

# DR. CARLO HARVEY BSc Hons FHEA PhD

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## OVERVIEW

### LOCATION

University of Warwick  
University of Warwick  
University of Bristol  
Stonyhurst College

### PLACE OF WORK

Birmingham City University  
University of Bournemouth  
University of Warwick  
Johnson Tiles  
University of Warwick  
Sound Space Design  
University of Warwick  
University of Warwick

### GENERAL

Software and Libraries

Programming Languages

### DEPARTMENT

Computer Science  
Creative Technologies  
CSC  
WMG

### EDUCATION

2013 - 2016: Postgraduate Certificate in Applied Professional Practice, (PCAPP)  
2007 - 2012: PhD, Modality Based Perception for Selective Rendering  
2003 - 2007: BSc, Computer Science, 2:1 (Hons)  
2001 - 2003: A2 / (AS), Mathematics, ICT, Economics, (Spanish): AAB (B)

### WORK EXPERIENCE

Sep 2017 – present: Senior Lecturer & Researcher, Digital Media Technology Lab  
Nov 2016 – Sep 2017: Senior Lecturer & Course Leader, Games Programming (BSc)  
Oct 2012 – Oct 2016: Research Fellow, Program for Simulation Innovation (PSi)  
Jul 2012 – Oct 2012: Innovations Consultant  
Mar 2012 – Jun 2012: Imaging Consultant  
Jan 2012 – Mar 2012: Acoustics Consultant  
2011 – 2012: Research Fellow  
2009 – 2010: Software Developer

### IT SKILLS

Unity3D, UE4, 3DStudio Max, Maya, Blender, Houdini, zBrush, Mudbox, Mentalray, Renderman, Maxwell, Matlab, Octave, Android Studio, R Studio, Pure Data, Max/MSP, DSP VST's, DAWs, SPSS, MS Office, Photoshop / GIMP, Substance Painter, Illustrator, Latex, Git, Amazon Web Services, CUDA, OpenCL, DirectX, OpenGL, FMOD, OpenAL, Polhemus, Android SDK, Rift SDK and FD2X.

C, C++, C#, Java, Objective-C, Matlab, R, Mel-Script, Python, HTML, CSS, Javascript and VB.  
Proficiency varies.

### LECTURING EXPERIENCE

Machine Learning, Graphics Programming, Artificial Intelligence for Games.  
Maths for Computer Graphics, Mobile Games Programming, Game Dev. Pipeline.  
Data Structures and Algorithms  
e-Business Technologies, Computer Graphics and Visualisation, Perceived Quality

### REPRESENTATIVE PUBLICATIONS

- Harvey C., Bashford-Rogers T., Debattista K., Doukakis E., Chalmers A.: *Olfaction and Selective Rendering*. Computer Graphics Forum. 09/2017.
- Doukakis E., Debattista K., Harvey C., Bashford-Rogers T., Chalmers A.: *Audio-Visual Resource Allocation for Bi-Modal Virtual Environments*. Computer Graphics Forum. 06/2017.
- Harvey C., Debattista K., Bashford-Rogers T., Chalmers A.: *Multi-Modal Perception for Selective Rendering*. Computer Graphics Forum. 01/2016.
- Hulusic V., Harvey C., Debattista K., Tsingos N., Walker S., Howard D., Chalmers A.: *Acoustic Rendering and Auditory-Visual Cross-Modal Perception and Interaction*. Rushmeier H., Groeller E., (Eds.), Computer Graphics Forum. Volume 31(1), pp. 102-131. 2012.

## EDUCATION

### UNIVERSITY OF WARWICK

Coventry  
2013 – 2016

### POSTGRADUATE CERTIFICATE IN APPLIED PROFESSIONAL PRACTICE

This development has allowed a large pedagogic review of modern teaching practices to inform and drive my own teaching and these have been incorporated into my own teaching philosophy. This course granted me Fellowship of the Higher Education Academy (FHEA). Completed January 2016.

### UNIVERSITY OF WARWICK

Coventry  
2007 – 2012

### DOCTORATE OF PHILOSOPHY

Computer Graphics, Engineering: Modality Based Perception for Selective Rendering. User study evaluated techniques to speed up image synthesis. Taking advantage of perceptual artefacts of cross-modal attention under different sensory systems.

