



Serious Games Institute

Applied Research Strategy

This report includes an overview of the Serious Games Institute Applied Research strategy. The report lists the main accomplishments of the Research and Development Group 2008-2009, and sets out new targets for 2009-2010.

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APPENDIX E: FUNDING ATTAINED BY THE SGI

APPENDIX F: THE SGI FELLOWSHIP SCHEME

APPENDIX G: THE SERIOUS GAMES APPLIED RESEARCH GROUP.....

APPENDIX H: FUTURE PLANNING FOR SGI APPLIED RESEARCH GROUP

TABLE OF CONTENTS

TABLE OF CONTENTS	
1.0: BACKGROUND TO THE SGI	
1.1: MISSION	6
1.2: AIMS AND OBJECTIVES	7
2.0: RESEARCH AND DEVELOPMENT	
2.1: PUBLICATIONS	10
2.2: SEMINARS AND CONFERENCES	10
2.3: R&D NETWORK	12
2.4: WEB RESOURCES AND ASSETS	12
3.0: SERVICES	
3.1: SPECIALIST CONSULTANCY	13
3.2: WORKING WITH SMES IN SGI	13
3.3: ACCESS TO HIGH QUALITY RESEARCH FACILITIES ON SITE	14
4.0: COLLABORATION	
4.1: PARTNERSHIPS WITHIN COVENTRY	14
4.2: APPLIED RESEARCH ADVISORY GROUP	14
4.3: SERIOUS GAMES APPLIED RESEARCH GROUP (SGARG)	15
4.4: SGI FELLOWS	15
4.5: VISITING FELLOWSHIPS	15
4.6: ASSOCIATE MEMBERSHIP	16
4.7: LINKS WITH OTHER LEADING RESEARCH GROUPS	16
4.8: ASIA COLLABORATION	16
4.9: STRATEGIC PARTNERSHIPS WITH CORPORATIONS	16
5.0: CONCLUSIONS	
APPENDIX A: BIOGRAPHIES OF KEY PERSONNEL	
APPENDIX B: INDUSTRY TO ACADEMIA MODELS EMPLOYED IN THE SGI	
APPENDIX C: SELECTED PUBLICATIONS AND PRESENTATIONS	
APPENDIX D: SGI PROGRAMME OF EVENTS 2009-2010	
APPENDIX E: FUNDING ATTAINED BY THE SGI	

APPENDIX F: THE SGI FELLOWSHIP SCHEME

APPENDIX G: THE SERIOUS GAMES APPLIED RESEARCH GROUP.....

APPENDIX H: FUTURE PLANNING FOR SGI APPLIED RESEARCH GROUP

1.0: BACKGROUND TO THE SGI

The Serious Games Institute was set up at a time of step change in the consideration of games technologies, computer modelling simulations and the use of digital interactive media to support non-leisure-based activities. At a time of rapid changes in the uses of these relatively new technologies it is important to accompany forays into using these more socially-based technologies with timely research and development. More recently, with the credit crunch the SGI offers businesses in this nascent industry sector business support and incubation facilities, as well as links into leading edge research outputs and technologies that may provide market advantage.

The term 'Serious Games' covers a broad range of applications from flash-based animations to totally immersive and code driven 3D environments where users interface with large volumes of data through sophisticated and interactive digital interfaces. This shift towards immersive world applications being used to support education, health and training activities mark the beginning of new challenges that offer real scope for collaborative and multi-disciplinary research solutions, and real opportunities for innovative development.

The Serious Games Institute (SGI), was launched in September 2007, is based in Coventry University's Technology Park, and aims to become an international centre of excellence for serious games and a model of best practice for regional development through technology innovation. The Institute provides a close interface between high-level applied academic research and leading edge technology companies in the field of game-based learning.

The Serious Games Institute (SGI) is strategically linked with leading computer games companies in the West Midlands. Companies such as Blitz Games and Codemasters are already publishing global titles within the entertainment sector and Pixelearning at the Coventry University TechnoCentre has established an international reputation for its development of Flash-based serious games for management training.

The SGI has three main streams of activities: business support and marketing, showcasing facilities and applied research. The SGI business plan outlines the overall mission and plan for activities 2009-2010. This document provides the applied research strategy for the SGI, including an outline of the current structure outputs and outcomes of its first year of operations, and future planning.

Overall, the SGI model brings together the three areas of operations with a cluster of around 30 companies in related areas. Bringing high level academic inputs to the

network, the SGI will play a leading role not only at the interface between academia and industrial outputs, but also for test-bedding and evaluating key outputs from the research and development produced by network members.

