FOster the Comprehension and USe of Knowledge intensive technologies for coding and sharing 3D media content

FOCUS K3D

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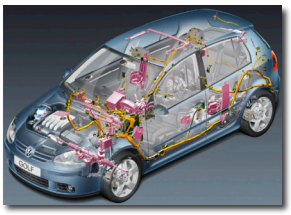
3D media

- digital representations of either physically existing objects or virtual objects that can be processed by computer applications
- created by **design** or acquisition





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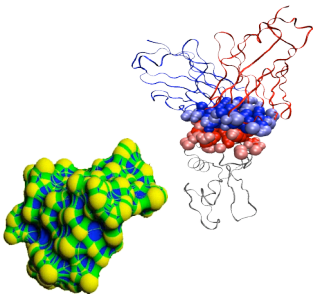


Explosion of 3D technology

- the reduction of 3D hardware costs makes it possible to think now of 3D on the desktop
- computer networks may now rely on fast connections at low cost
- 3D acquisition devices are becoming more and more commonplace (*laser scanning, photogrammetry*)
- 3D TV displays
- 3D printers are now able to produce not only mockups but even end products

rendering, acquiring, transmitting, "materializing" 3D data is now feasible in specialized and unspecialized contexts

shift of paradigm & users

- gradual shift of paradigm in science from *physical prototypes and experience to virtual prototypes and simulation*
  - CAD/PLM
  - Bioinformatics
  - Medicine
  - Cultural Heritage
  - ...
- users in these disciplines are experienced scientists or professionals but their expertise is neither in the computer graphics domain nor in semantic web technologies (media professionals, enterprise designers, doctors, publishers/dealers,....)

the data grave !

How to organize, process, share, use and re-use, navigate, this large amount of complex content ?

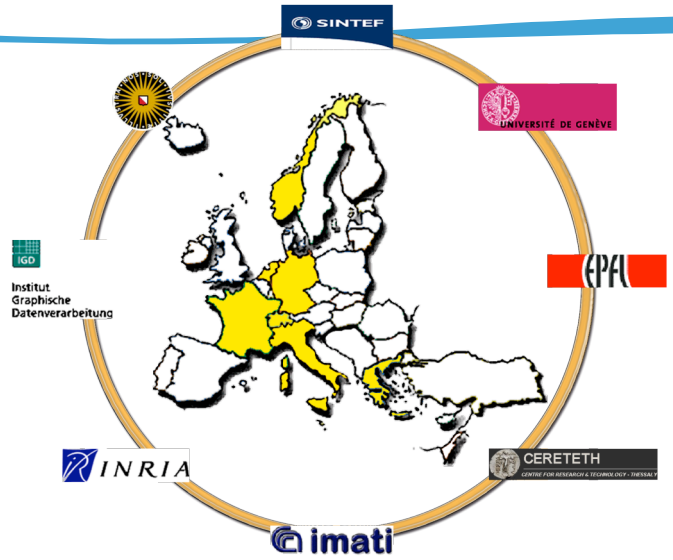
data and knowledge expressed by 3D media is useless if it cannot be accessed, retrieved and easily re-used and re-purposed

Embedding 3D into the Semantic Web

FOCUS K3D

- FOCUS K3D : **FOster the Comprehension and USe of Knowledge intensive technologies for coding and sharing 3D media content**
- Coordination Action funded in the Call 1 of the FP7 ICT Work Programme, Objective: Intelligent Content and Semantics
- Duration: March 2008 - February 2010
- Funding: ≈1.2 Mio €
- Coordinator: Bianca Falcidieno, CNR-IMATI-GE
- www.focusk3d.eu

Consortium



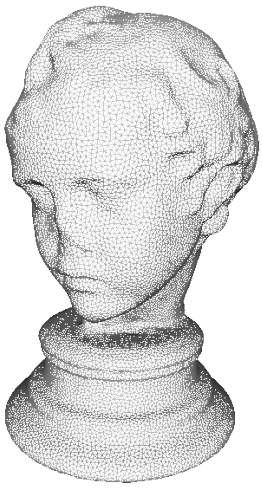
FOCUS K3D bridges two key concepts

3D shapes & knowledge

and wants to promote the adoption of the semantic multimedia paradigm to 3D content- and knowledge-intensive application domains

"shape-intensive" applications

what is "knowledge" related to 3D content ?



"knowledge" related to the type of **geometric** representation used to model the shape, eg:

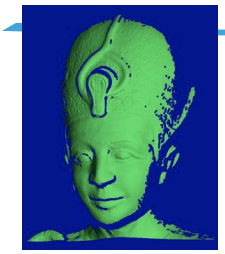
- *triangle mesh vs point cloud*
- *triangle, vertex, edge count*
- *topological properties*
- *smoothness*

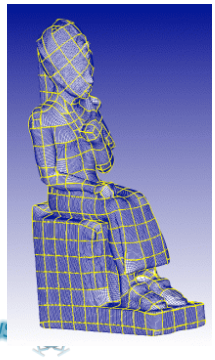
what is "knowledge" related to 3D content ?

