will emerge during the simulation*
- *Not always useful for training*
  - *Would prefer a predictable outcome that 'gets the message across'*
  - *Case study – aircraft evacuation*
- *Often better to use 'expert knowledge'*
  - *Case study – Wembley station crowds*

# Visualisation



- *Visualisation of procedures*
  - *Current working practices can be more easily analysed in a simulator*
- *Data Visualisation*
  - *Integrate image and 3D data into accessible form*
    - *Case studies – thermal IR, Fire test*
- *Visualisation of expert knowledge*
  - *Capture and visualise expert knowledge of a situation in an accessible form for training*
    - *Case study – wembley station crowds*

# Case studies

- *IR thermal / Visible visualisation*
- *Wembley Park station crowd management*
- *Aircraft Evacuation*
- *Fire test visualisation – laser, model & video*
  
- *Aircraft Familiarisation*
- *The Virtual Abattoir*

# Summary

- *Desktop simulation is an ideal tool for part-task training in regulated industries*
- *Familiarisation of difficult to access locations or equipment*
- *Visualisation of image data or expert knowledge*
- *Engineering simulation data can be converted into a form suitable for training*

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