Real-time Animation

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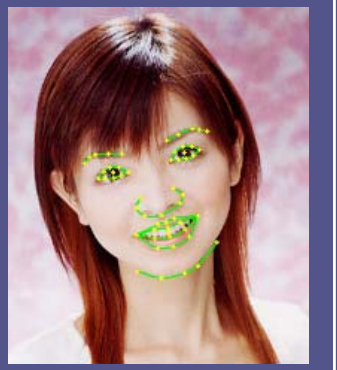
Course www: http://isg.cs.tcd.ie/cosulliv/

Visual Computing

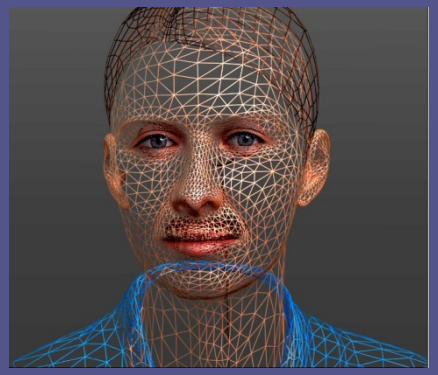
Graphics	Vision	Visualisation	Virtual Reality
			

Using computers both to generate visual images synthetically and to integrate or alter visual and spatial information sampled from the real world

Credits: Twentieth Century Fox Film Corporation and Dune Entertainment LLC., Seestorm, Argosy's Visible Body, Renselaar Polytechnic

Graphics

Modelling



creating, or capturing the representation of objects – most often geometrical

Rendering

creating an image of these objects on a display device

Animation

making objects move by describing how they change over time

Overview of Animation

- MAKING THINGS MOVE!!

- Scripted Animation
  - Keyframe interpolation, articulated models, inverse kinematics (IK), deformations, ...
- Procedural Animation
  - Rule-based, physics-based, behaviour driven, particle systems, flocks, crowds, cloth, fire, smoke, water, ...
- Motion capture
  - Capturing, filtering, editing, retargeting, motion graphs, compressing...

Related Areas

- Maths and Physics
- Biology, Physiology, Biomechanics
- Engineering
- Presence/Immersive Virtual Reality (VR)
- Haptics, Audio
- Artificial Intelligence, Psychology, Perception
- ...

Course Details

- 5 ECTS
- Michaelmas wks 1-12
  - Reading week 7: 7-11h November
- Two hours of lectures every week
- One hour of labs every week

Assessment

- 100% continuous assessment
  - Lab exercises
  - Programming project
  - Demo/interview + Report

Course Topics

- Wk1 Intro + basic maths
- Wk2 More math + programming foundations
- Wk3 Scripted animation (keyframing etc.)
- Wk4 Hierarchical animation / Inverse Kinematics (IK)
- Wk5 Inverse Kinematics (IK) cont.
- Wk6 Data-driven Animation/Motion capture
- Wk7 Reading Week
- Wk8 Motion capture cont. (editing, motion graphs...)
- Wk9 High level behavioural animation/Crowds
- Wk10 Physics based character animation
- Wk11 Perceptual issues in animation
- Wk12 Project Demos

Schedule

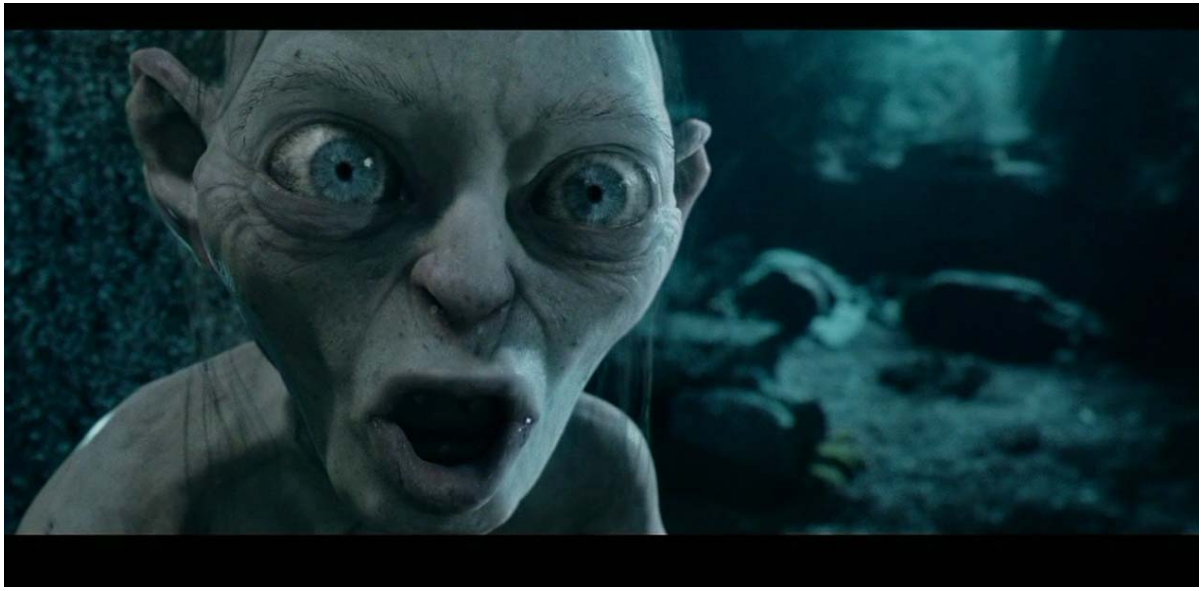
Wk	Topic	Wed	Th1	Th2
1	*Intro*	Lecture	Lecture	Lecture
2	*Foundations*	Lecture	Lecture	Lecture
3	*Scripted animation*	Lab 1 (prep)	Lecture	Lecture
4	*Hierarchical / IK*	Lab 1 (mark)	Lab 2 (prep)	
5	*IK cont.*	Lecture	Lecture	Lecture
6	*Motion capture*	Lab 2 (mark)	Project (prep)	
7	*Reading Week*	---	---	---
8	*Motion capture*	Project (prep)	Lecture	Lecture
9	*Behaviour*	Project (prep)	Lecture	Lecture
10	*Physics-based*	Project (prep)	Lecture	Lecture
11	*Perception*	Project (prep)	Lecture	Lecture
12	*Project Demos*	Project demos		

