The Research Institute of Visual Computing, RIVIC

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http://www.rivic.org.uk/

Abstract
Visual computing represents one of the most challenging and inspiring arenas in computer science. Today, fifty percent of content on the internet is in the form of visual data and information, and more than fifty percent of the neurons in the human brain are used in visual perception and reasoning. RIVIC is the collaborative amalgamation of research programmes between the computer science departments in Aberystwyth, Bangor, Cardiff and Swansea universities. Its aim is to promote research in visual computing, e.g. visualisation, computer vision and image/video processing, computer graphics and virtual environments.

1. Lab history

The Research Institute of Visual Computing, RIVIC, is the collaborative amalgamation of research programmes between the computer science departments in Aberystwyth, Bangor, Cardiff and Swansea Universities. Research groups in the area of visual computing were initiated in 2004 (Aberystwyth), 2003 (Bangor), 1982 (Cardiff) and 1992 (Swansea).

2. Areas of expertise

Our strategy is to organize collaborative projects around our core strength in areas such as medical visualisation, segmentation and applications, sports visualisation, facial modelling, visualization, geometric modelling and rendering, and to broaden the scope by exploring collaborative and interdisciplinary research with other areas such as image analysis, measurement and segmentation, flow and information visualization, and computer animation, where Wales has expertise (see Figure 1). By carrying out a collection of collaborative projects, we can bring scientists together from the different universities.

3. Staff

The individual groups that make up RIVIC are:

Aberystwyth: Vision, Graphics and Visualization Group [†]

Bangor: Visualization and Medical Graphics Group [‡]
Cardiff: Visual Computing Group [§]
Swansea: Visual and Interactive Computing Group [¶]

Each centre is supported by a number of academics, (i.e. lecturers, senior lecturers and professors in computer science), 29 in total (see Table 1), and research staff, including 29 PhD students, 18 postdoctoral fellows and 9 research assistants (see Table 2).

4. Facilities and Equipments

In addition to traditional computing research laboratories and equipment, each centre has specific research equipment. The group in Aberystwyth has set up 3D scanners and an excellent thermal camera. In Bangor, a large stereo, rear projected, display system from Mechdyne and 7 different kinds of haptic devices are in used. The group in Cardiff make use of a 3dMD 4d (3d + time) Face Scanner and Minolta Vivid 3D scanner, and a GPU/CPU hybrid cluster (64 CPU/24K GPU cores, 8GB per CPU core). In Swansea, flexible workspaces for biometric analysis have been set up (e.g. kinects, multiple video cameras, fast frame rate video cameras). RIVIC researchers also have access to a 3T MRI, and a Nikon CT inspection machine at Swansea and cluster computing available through HPC Wales. Further equipment information is available on group websites.

[†] http://www.aber.ac.uk/en/cs/research/vgv/

[‡] http://vmg.cs.bangor.ac.uk/
[§] http://www.cs.cf.ac.uk/research/vis.php
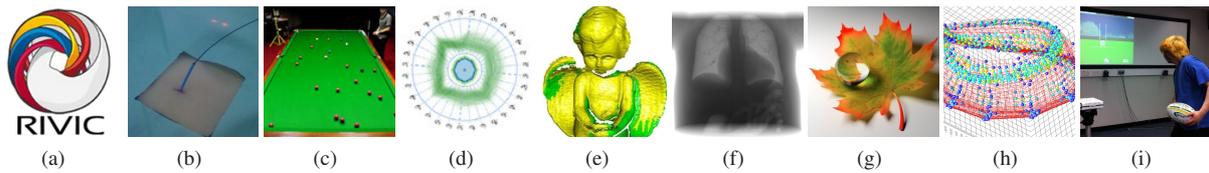[¶] http://cs.swansea.ac.uk/visualcomputing/

Figure 1: *RIVIC areas of expertise: (b) Augmented Reality; (c) Computer Vision; (d) Data Visualization; (e) Geometry Processing; (f) Imaging; (g) Rendering; (h) Video Processing; (i) Virtual Environments.*

Aberystwyth	Bangor
Prof. Reyer Zwiggelaar	Prof. Nigel W. John
Dr Hannah Dee	Prof. Sian Hope
Dr Frédéric Labrosse	Dr Ik Soo Lim
Dr Yonghuai Liu	Dr Rafal Mantiuk
Dr Bernie Tiddeman	Dr Jonathan C. Roberts
Prof. Simon Cox	Dr Franck P. Vidal
Cardiff	**Swansea**
Ralph Martin	Dr Mark Jones
Prof. Nick Avis	Dr Rita S. Borgo
Dr Yukun Lai	Dr Robert S. Laramee
Dr Frank Langbein	Dr Daniel Archambault
Prof. David Marshall	Dr Ben Mora
Prof. Paul Rosin	Dr Xianghua Xie
Dr Kirill Sidorov	Dr Gary Tam
Dr Xianfang Sun	Dr Phil Grant
Prof. Shimin Hu	

Table 1: *Academic staff. Underlined text marks the RIVIC director of each centre.*

Centre	PhD students	Postdoctoral fellows	Research assistants
Aberystwyth	10	5	0
Bangor	9	2	1
Cardiff	4	5	1
Swansea	6	6	7

Table 2: *Research staff. 3 of the research assistants are also studying for a PhD, 1 is about to submit his thesis.*

5. Funding

RIVIC was launched in 2009, funded with a £5M grant over four years from the Welsh Government. During the period, we have obtained an additional £9.3M in grant funding from EU & UK Research councils, industry and charities. We have dedicated Knowledge Exchange Officers who work directly with industry to exploit our research results. Industrial partners have included: Airbus / General Dynamics / British Aerospace / Qinetiq / EADS; Renishaw / Delcam / Royal Mint; nVidia / STMicroelectronics; Welsh Rugby Union / Terry Griffiths Snooker / Sportsviz. RIVIC has run graduate schools annually (2009-2013), and has been able to fund many visiting researchers (e.g. J. Tsotsos, D. Weiskopf, N. Max, C. Hansen, C. Wallraven, C. Ware, H. Samet, L. De Floriani, R. Maciejewski, D. Ebert, Y. Wang, P.-F. Villard).

6. Projects

RIVIC members are conducting research in many areas of visual computing (see Figure 1). It includes augmented reality [CJGC11], computer vision [OFM*08], data visualization [LLC*12], geometry processing [LHM09], imaging [Liu10], rendering [SJ13], video processing [WLH*12] and virtual environments [VJGH08]. This research will often be applicable to a number of different domains, including architecture, CAD/CAM/CAE, creative industries, defence, education, heritage, industrial, medical, security, and sports.

7. Future of the lab

RIVIC intends to continue to make Wales an international centre of excellence for visual computing research. In the next phase of the institutes's development we plan to focus on investing in the training of doctoral students.

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