The applied research group is led by Prof Sara de Freitas, and includes four Research Assistants, three SGI fellowships and the Serious Games and Virtual Worlds Applied Research Group (with around 30 members). Biographies of the key personnel of the SGI are included in **Appendix A**.

All the research work being undertaken includes industrial partners and participation. The group has explored interacting with its industrial partners in a range of different ways. See **Appendix B** for an outline of the business to academia models used at the SGI.

1.1: MISSION

The mission of the Serious Games Institute (SGI) Research & Development Group is to become *a leading academic international centre in the emerging research field of serious games and virtual worlds and through knowledge transfer and networks provide tangible benefits for industrial partners*. This mission will be attained through excellence in research outputs, including publications and presentations in international conferences, peer-reviewed journal publications, books and intellectual property generation. In parallel, through our SGI model of academic-industrial collaboration, knowledge transfer and networks supported by events, benefits for the companies in the SGI cluster and regional benefits will include: upskilling workers in the region, supporting innovations in technologies with links into the manufacturing base, increasing knowledge transfer within Europe and UK employer training initiatives.

1.2: AIMS AND OBJECTIVES

The Serious Games Institute Research & Development Group is providing leading edge research and development in support of a wide range of serious games applications and virtual world technologies. Current research is focusing upon applications in the areas of health, education and environment. Research is focusing upon comparisons between traditional and game-based learning approaches, integration of artificial life technologies, modeling and visualization work, new uses for games technologies and testing new multimodal interfaces.

The Research & Development Group provides a focus for the research and development community in the UK and abroad through creating new links between research groups and collaborating on leading edge research projects, as well as stimulating opportunities for bringing together researchers from psychology, computer science, education, creative media and other disciplinary backgrounds to

fully explore the uses and applications of serious games. See **Appendix C** for selected publications and presentations. The Research Group also supports and develops a network of the research, development and user communities with special interest groups in health training, education, schools, environmental training and awareness and team-based training.

The Research & Development Group disseminates its findings to the West Midlands community through seminars, targeted publications and reports. Outputs of the group are also disseminated through the Applied Research Group web site, as part of the SGI web site and via the Buyseriousgames.com web site. Selected publications from the group and lists for other researchers in the field will provide a focus for the community. See **Appendix D** for SGI Programme of events 2009-2010: Converging Technologies, Hybrid Spaces.

The main objectives therefore are to:

- develop SGI Research as a centre for excellent applied research and development, building capacity in the team and creating strong and sustainable links with our industrial partners
- Offer a series of activities including seminars and conferences to bring together the community through the Second Wednesday events, IEEE conference and planned Association and the annual Serious Virtual Worlds conference
- Undertake high-quality and leading edge research and development work
- Produce high-quality and leading edge publications including journal articles and reports, edited books and monographs
- Build upon the networks set up for serious games research (regional, national and international) during 2008-2009
- Market and offer consultancy and services for external private and public sector organisations

2.0: RESEARCH AND DEVELOPMENT

The main aim of the SGI Applied Research Group is to provide high quality research to underpin games and virtual world development. To facilitate this aim, the applied research will focus upon the following:

- Provide high quality research outputs (e.g. books, journal articles, reports) in high impact rated journals and conferences (e.g. ACM, IEEE)
- Provide an infrastructure for providing high quality consultancy and research support

- Build capacity in the research and development hub at SGI to support sharing resources and expertise
- Continue to develop and provide methodologies, frameworks and approaches for supporting participatory design approaches
- Undertake market research to help focus companies upon new markets, identify challenges for SMEs and provide indicators of how SMEs need further support to bring their products to market
- Undertake technical evaluations and assess technological challenges with particular platforms and technologies and transfer the knowledge back into the cluster
- Work with SMEs and other partners including Acua to develop blended learning solutions that integrate content developed by the cluster of companies
- Develop models, approaches and tools for supporting more effective development of serious games and virtual world applications
- Provide consultancy services for SMEs to provide links with funding sources and business support (from Business Link and other regional agencies)
- Provide brokerage services for supporting business development and creating linkages between sectors and companies with shared interests

The Centre was returned through the Centre for the Study of Higher Education (CSHE) for the Research Assessment Exercise (RAE) 2008. Using the new 2008 rating scale, Coventry's RAE Education profile has improved its overall score from a 3b in 2001 (which converts as a 1.0 score in 2008 terms) to 1.7 in 2008. So, in short, our overall RAE Education rating has moved up by 0.7 from 1.0 in 2001 to 1.7 in 2008. 60% of the Education papers we submitted were rated 3* or 2* which means they were considered to be "internationally recognized" or better - really good news. In detail this shows that: 20% of our papers gained a 3* rating and were therefore rated "internationally excellent in terms of originality, significance and rigour"

2.1: PUBLICATIONS

The aim of keeping a high research profile is to foster an environment where high quality research staff will be attracted to and stay at Coventry University, adding value to the profile of the SGI and the University, and keeping expertise within the Institute. To achieve this means providing an intellectually stimulating and dynamic environment, building capacity in the research group and providing visual demonstrations of excellence through publications and funding. Towards this objective, we are committed to providing a structure of mentoring and support within the team.

