So, what is VR?

- Bringing together many technologies:
  - High quality computer graphics
    - Photorealism
  - High performance rendering
    - Large and complex scenes
  - Accurate tracking in many DOF’s
  - Accurate, fast force feedback
  - High quality audio rendering

What is VR? (2)

- Using sophisticated approaches...
  - sophisticated scene rendering
  - Appropriate, complex interaction techniques
  - Accurate, realistic physical modelling
    - Game engines
  - addressing many senses simultaneously:
    - Sight, hearing, smell, touch (& heat, wind...)

What is VR? (3)

- to create a virtual world...
  - designed to meet a need
  - creating a sense of presence
  - and of immersion
  - and hence (with good goal design) involvement

What is VR? (4)

- so that the user can do something!
  - Be entertained
  - Learn something
    - practice a skill or a new technique
    - memorize an escape route
  - Carry out a task
    - Examine some data
    - Operate on a patient

VR has always been...

- a lot of hype!...
- ...but it’s becoming more and more useful
- Finding a place in niche markets
  - Oil and gas survey (geological)
  - Medical – training and diagnosis
  - Engineering (data analysis)
  - Design and engineering (CAD)
  - Training and education
  - Entertainment
  - ...
It needs the best and most expensive cg hardware

- But that's becoming available in hardware down to the level of a PC
  - Rendering performance quite adequate to some tasks is already available
  - Single screen trainers based on 3D graphics cards in PC's are becoming commonplace

Needs complex software

- Needed to manage complex 3D scenes
- Which you can now download for free from the web
  - OpenGL
  - OpenInventor
  - OpenScenegraph
  - VR Juggler (replacement for CaveLib)

Very expensive displays

- Bright and powerful projectors...
  - which you can now buy for ~$2000
    - ASK-DLP
- Expensive head-mounted displays...
  - which you can now buy for ~$2000
- Or expensive shutter glasses (<$100)
- Or polarized glasses (<$10)

Expensive tracking equipment

- Commercially that's still true...
  - Still costs many thousands of dollars
  - Which affects things like head and pointer tracking badly
  - ...but building your own *mechanical* devices is not prohibitive
    - Building Stefan's monkey cost $300

Very expensive haptic kit

- Sadly still true and not much to be done about it
  - Building your own is difficult
  - The 'toy' equipment isn't much use
- Prices are coming down
  - Still costs thousands
  - Won't be available for general (home) use for several years at least

Hard to interact with

- Yes, it can be
- Needs:
  - Careful design
  - Some (more) imagination
  - More research and development
- In 1976 someone implemented ‘WIMP’
  - Took ~15 years to become commonplace
And so...

- Is finally becoming a main-stream technology
- Ten years ago it was science-fiction
  - (Ok, almost)
- Now it’s expected to be the norm in less than 20 years time

Application areas

- Oil and gas
  - Major buyers of cylindrical semi-immersive display technology
  - Use it for collaborative discussion of geological data
  - Norsk Hydro use it routinely

Application areas

- Medical
  - In Trainers
  - In surgery

Application areas

- Engineering (data analysis)

Application areas

- Design and engineering (CAD)

Application Areas

- Trainers
Application Areas

So...

- The range of applications is expanding
  - Few have completely converted
  - Many have taken on components of VR
- VR trainers are becoming common
  - Because they’re a cheaper alternative
  - Because they’re convenient
  - Because they can now be authentic

Future developments

- Other than more and better examples of VR...
- Collaborative VR
- Augmented reality
- Better user interface design
  - More imagination!

And finally... The Exam!

- To be held Tuesday (18th)- Friday (21st)
- Booking sheets up at my office tomorrow afternoon (Tuesday).
  - 6th floor.
- Each slot 30 minutes.
- Examination is oral
  - Spoken ‘interview’ Q&A
  - English or Swedish