

CS7GV5 Real-Time Animation

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Demonstrator:

Donal Egan

Course www: Blackboard

Credits: some slides from Rachel McDonnell

Crowds

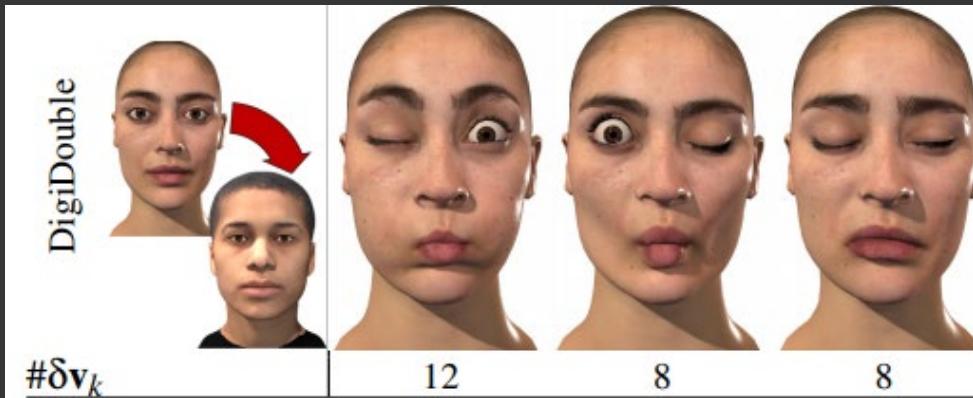


Gestures



VR

Faces



Perception

Introduction

- 5 ECTS
- 100% continuous assessment
- Prerequisite: Knowledge of C++ & OpenGL & computer graphics basics
- Hilary Term wks 1-12
 - Reading week, wk 7

Lectures

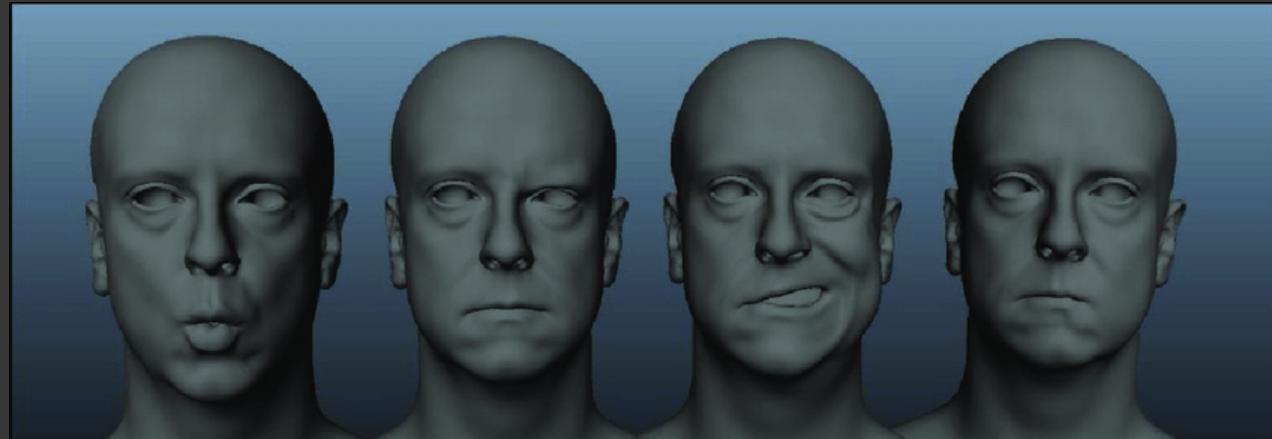
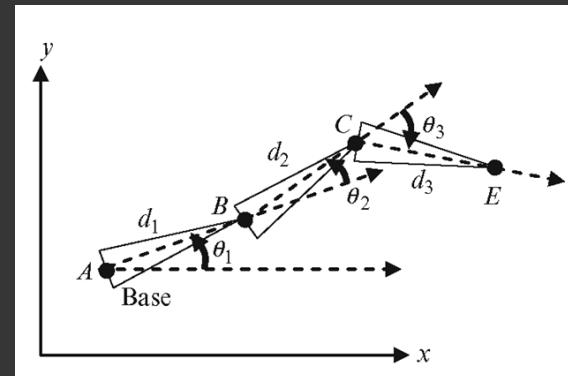
- 11-12pm Tuesday
 - Lecture or lab
- 11-12pm Wednesday
 - Lecture or lab
- All content on Blackboard
 - Lecture Notes
 - Extra Reading
 - Assignments
 - Announcements
 - *Possibly recordings*