Animation in Movies

Luxo Jr. (1986) – First use of shadows in CGI, made with special developed softare Renderman. First CGI film to be nominated for an Academy award.

Toy Story (1995) - The first all computer graphics animated film.


Yoda, Star Wars: Episode III -
Revenge of the Sith (2005).

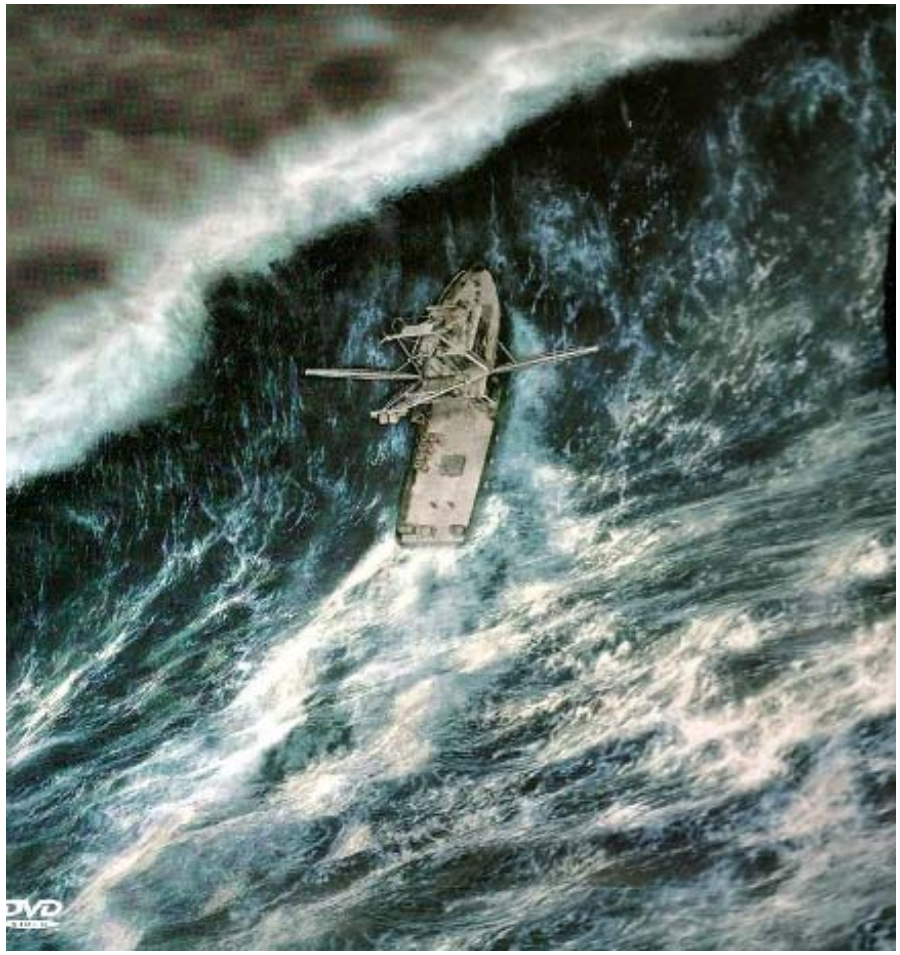


The Return of the King (2003) - Using motion capture technology.

The Polar Express (2004) - Using motion capture technology.

Crowd scene from the Lord of the Rings Trilogy.

Natural Phenomena



Animation in Games

Assassin’s Creed, Ubisoft, 2007

Realistic, responsive environments
Open-ended environments

Spore, Electronic Arts inc. 2008

Open-ended gameplay - permits multiple sequences to finish the game
Procedural generation – create content on the fly

The Sims

Strategic life-simulation computer game in an interactive environment, in which player makes choices and engages fully in a virtual world: best-selling PC game ever

MMOG: Massively Multiplayer Online Games

LOTRO: Lord Of the Rings Online – millions of players worldwide