"knowledge" related to the **meaning** of the shape represented by the geometric model:

- *class, category*
- *features, characteristic parts of the shape*

what is "knowledge" related to 3D content ?





"knowledge" related to the way the model was produced, analysed processed

- *acquisition process*
- *domain-specific workflows*
- *domain-specific manipulation of the shape*

FOCUS K3D builds on AIM@SHAPE

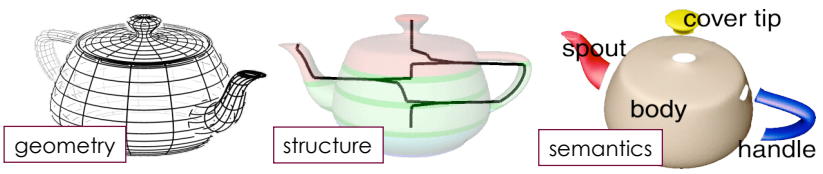
- emergence of 3D in "traditional" multimedia scenario
  - first effort to establish a methodology for documenting digital shapes, tools and processes, with emphasis on 3D, with **structured metadata** about the geometry, and **semantic annotation** (meaning and context of use)
- technological and infrastructural support
  - DSW: the Digital Shape Workbench
  - Ontologies for shapes
  - Ontologies for specific domains
  - Semantic search engine
  - 3D search engine (shape similarity)

AIM@SHAPE

http://www.aimatshape.net/

3D Geometry & Semantics

- to model not only the visual appearence of objects but also their meaning in a given knowledge domain
- integration of Computer Graphics and Vision with Knowledge Technologies



semantic 3D media

- 3D media are characterized not only by **shape data** but also **knowledge**
  - what is the *meaning/purpose* of a 3D object ?
  - what is the *category/class* of a 3D object ?
  - what is a 3D scene about ?
  - in which *context* the 3D media are used ?
  - what are the *workflows* used to produce a 3D object ?

semantic 3D media

- key role of **knowledge technologies** for the formalization of:
  - the semantic content of a 3D model/scene itself
  - methods to share user-generated 3D content
  - methods to code the rules of scientific workflows that involve 3D content
- knowledge technologies, as an evolution of knowledge management, for the organization and exchange of data **&** knowledge about the data
- the adoption of KT in computer graphics will facilitate the development of *smart* 3D media and services for various application domains

FOCUS K3D goals

- Requirements of the user communities
  - how and why they create and process 3D content
  - how they deal with 3D content knowledge
- Current practices and analysis of the needs for advanced 3D content modelling and processing
  - building up on previous FP6 R&D, evaluate how usable/useful semantics-oriented techniques can be in the different applied domains
  - what kind of services users need to handle the 3D knowledge workflow pipeline
- Research roadmaps
  - which research problems are still open in 3D content and knowledge modelling and processing
  - how to personalise solutions in the application domains
- Openness to a larger audience

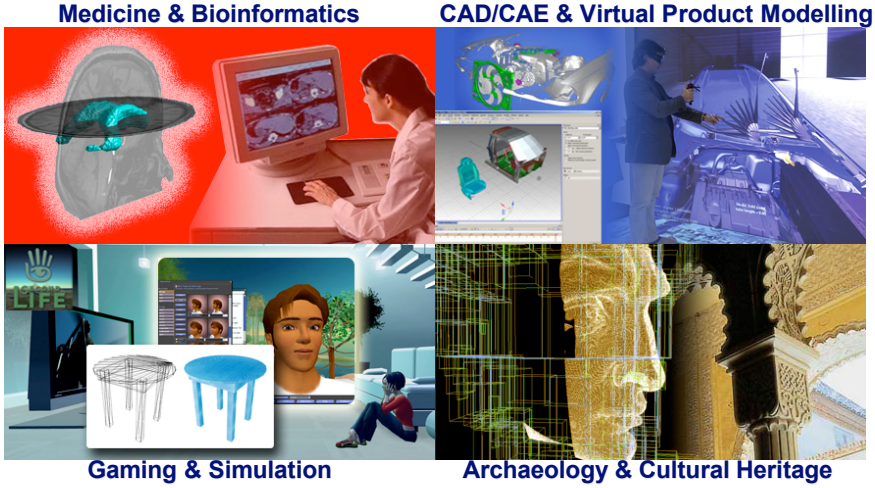
Strategy

- Application Working Groups (AWGs)
  - User's communities, one for each application area
  - questionnaires to better understand and evaluate the current methods and practices in 3D modelling and knowledge capture
  - meetings and workshops to present and discuss open problems in terms of 3D modelling and analysis as well as knowledge capturing and management
- Methodological Working Group (MWG)
  - assessment of the current practices and proposals for research roadmaps
  - To set up ad hoc strategies for a profitable collaboration with the different communities