Communication

- Blackboard announcement on Mondays before 12:00
- Check Blackboard
- Email me: carol.osullivan@tcd.ie
- Demonstrator Donal Egan main point of contact for labs
- Post question on the discussion board for Donal
 - Useful for others to see replies from demonstrator

Assessment

- 100% continuous assessment
 - 3 smaller assignments
 - OpenGL, C++
 - 1 large project
 - Unreal Engine
 - Demo/interview + report

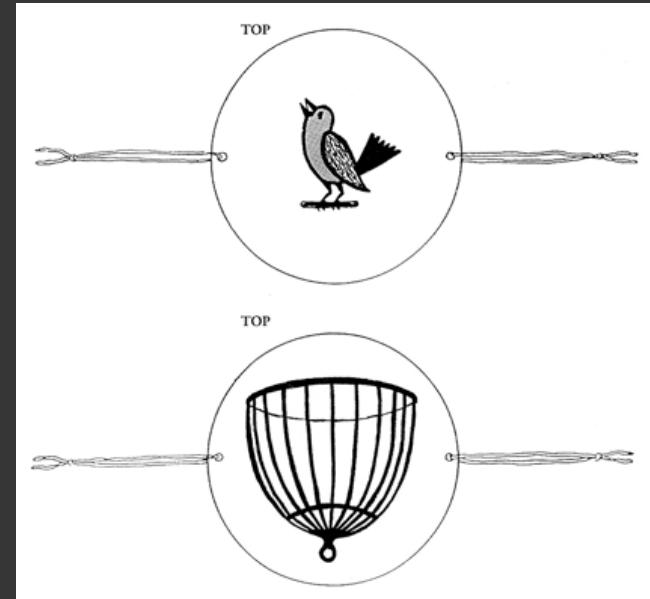


Last Year - Music Video Project

- *Creativity*
 - Concept design
 - Own favourite music
 - Principles of animation
 - Camera work
 - *Technical investigation, e.g...*
 - Advanced character Animation
 - Motion Capture
 - Motion State Machines
 - Motion Editing – blending, transplanting, etc.
 - Facial animation using morph targets
 - Automatic lip-sync from text or audio
 - Stylized motion
 - Crowd Simulation
 - Gesture or personality modelling for the character
 - Complex/scripted camera motion
 - Interesting character behaviours/AI
 - Particularly imaginative narrative
 - Cloth Simulation
 - Advanced Particle systems
 - Physically-based animation
- 

