CRS4 Visual Computing Overview

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CRS4: Center for Research, Development, and Advanced Studies in Sardinia

- **Focus on ICT & computational sciences RTD**
- **Leading computational & bioprocessing facilities**
- **Located in the POLARIS S&T Park (Sardinia)**
- **Operational since 1992**
- **Staff of 187 people (Jan 2013)**

CRS4: Visual Computing Group

- **Main activities**
  - Visual Computing RTD
  - 3D scanning + applications
- **Staff (early 2013)**
  - **Director**: Enrico Gobbetti
  - **Main lab**: Marco Agus, Marcos Balsa Rodriguez, Fabio Bettio, Alberto Jaspe Villanueva, Fabio Marton, Gianni Pintore, Ruggero Pintus, Antonio Zorcolo
  - **TT/3D scanning lab**: Roberto Combet, Emilio Merella, Alex Tinti
  - **Secretariat**: Katia Brigaglia, Cinzia Sardu

CRS4: Visual Computing Group

- **Externally funded research program**
  - Many EU projects (4FP-7FP) and national projects
  - Industrial projects from GEXCEL, DIES, ENEL, …;
- **Active presence in the scientific community**
  - Many scientific collaborations: ISTI-CNR, U. Zurich, U. Rostock, Chalmers U., JHU APL, …, Holografika, Diginex, Gexcel, …
  - Over 150 refereed publications
  - IPCs, journal editor, conference organization (EG2012, EGPGV2012, 2013), active in EG community
- **Software products and technology transfer**
  - "Industrial software": point cloud, surgical simulators, sciviz tools,
  - "Public software": geoviewing, neuroimaging tools, …
  - 3D scanning (mostly for medicine / cultural heritage)
- **Educational Activities**
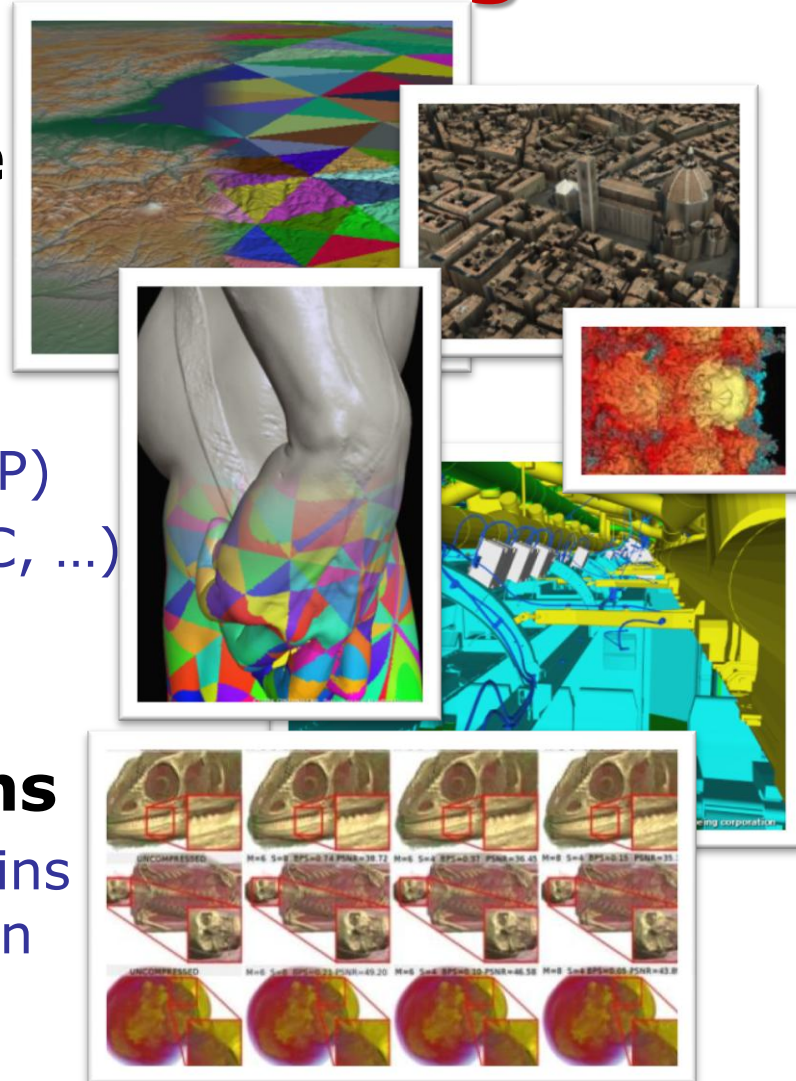 - University courses; PhD students; Tutorials; ITNs, …

