MIRALab, University of Geneva

Presentation at the ERCIM e-Mobility Kick-Off
MIRALab

- Founded in 1989 at the University of Geneva
- Director:
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- Team of
  - 6 post doc and senior researchers
  - ~30 researchers and PhD students
  - ~20 MSc students
A pluridisciplinary lab working on virtual human simulation and virtual worlds

- Facial animation
- Medical simulation
- Mixed realities
- Motion capture
- Virtual clothing
- Graphics standardization
- Virtual heritage
- Hair simulation
- Web 3D
- Body animation
- Personality and emotion simulation
- Multidevices platform (PDAs & cellphones)
Some EU research projects…

- On content for networked scenarios
  - InterFace → facial animation for the web
  - SoNG → automatic streamable content production
- On mobile applications
  - ISIS → intelligent scalability of content
  - DANAE → dynamic and distributed adaptation of content
  - Coordination of INTERMEDIA → dynamic networking, wearable interfaces, and scalable multimedia content
DANAE Project

- **Offering dynamically and automatically to users:**
  - Optimum quality regarding the nature of media (audio, video, graphics, virtual characters)
  - Under any network and terminal constraints as well as user preferences.

- **Research innovations**
  - Scalable 3D modeling
  - Scalable 3D and 2D facial animation
  - Scalable 3D body animation

- **Technical achievements**
  - Network and MPEG platform integration
  - Implementation of new plugins and tools
  - Specific content design and authoring
DANAE innovations

- Multi resolution representation
  - Ready to be adapted meshes
    - Clustered representation
    - Low-cost adaptation
    - Easy for hardware acceleration
    - Reduced amount of data
  - Scalable procedural textures

- Key feature preservation
  - For animation of low resolution
    - Control points for facial animation
    - Near-joint vertices for body animation
DANAE innovations

- 3D animated human on PDA
  - Statically adapted mesh and body animation
  - Additional media (audio, images, slideshow)
**DANAE innovations**

- **Facial Animation**
  - Generation of multi-modal speech
    - Multiple languages (english, dutch)
    - Coupled with Text-To-Speech and/or SpeechRecognizer
  - Scalability mechanisms
    - Adaptive Deformation Tables
    - Scalable FAP
    - FATInterpreter
      - including the possibility to use 3D FAP for 2D FDP
DANAE innovations

- **3D to 2D transformation**
  - With deformable 2D mesh
    - 2D FDP from initial 3D mesh
    - Adapted deformation tables
    - FATInterpreter
      - Usage of 3D FAP for 2D face
DANAE innovations

- Adaptive body animation
  - Multi-resolution hierarchical animation
    - Levels of articulation to adapt the hierarchy
    - Regions of interest to select subset of joints
    - Context-based decision (terminal, network)

Control number of joints

- Optimize data
- Reduce computations
DANAE innovations

- Dynamic adaptation of animation
  - Driven by bandwidth in next demo
  - Rotation updates fixed
  - Animation for museum looped for visualization

- Integrated in networked chain
  - Stream graphics and animation data
  - Monitoring events and control slider
DANAE innovations

3D Dynamically Adapted Streamed Animation
MPEG-4 compliant file generation
- MP4Box tool
  - Extension to support face and body nodes in BT syntax
  - Multiplex, synchronize and compress elementary streams
    - BT (scene), BBA, FAP, AAC (audio), JPG and PNG (images)

MPEG-21 streamable and adaptive content
- DIGenerator (python script)
  - Generate DID (item description)
  - Extract packet units for server
  - Generate SDP for client (item configuration)
- BSDLink (xml file)
  - Information on the stream structure (gBSD)
  - Mapping of the context (AQoS)
  - Transformation of the gBSD (XSLT)
**DANAЕ achievements** tools & plugins 1..3

- **3DSMax plugins for geometry**
  - LODGen
    - generate different mesh resolutions
  - BiFSExport
    - export .bt scalable geometry and texture file
  - JointFill
    - fill in multi-mesh for rigid animation

- **Stand-alone tool for geometry**
  - Level-Of-Adaptation selection
DANAE achievements tools & plugins 2..3

- Tools for facial animation
  - Text-to-Visual generator
    - .txt to .fap
  - FAPMixer
    - blend different FAP files
  - FATInterpreter
    - supporting 3D FAP for 2D face
  - 3DtoSVG
    - generate SVG gouraud-shaded facial animation
Tools for body animation
- wrk2bba converter
  - Standalone or integrated in VHD++
  - Support .bba and .mp4
- BBAGen
  - generate adapted body animations
- BBAEncoder
  - compress .bba
  - generate metadata
INTERMEDIA Project

- Partners
  - MIRALab, Switzerland
  - IBBT, Belgium
  - ISI, Greece
  - RWTH, Germany
  - UNIGE, Italy
  - FHG-FIT, Germany
  - UNIKLU, Austria
  - EPFL, Switzerland
  - GET-ENST, France
  - ICU, South Korea
  - ICOM, Greece
  - OFFIS, Germany
  - CNR, Italy
  - TELEFONICA, Spain
  - CU, Canada
**INTERMEDIA vision**

- *The User as Multimedia Central*
- *Be naturally automatically connected with any information device*
- *Today*: we have several devices that do not recognize each other and are different multimedia centrals themselves ((phone, pda), ipod, tv, radio)
- *In the future*: Intermedia will create a user-centric mobile device (like a jacket) that is aware of these other devices and user-friendly.
  - Our information data are always with us
  - Connection with no human intervention
Chloe prepares herself to go out while listening to her preferred music. She transmits orally her program of the day as well as her itinerary to her electronic agenda, which is somewhere in the house.

At the time of leaving, she puts on her “INTERMEDIA” jacket.

At this moment, all the data of each multimedia device are transmitted automatically to her jacket (e.g. the itinerary which she intends to take this morning and her music selection).

Chloe gets into her car. The information contained on the jacket are transferred towards the electronic devices being in the car: the radio car and the GPS system for guidance by satellite according to the recorded itinerary.
Chloe is traveling by plane; she is wearing her INTERMEDIA jacket.

All her personal data are transmitted to the computer, which is in front of her seat.

She can easily continue working on her files, listen to her preferred music or watch her preferred movies and receives her preferred meal.
MIRALab in INTERMEDIA

- **Leading**
  - Construction and Management of Network governing bodies
  - Financial and Administrative Management of the Network
  - Installation of a Web portal
  - Organization of open forums
  - Definition of the requirements in content sharing for user-centric convergence

- **As a partner**
  - Ontology model creation to link all descriptors
  - Creation, annotation and organization of the audiovisual content according to a showcase scenario
MIRALAB in the group

- **Technical**
  - Expertise in complex multimedia content authoring and in collaborative virtual environments
  - Technologies for scalable 3D content
  - 3D renderers on different platforms
  - Standardization activities
    - Khronos standards (OpenGL ES, Collada …)
    - MPEG standards
      - AFX version 2 (3D compression group)
      - MPEG-21 Digital Item Adaptation

- **Others**
  - Concertation and communication with related EU projects
  - Contributions to proposals for FP7 calls