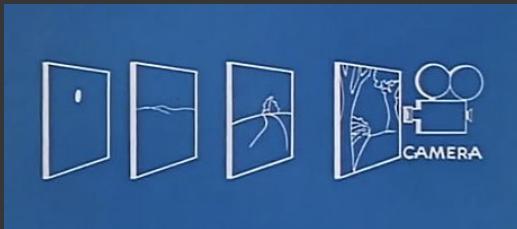
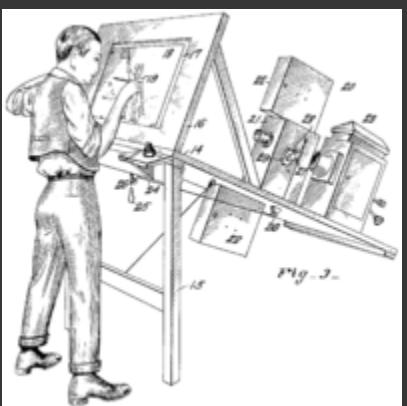
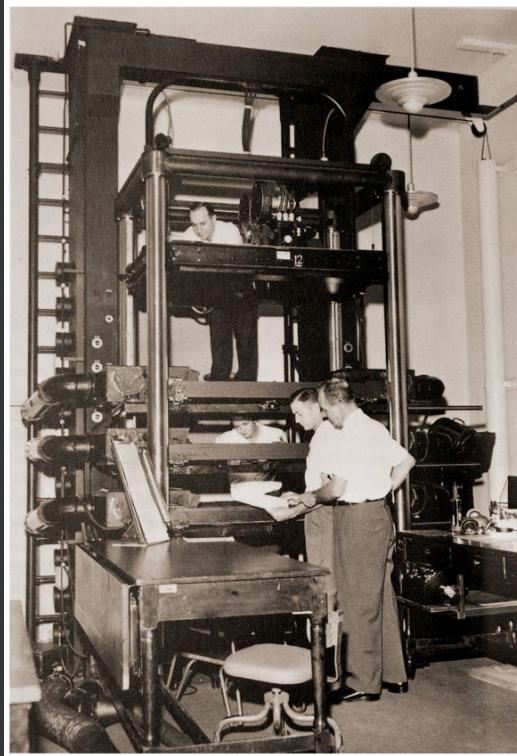
Motion Perception

- *Animate* means “give life to”
- Human Visual System is designed to notice and interpret movement
- Persistence of vision: eye retains a visual imprint of an image for a brief instant once the stimulus is removed



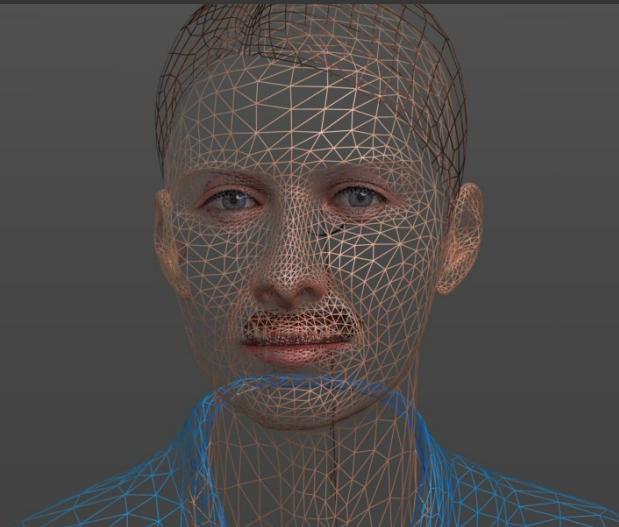
1800's early devices

Traditional Animation



Computer Animation

Modelling



Creating or capturing the representation of objects - motion often geometrical

Rendering



Creating an image of these objects on a display device

Animating



Making objects move by describing how they change over time

Animation in the Movies!

- Tron (1982)
- 15 minutes fully computer generated
- Very early facial animation



Animation in the Movies!