### UNIVERSITY OF BRISTOL

Bristol  
2003-2007

### BACHELOR OF SCIENCE

Computer Science, 2:1 (Hons).  
Subjects: Computer Graphics, Advanced Computer Graphics, Software Engineering, Language Engineering, Concurrency and Communications, Computer Architecture, Multimedia, New Media Design, Software Development, Web Technologies, Animation Production, Character and Set Design, Systems Integration, Human-Computer Interactions, Pure Mathematics, Calculus, Number and Group Theory.

### STONYHURST COLLEGE

Clitheroe  
2001-2003

### A2/(AS) LEVELS

Mathematics, ICT, Economics, (Spanish). AAB (B).

## WORK EXPERIENCE

### BIRMINGHAM CITY UNIVERSITY

Birmingham  
2017 – present

### SENIOR LECTURER / RESEARCHER

I lecture on both the Computer Science Machine learning unit and the Games Technology Artificial Intelligence units as well as teach Graphics Programming using C++.

Half of my time is spent embedded within the Digital Media Technology research lab focussing on research interests such as perception-aware rendering, sound propagation and human factors in virtual and mixed reality.

### UNIVERSITY OF BOURNEMOUTH

Poole  
2016 – 2017

### SENIOR LECTURER / COURSE LEADER

I was the programme leader for the Games Programming course within the Creative Technologies department in the Faculty of Science and Technology. I oversaw the iteration from the BSc Games Programming course offering into the redesigned BSc Games Software Engineering. This process has been approved by both an internal and external panel, by the Academic Quality team and by the Faculty Academic Standard Committee. This new course launched in September 2017 and offers students a course which is much more aligned to the needs of industry, focussing on key graduate skills.

Academic citizenship duties saw me in the capacity of Unit of Assessment 11 Impact Champion, whereby I oversaw the development of case studies being prepared for the Research Excellence Framework 2021 submission process.

Representative day-to-day duties include administration and enterprise responsibilities, lecturing, project supervision, research output and grant writing.

### UNIVERSITY OF WARWICK

Coventry  
2012 – 2016

### RESEARCH FELLOW

Working with JLR on an EPSRC funded research proposal, Program for Simulation Innovation (PSi). This project aimed to drive digital prototyping forward for the next generation. My work on this project included visualisation and sound-field manipulation for virtual vehicles. This utilised and integrated a wide variety of technology into one holistic demonstrator. The types of technology involved included Head Mounted Displays, Head Tracking, Motion Tracking, Acoustics, Head Related Transfer Functions, Renderers, Peripheral Devices, Eye Tracking and 6DOF Stewart Motion Platform. In

addition, administrative duties included principal supervision of Master's projects and respective examination duties, annual PhD reviews, organisation of a weekly seminar series within the research group and acting as a mentor to tutees within the department. In terms of research, maintaining participation in ongoing dissemination of research activities within the wider field and actively publishing at regular intervals was critically important, both in terms of academic engagement and indicators of esteem.

#### **JOHNSON TILES**

Stoke-on-Trent  
Jul 2012 – Oct 2012

#### **INNOVATIONS CONSULTANT**

Four-month contract developing a server-client rendering solution to facilitate product visualisation virtually in-situ on client's bathroom or kitchen walls/floors. This entailed working closely and effectively communicating with the Innovations Director at Johnson Tiles to ensure their corporate needs were met.

#### **UNIVERSITY OF WARWICK**

Coventry  
Mar 2012 – Jun 2012

#### **IMAGING CONSULTANT**

Three-month contract building High Dynamic Range hardware display technology utilising dual-DLP projectors in concatenation with bespoke software to drive it.

#### **SOUND SPACE DESIGN**

London, Putney  
Jan 2012 - Mar 2012

#### **ACOUSTICS CONSULTANT**

Three-month contract. Sound Space Design is primarily a concert hall design studio. Implemented Ambisonics, Ambiphonics and Stereo Dipole filters, encoders and decoders to deliver speaker feeds to a twelve-channel speaker array to upgrade the acoustics suite at this facility.