Facilities

- **Visual Computing Lab**
  - Graphics PCs and clusters
  - Custom camera array, Kinect, Phantom, …
  - Customized Holografika light field display (72 projectors), geowalls, tiled displays

- **3D scanning lab**
  - NextEngine , Minolta Vivid, Leica, Artec
  - Zcorp 3D printer

- **Access to large computing center**
  - Ranked in Top 500, hybrid CPU/GPU/FPGA clusters, petabyte storage facilities

Massive research...

- **RTD (mostly) connected to 3D massive models**
  - RTD covers acquisition, processing, distribution, rendering, exploration
- **... plus other (related) topics**
  - Surgical simulators, 3DTV, ...

- **Appl. Domains**
  - Cultural heritage
  - Geoviewing
  - Medical imaging
  - Sciviz
  - ...

Massive acquisition & processing...

- **3D scanning pipeline (color and geometry)**
  - Point cloud management, 3D registration, streaming MLS, …
  - (Semi-)Automatic Registration of Photographs to 3D Geometry
  - Streaming framework for seamless photo blending on massive point clouds and triangle meshes
- **Real-time capture & 3DTV**
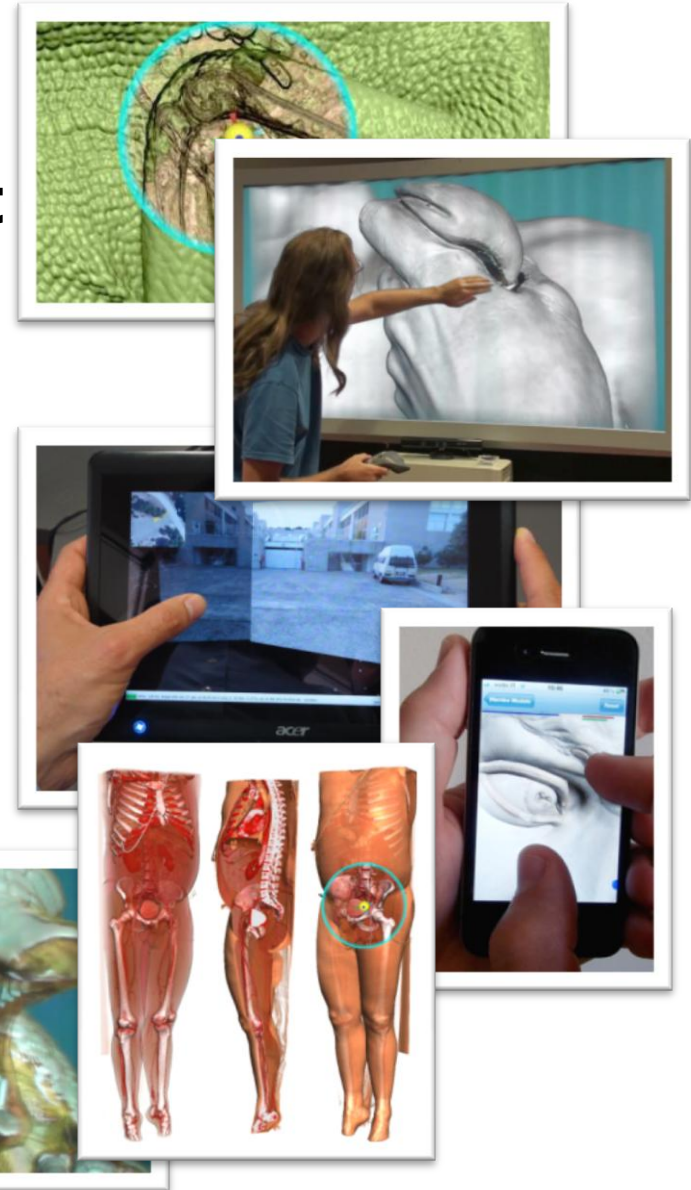 - GPU accelerated decoding, depth estimation, and high quality rendering on a multiprojector light-field display