- Luxo Jr. (1986) - First Pixar short movie



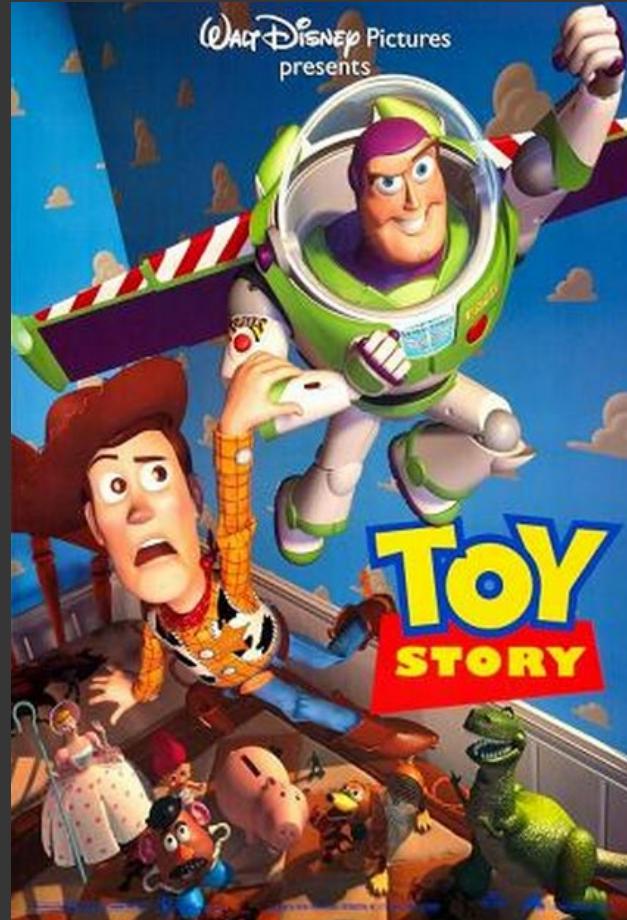
Animation in the Movies!

- Jurassic Park (1993)
- Landmark in the use of CG animation
- First CG creatures
- Filmmakers were inspired and realised that many of their visions, previously thought unfeasible or too expensive, would now be possible



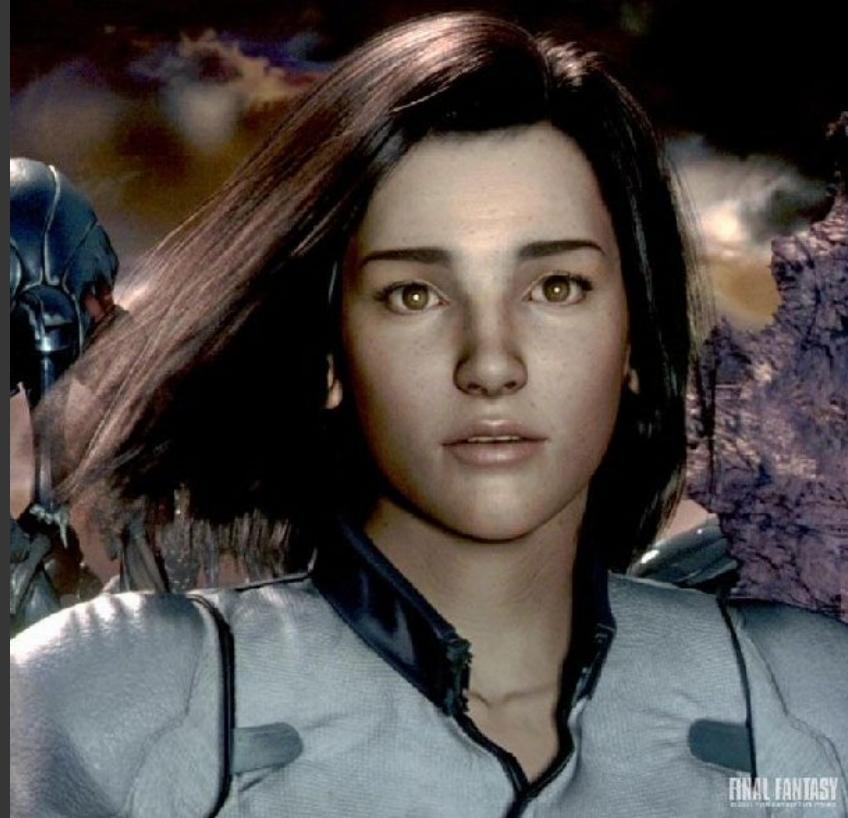
Animation in the Movies!

- Toy Story (1995) – First all computer graphics animated film
- One of the greatest and most revolutionary films in the history of animation
- \$30 million budget using staff of 110
- (Lion King \$45M, 800 staff)
- 2-15 hours per frame
- One of the highest grossing films of all time



Animation in the Movies!