#### **UNIVERSITY OF WARWICK**

Coventry  
2011-2012

#### **RESEARCH FELLOW**

Developing a multi-sensory head-mounted display environment incorporating sound, smell and graphical stimuli. This is directed towards the treatment and research of paranoia through exposure therapy for the NHS.

#### **UNIVERSITY OF WARWICK**

Coventry  
2009-2010

#### **SOFTWARE DEVELOPER**

Work for the NHS towards realising a hybrid synergy of HMD and cube-mapped video streams for virtual reality exposure therapy.

### **PEER-REVIEWED PUBLICATIONS**

#### **JOURNALS**

- Harvey C., Bashford-Rogers T., Debattista K., Doukakis E., Chalmers A.: *Olfaction and Selective Rendering*. Computer Graphics Forum. 09/2017.
- Doukakis E., Debattista K., Harvey C., Bashford-Rogers T., Chalmers A.: *Audio-Visual Resource Allocation for Bi-Modal Virtual Environments*. Computer Graphics Forum. 06/2017.
- Harvey C., Debattista K., Bashford-Rogers T., Chalmers A.: *Multi-Modal Perception for Selective Rendering*. Computer Graphics Forum. 01/2016.
- Minors A., Harvey C.: *Influence of active listening on eye movements while viewing images of concert halls*. Psychomusicology: Music, Mind, and Brain 01/2015; 25(3):345-354.
- Hulusic V., Harvey C., Debattista K., Tsingos N., Walker S., Howard D., Chalmers A.: *Acoustic Rendering and Auditory-Visual Cross-Modal Perception and Interaction*. Rushmeier H., Groeller E., (Eds.), Computer Graphics Forum. Volume 31(1), pp. 102-131. 2012.

#### **CONFERENCES**

- Dong Y., Webb M., Harvey C., Debattista K. and Chalmers, A.: *Multisensory Virtual Experience of Tanning in Medieval Coventry*. In: EUROGRAPHICS Workshop on Graphics and Cultural Heritage. 27-29 September 2017. Graz, Austria.
- Barnett L., Gatzidis C., Harvey C.: *An Investigation into Usability and First Time User Experiences within a Mobile Gaming Context*. Edutainment 06/2017. (Best

Short Paper Award).

- Bradley T., Debattista K., Bashford-Rogers T., Harvey C., Chalmers A.: *Selective BRDFs for High Fidelity Rendering*. Computer Graphics & Visual Computing (CGVC) Oct 2016.
- Dhokia A., Debattista K., Harvey C., Bashford-Rogers T., Chalmers A.: *A Calibrated Olfactory Display for High Fidelity Virtual Environments*. Computer Graphics & Visual Computing (CGVC) Oct 2016.
- Harvey C., Chalmers A.: *Diffraction for Virtual Point Microphones*. Real Time Virtual Environments, Portugal; 09/2013.
- Paolo Santos L., Wood J., Selmanovic E., Harvey C., Debattista K., Chalmers A.: *Bespoke high-fidelity visualisation of tiling*. HDRI 2013: First International Conference and SME Workshop on HDR Imaging; 01/2013.
- Minors A., Harvey C., Chalmers A.: *Multimodal Perception in Concert Halls*. Spring Conference of Computer Graphics, Slovakia, Eurographics Association, 03/2012.
- Harvey C., Bashford-Rogers T., Debattista K., Chalmers A.: *Visual Saliency for Smell Impulses and Application to Selective Rendering*. Carr H., Grimstead I., (Eds.), In TPCG'11, EG UK Theory and Practice of Computer Graphics, (Best technical paper award), Eurographics Association, pp. 73-80. 2011.
- Hulusic V., Harvey C., Tsingos N., Debattista K., Walker S., Howard D., Chalmers A.: *Acoustic Rendering and Auditory-Visual Cross-Modal Perception and Interaction*. John N., Wyvill B., (Eds.), Eurographics Association, EG 2011 - State of the Art Reports, pp. 151-184. 2011.
- Bashford-Rogers T., Debattista K., Harvey C., Chalmers A.: *Approximate Visibility Grids for Interactive Indirect Illumination*, Second International Conference on Games and Virtual Worlds for Serious Applications (VS-GAMES), (Best technical paper award), 2011.
- Harvey C., Czanner S., Wilcockson M., Chalmers A.: *Cognitive Behaviour Therapy for Treatment of Myrmecophobia*. Interface: Humanities and Technology, UK; 01/2010.
- Harvey C., Walker S., Bashford-Rogers T., Debattista K., Chalmers A.: *The Effect of Discretised and Fully Converged Spatialised Sound on Directional Attention and Distraction*. Collomosse J., Grimstead I., (Eds.), In TPCG'10, EG UK Theory and Practice of Computer Graphics, (Best student paper award), Eurographics Association, pp. 191-198. 2010.
- Harvey C.: *High-Fidelity Rendering of Ancient Egyptian Gold*. Central European Seminar on Computer Graphics. 2008.