Application Working Groups (AWG)

Medicine & Bioinformatics

CAD/CAE & Virtual Product Modelling



Gaming & Simulation

Archaeology & Cultural Heritage

AWG members and further contacts

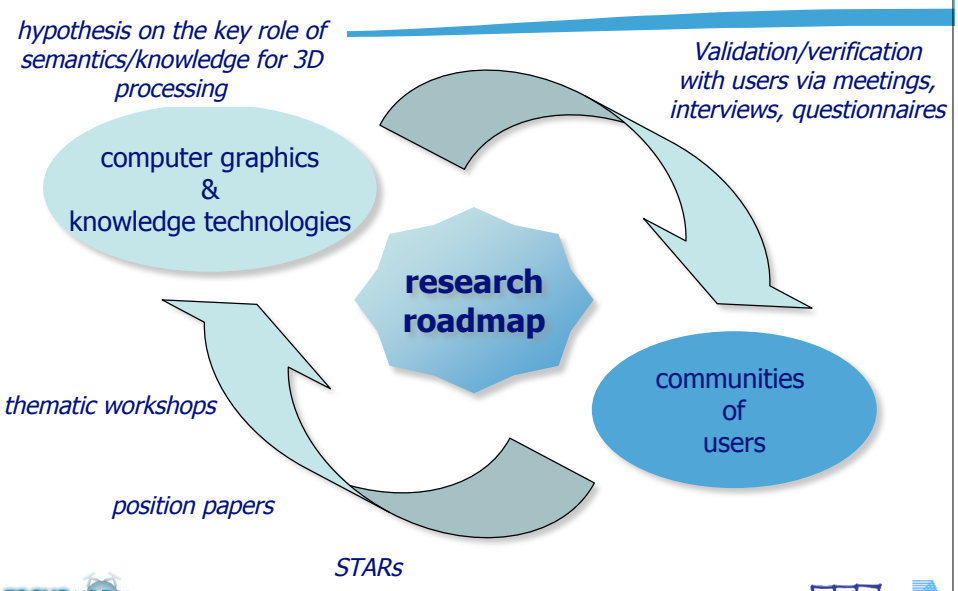
USA, Canada

China, Japan

Brazil

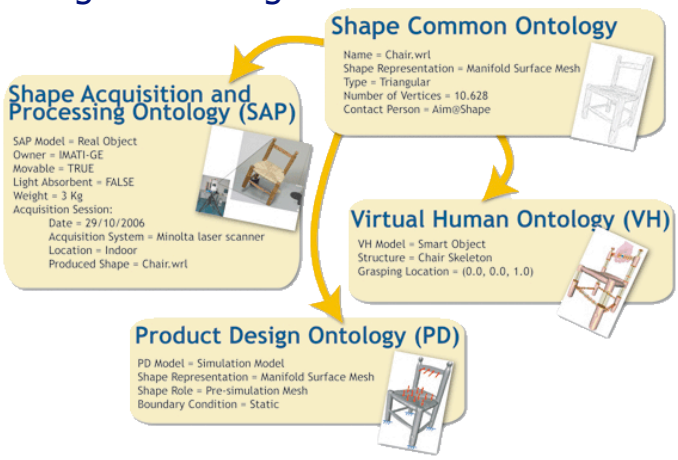
Jordan

FOCUS K3D



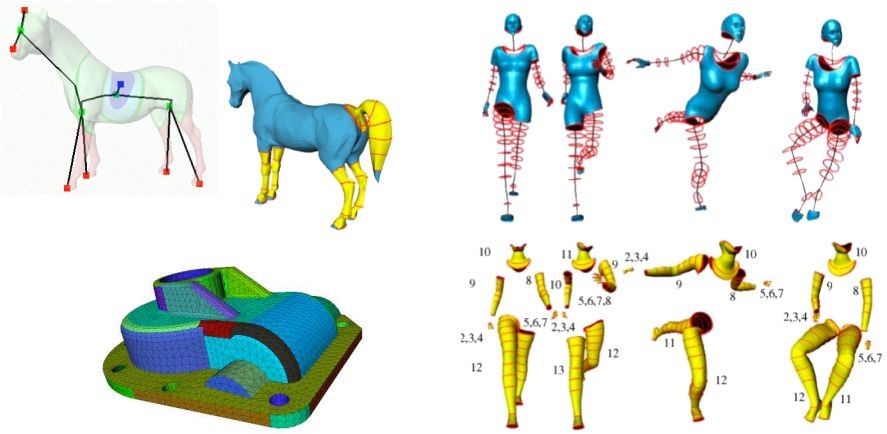
key problems

- documenting for sharing



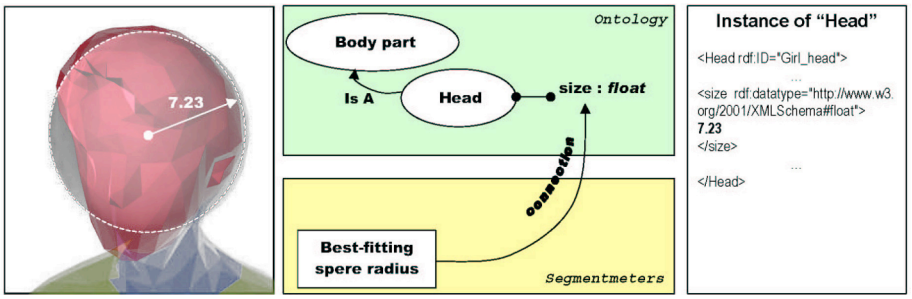
key problems

- understanding the meaning



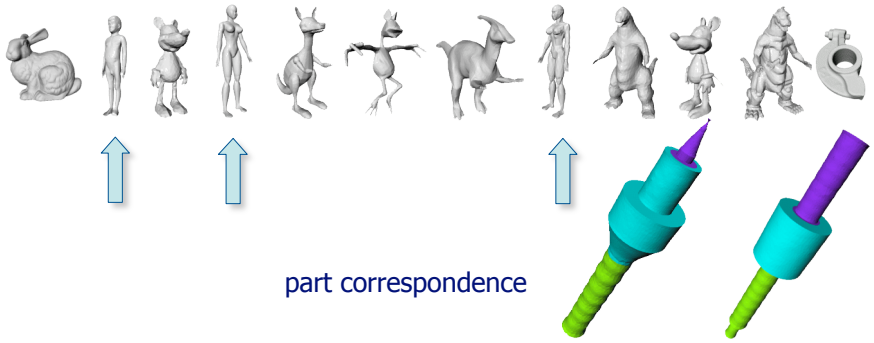
key problems

- annotation & markup



Key problems

- shape similarity assessment
  - content-based retrieval and delivery
  - classification



part correspondence

Results so far

- Active collaboration with 86 community members in the 4 application domains
- Input from the Users' Communities: report on the assessment of questionnaires
- Resources gathered:
  - more than 120 links to related projects, initiatives, domain ontologies,..
  - new 3D shapes uploaded by community members
- STARs about the usage of KT in the 4 domains (available on the portal)
- Web portal, regular newsletters
- Dissemination Events
  - ICT Networking Session, Lyon 2008
- 5 Thematic Workshops

Thematic Workshops

- **Workshop on Flexibility in Biological Recognition** (18-20 March 2009), organized by INRIA Sophia Antipolis - Mediterranee, France, http://www-sop.inria.fr/manifestations/fmr2009/index_en.shtml.