- Final Fantasy: The Spirits Within (2001)
- First film to use performance capture for all of its characters actions.
- The near lifelike appearance of the characters in the film was acknowledged as a **technological tour-de-force**
- However, some felt the character renderings fell into the trap robotic scientists called the uncanny valley



Animation in the Movies!

- The Lord of the Rings: The Fellowship of the Ring (2001)
- Gollum was the first photorealistic motion captured character for a film.
- First digital actor to win an award



Animation in the Movies!

- The Polar Express (2004)
- The second film that used motion capture for all actors
- Similar negative response as Final Fantasy



Animation in the Movies!

- Avatar (2009)
- First full length movie using performance-capture to create photo-realistic characters and to feature a fully CG 3D photo-realistic world



Animation in the Movies!

- Avatar:
- The Way of Water(2022)



Animation in Live Attractions!



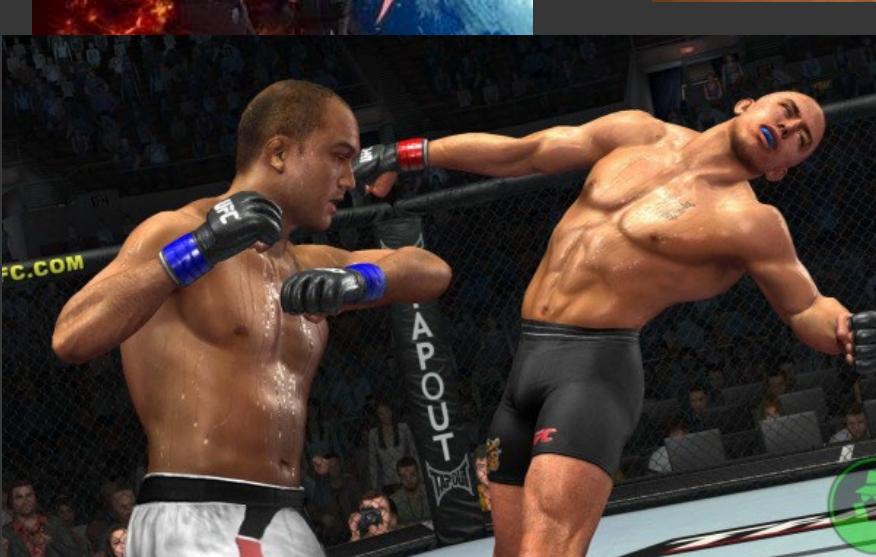
Pandora – The World of Avatar (Disney's Animal Kingdom)

Animation in Live Attractions!



Pandora – The World of Avatar (Disney's Animal Kingdom)

Games



Animation in Games

- Assassin's Creed,
Ubisoft, 2007
- Realistic, responsive
environments
- Open-ended
environments



Animation in Games

- Spore, Electronic Arts inc.
2008
- Open-ended gameplay - permits multiple sequences to finish the game
- Procedural generation – create content on the fly



Animation in Games

- 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



Animation in Games

- MMOG: Massively Multiplayer Online Games
- LOTRO: Lord Of the Rings Online – millions of players worldwide