#### UNDER SUBMISSION

- Debattista K., Bashford-Rogers T., Harvey C., Waterfield B., Chalmers A.: *Subjective Evaluation of High-Fidelity Virtual Environments for Driving Simulations*. Under submission to IEEE Transactions on Human-Machine Systems.
- Doukakis E., Debattista K., Harvey C., Bashford-Rogers T., Chalmers A.: *Just Noticeable Difference Thresholds for perceptually assessing Smell Simulations in Virtual Environments*. Under submission to IEEE VR 2018 & TVCG.

#### TEACHING EXPERIENCE

**COMPUTER SCIENCE**  
Birmingham City University

#### MACHINE LEARNING

This unit introduces the field of Machine Learning, and teaches how to create and use software that improves with experience. The syllabus of the unit includes: Introduction: tasks, models and features. Binary classification and related tasks. Beyond binary classification. Tree models. Rule models. Linear models. Distance-based models. Probabilistic models. Model ensembles. Machine learning experiments.

#### GRAPHICS PROGRAMMING

The aim of this unit is to produce professional programmers with knowledge and skills in graphics and computational programming with an emphasis on the underlying technical theories, evaluation methods and implementation required for advanced computer graphics applications. Material delivered covers computational methods and algorithms, advanced graphics algorithms and parallel computing on both CPU and GPU using C++.

#### **ARTIFICIAL INTELLIGENCE FOR GAMES**

Covering both deterministic and non-deterministic AI methods, the aim of this unit is to develop an understanding and skills in artificial intelligence needed for games programming. Students will look at fundamental AI algorithms in the right context and will also explore the implementation of those algorithms in games.

**CREATIVE  
TECHNOLOGIES**  
Bournemouth University

#### **MATHS FOR COMPUTER GRAPHICS**

Priming material to delve into the field of computer graphics and games programming, starting with linear equations and vector algebra, working towards projections, matrix manipulation and quaternions.

#### **MOBILE GAMES PROGRAMMING**

I was unit leader for this second year undergraduate module. It introduces sound and graphics programming for creating games on mobile platforms. We touch upon such things as algorithm choice, efficiency, device dependence, optimisation and the mobile graphics pipeline. This has a focus on developing for platforms like Android, the iPhone and the iPad. Whilst low level architecture targets are welcome, this unit is offered across multiple course streams, and the module is flexible in that it offers the opportunity for students to work directly on their chosen architecture, or embedded within a high-level middleware games engine, such as Unity3D.

#### **GAMES DEVELOPMENT PIPELINE**

I was unit leader for this first-year undergraduate module. In this unit, students learn how to create a 3D interactive environment using industry-standard game middleware. A non-exhaustive list of subject material: Asset Importing, Prototyping, Version Control, Finite State Machines, Event-based Behaviour, Collision Models and Physics, Skeletal / Vertex / Key-framed Animation, User Interfaces, Data Persistence and Games related scripting and programming techniques. The material is contextualised within Unity3D.

**CENTRE FOR  
SCIENTIFIC  
COMPUTING**  
University of Warwick

#### **DATA STRUCTURES AND ALGORITHMS**

Masters level, current invited lecturer, permanent whilst in situ at Warwick. Covering a wide range of uni and multiprocessor practical fundamentals. This includes: sorting and searching, spatial data structures, trees and heaps, complexity, parallelism and parallel algorithms, parallel data structures, string matching and an introduction to practical uses of polymorphism, STL and C++11.