- **Workshop on Anatomical Models**, organized by INRIA and IMATI at INRIA Sophia-Antipolis, France (16-17 June 2009), http://www-sop.inria.fr/geometrica/events/wam.
- **Workshop on 3D Advanced Media in Gaming and Simulation** (3AMIGAS), in conjunction with CASA, organized by UU June 16 2009, http://www.cs.uu.nl/events/3amigas/
- **Go-3D – Workshop on challenges in 3D content for Virtual Product Modeling** (31 August, 1 September 2009), organized by Fraunhofer IGD Rostock (http://www.go-3d.de/veranstaltungen/go-3d-2009/call-for-paper.html
- **Workshop on 3D knowledge technologies for Cultural Heritage Applications**, organized by CERETETH (Manolis Vavalis, Marios Pitikakis, Michela Spagnuolo), in Vienna, week 9-12 September 2009

Join FOCUS K3D

- How to join:
  - Contact us through the web portal ***www.focusk3d.eu***
  - or mail to
    - The AWG leaders:
      - Med&Bio: Frederic.Cazals@sophia.inria.fr
      - CAD/CAE/PM: Andre.Stork@igd.fhg.de
      - G&S: Wolfgang.Huerst@cs.uu.nl
      - CH: Marios.Pitikakis@cereteth.gr
    - The Project Coordinator:
      - Bianca.Falcidieno@ge.imati.cnr.it

why to join the project activities

- Workshops and ad hoc meetings
- Questionnaires by AWGs to analyse user's requirements for various user's profiles
- Demos to the user communities on the use of advanced tools and services for 3D content creation and manipulation (geometry & knowledge)
- Research roadmaps for the scientific communities involved

join the discussion sessions !!