Animation in Games



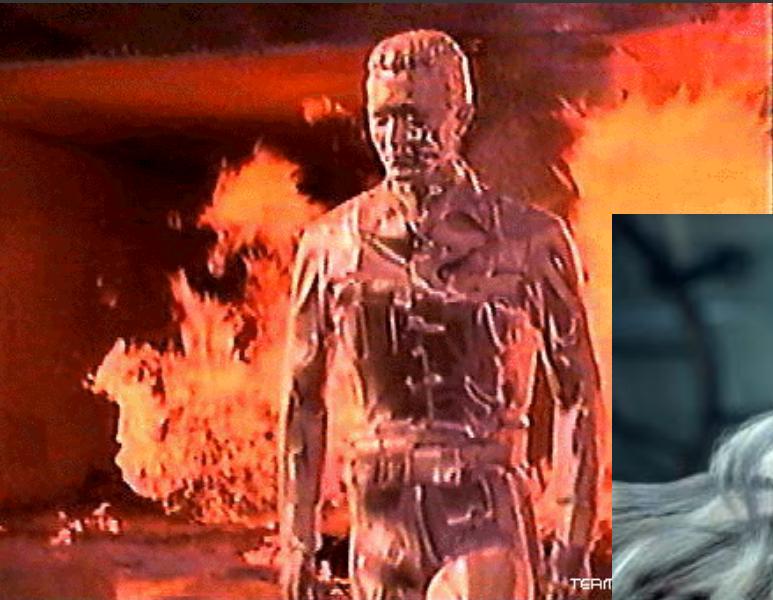
Animation in Games



Animating Objects



Animating Humans



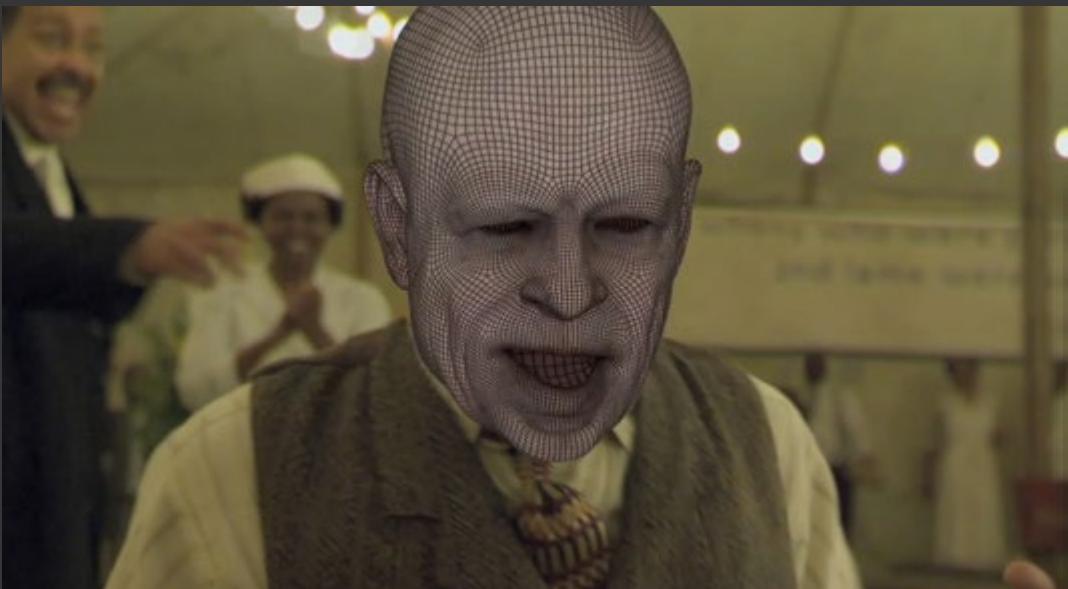
Animating Creatures



Animating Crowds



Facial Animation

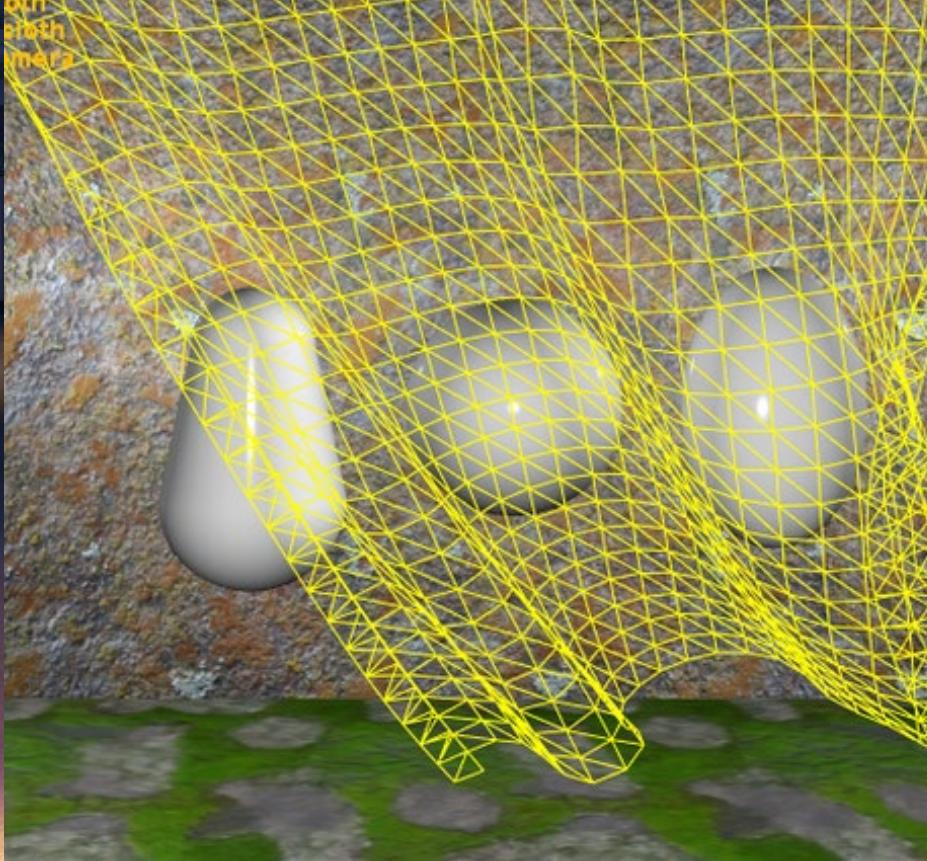


A woman with long blonde hair is dancing in a dark room. She is wearing a white, flowing dress and has her arms raised. The background is dark with some purple and blue lighting.

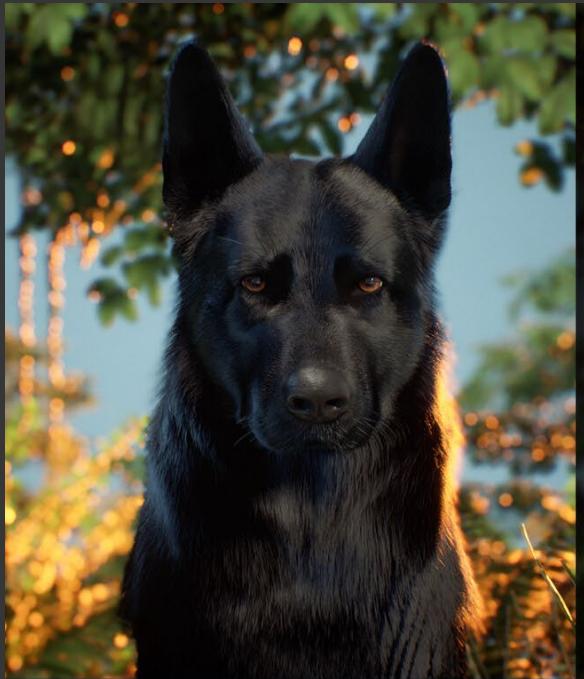
IPHONE X FACIAL CAPTURE WITH **FULL BODY**

By [Sergio Peralta](#)

Cloth Simulation



Hair and Fur



still frames from cinematic renders



Fluid Simulation



Animation Research

Conferences:

- ACM **SIGGRAPH**
- **Eurographics**
- **SCA**: ACM Symposium on Computer Animation
- **CASA**: Computer Animation & Social Agents
- **MIG**: Motion, Interaction & Games
- **i3D**: ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games

Hot topics:

- ML based animation
- Deep-fakes
- Hair!
- Virtual clothes try-on
- Directable cloth/animation
- Markerless mo-cap
- AR/VR



Summary

- Course overview
- Animation in movies & games
- Types of animation
- What next?
 - Create OpenGL project (in Assignments folder)
 - Check computer can handle UE4
 - Next Lecture: mathematical foundations