**WARWICK  
MANUFACTURING  
GROUP**  
University of Warwick

#### **e - BUSINESS TECHNOLOGIES**

I was named module leader and module creator of this elective part of the e-Business Management Masters course offered at WMG. The module covers technologies such as: Development and Deployment of Web Apps, Operating Systems, Cloud Services, Virtualisation.

#### **COMPUTER GRAPHICS AND VISUALISATION**

Coordinated by Associate Prof. Kurt Debattista, my lectures on this module encapsulate Animation, Texture Mapping, Geometrical Modelling, Rendering and Post-Processing. I am currently an invited lecturer for this Masters level series at the University of Warwick.

#### **PERCEIVED QUALITY**

The module is led by Prof. Paul Jennings. I used to run lectures in this series covering the practical use of Computer Graphics algorithms within industrially leading software packages, such as Autodesk Maya. I also covered areas such as Attention and Perception as filters to the real and virtual world.

**THEATRE STUDIES**

#### **MULTISENSORY PERCEPTION**

University of Warwick

This course is run by Dr. Margaret Shewring, it is interdisciplinary and a multi-departmental collaboration. Topics I covered included multi-sensory perception and interaction.

## **PROFESSIONAL PRACTICE**

### **INVITED CONFERENCE TALKS**

EuroGraphics Full Papers Stream, Lyon, 2017.

### **INVITED SESSION CHAIRS AND PANELLIST**

Edutainment Keynote Session Chair, Bournemouth, 2017.

EuroGraphics Short Papers Session Chair, Lyon, 2017.

HDRi2014 - Second International Conference and SME Workshop on HDR Imaging, 2014.

RTE'14 - Real-Time Multisensory Virtual Experiences 2014.

Visualisation at WMGRIC 2014.

Visualisation at WMGRIC 2016.

### **ORGANISATION COMMITTEES**

Interface 2010, University of Warwick, July 2010.

Secretary to the EU COST Action IC1005, 2012-2015.

SciTech PGR Conference, Bournemouth University 2017.

### **INTERNATIONAL PROGRAMME COMMITTEES**

EuroGraphics Short Papers 2016, 2017.

The Visual Computer 2015, 2016.

Spring Conference of Computer Graphics 2015, 2016.

Digital Heritage 2015, 2016.

### **CONFERENCE AND JOURNAL REVIEWS**

SIGGRAPH Technical papers reviewer 2014, 2015.

Spring Conference of Computer Graphics 2014, 2015, 2016.

EuroGraphics Short Papers 2016, 2017.

The Visual Computer 2015, 2016.

Transactions on Applied Perception 2017.

Computers and Graphics 2017.

IEEE Transactions on Visualisation and Computer Graphics, 2014.

ACM Journal of Computing and Cultural Heritage 2013.

ACM Transactions on Applied Perception 2012, 2014.

Computer Graphics Forum Journal, 2011, 2014.

EGPGV, EuroGraphics Symposium on Parallel Graphics and Visualization 2012, 2013, 2014, 2015.

Journal of Graphics Tools 2013.

## **GRANTS AND FUNDING AWARDS**

**EPSRC**  
2012-2016

Named Research Fellow in a multi-institutional bid with industrial support from Jaguar Land Rover. Engineering and Physical Science Research Council Reference number: EP/K014056/1 and title: Theme 7: Visualisation and Virtual Experience. £840,940.

**CRUK/EPSRC**  
Applied

Joint application with Dr. Christopher Mee (Coventry University) on a multi-disciplinary project award aiming to use computational modelling techniques for metastasis prediction based upon classification of the primary tumour cell phenotype. Bid for £500000.

## **REFEREES**

### **PROF. MARK JOSEPHS**

Head of Department

Computing and the Built Environment, Birmingham City University

E-mail: mark.josephs@bcu.ac.uk

### **DR. CHRISTOS GATZIDIS**

Head of Department  
Creative Technology, Bournemouth University  
E-mail: [cgatzidis@bournemouth.ac.uk](mailto:cgatzidis@bournemouth.ac.uk)

**PROF. ALAN CHALMERS**

Director of Visualisation Group  
International Manufacturing Centre, University of Warwick  
E-mail: [Alan.Chalmers@warwick.ac.uk](mailto:Alan.Chalmers@warwick.ac.uk)

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