Massive distribution & rendering...

- **Multiresolution representations & adaptive renderers**
  - Terrains (*-BDAM)
  - Urban models (*-Blockmaps)
  - Dense meshes (Tetrapuzzles, AQP)
  - General surfaces (Far Voxels, LPC, …)
  - Volumes (MOVR, COVRA, …)
  - …

- **Compressed representations**
  - Wavelet-based compressed terrains (C-BDAM...), compression-domain DVR (COVRA), quad patches, …
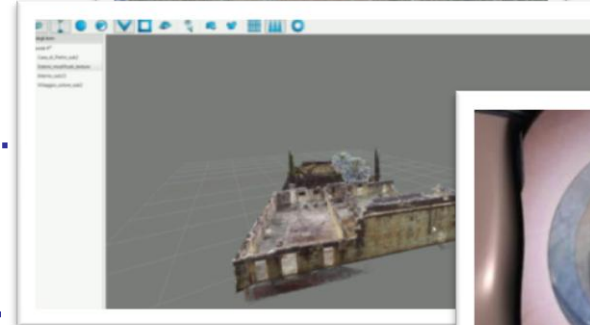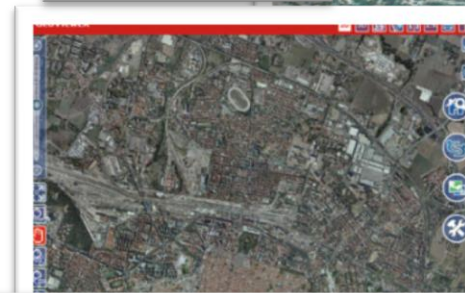
Massive exploration...

- **Specialized solutions for light field displays**
  - Parallel surface renderers
  - GPU volume renderers
  - Multi-view illustrative techniques
- **Specialized solutions for mobile devices**
  - Adaptive quad patches, compressed clouds & surfaces
- **User interfaces**
  - FOX constrained model manipulation, ...

Technology transfer...

- **Cultural heritage campaigns & apps**
  - Mostly 3D scanning – acquisition, archival, valorization
- **Italian geoviewing systems**
  - Open source, Emilia Romagna & Sardegna regional system
- **Point clouds management software**
  - Gexcel R3 products and more…
- **Surgical simulators**
  - DIES cataract surgery trainer…
- **… and more…**

Extramural funding & projects

- ## EU (FP4-FP7)
  - 1996-2012: 13 projects (~4.5M€ funding)
- ## Industry
  - 1996-2012: ~0.8M€ (TT, geoviewing, surgical sim., point clouds, Cultural Heritage)
- ## National/regional grants
  - 1996-2012: ~3.2M€

- ## Current projects
  - **DIVA**: Data Intensive Visualization and Analysis. Funded by (EU ITN)
  - **INDIGO**: Innovative Training and Decision Support for Emergency Operations. (EU FP7 STREP)
  - **GEXCEL-MPCMV**: Massive Point Cloud Management and Visualization (Gexcel)
  - **RATMAN-RER3D**: Rapidly Adaptive Terrain Models Available on the Net: Reuse (S.IT)
  - **MONTEPRAMA1**: 3D digitization of the Mont'e Prama statues (MIBAC)

For more information: www.crs4.it/vic/

... AND MORE!