To date the applied research group has produced key publications, such as peer-reviewed journal articles, reports and conference papers, building upon current expertise in the group. Our papers have been accepted at top conference (IEEE,

ACM, SIGGRAPH), our book chapters published in leading publications and journal article targeted at high impact rated journals. See selected list of publications in **Appendix C**.

Other publications include executive summary reports for research outputs. These are being produced as one-page A4 updatable project sheets and used for promotion of the Applied Research Group.

Selected publications are being produced as web-documents with related resources including links to demos. Other publications include project reports and newsletters.

2.2: SEMINARS AND CONFERENCES

In order to bring the community together the SGI has been organising and hosting a range of seminars, conferences and workshops in support of the main mission. The main aspect of this has been the Second Wednesday events as listed in **Appendix D**.

A: Serious Games & Virtual Worlds: Crossing Boundaries Season (2008-2009)

The events held over the last year revealed how games and virtual technologies are permeating into many different areas: from health to the environment from education to training. The first Second Wednesday season hosted a line up of international speakers from the UK and beyond showcasing some major innovations and leading edge research and development. Speakers from industry and academia such as Burro Happold, Cisco, Eden Project, Imperial College, London, Open University, Rutherford Labs, Sun Microsystems and Stanford University explored areas from environment to health. The Crossing Boundaries season culminated in the IEEE conference on Serious Games & Virtual Worlds which brought together 70 academics from 20 countries.

B: Conferences Crossing Boundaries Season (2008-2009)

The main launch event for the SGI was held on 11/12th September 2007 at Coventry TechnoCentre. Chaired by David Wortley, the event included representation from many of the key stakeholders and partners, including Ambient Performance, Blitz Games, Cisco, Forterra, IBM, Linden Labs, Pixel Learning and TPLD. There was also representation from academic institutions from Stanford University, and research groups such as Giunti Labs and SmartLab. Coventry University's Second Life Island was also launched at the event by the University Vice-Chancellor, Madeline Atkins.

The second conference was held on 11/12th September 2008. Chaired by Sara de Freitas, the event included speakers from The Guardian, Virtual Policy Network, SRI Consulting, Sun Microsystems, Hoseo University, University of London, University of Edinburgh. The full list of participants and programme from both events can be found at: www.seriousvirtualworlds.net, where the video archive can also be accessed.

The First IEEE conference in Serious Games and Virtual Worlds was hosted at the University of Coventry TechnoCentre, the first IEEE conference to be hosted at the university it brought together over 70 mainly academic participants from 20 countries, and attracted sponsorship from Becta and IEEE. The Proceedings of the

IEEE conference have been published and copies are available from www.vs-games.org.uk. The conference was streamed on the web and into Second Life with a live link with the City of Knowledge at the University of Sao Paulo, videos of the presentations are available at: <http://dp-x.com/datpresenter/dpx.php?dpxuser=SGL>.

SGL presentations at external events and conferences are listed in **Appendix C**. Presentations, keynotes and lectures have been undertaken in Europe, the United States and Asia with industrial groups and within academia. Conference presentations of papers and chairing events and sessions have also a method for dissemination and knowledge transfer.

2.3: R&D NETWORK

One of the key objectives of the research strategy has been to set up an international network according to specialist industrial and academic interest groups (e.g. health, schools education, environmental issues). This network aims to help regional companies to access wider markets, and to support the development of new markets around interactive digital content. Part of the network underpins the Second Wednesday events hosted through the SGI. The network brings together existing networks and groups and to support a range of different communities (including developers and academic researchers).

Future work will provide for mailing lists in specialist areas, further events and collaborative research and development outputs.

2.4: WEB RESOURCES AND ASSETS

The SGI web site provides resources including lists of companies and mini profiles, with demos of work showcased. The site also links to the SGARG web site and the Buyseriousgames.com online store. The Research web site provides links to current projects and their website, and will be extended to include references and databases to leading work in the field, providing a research tool for those in the field. The web site also includes details of services offered including consultancy and facilities hire, events booking facilities as well as contact details and biographies of the key personnel at the SGI. The web site and our regular mailings are key mechanisms for communicating with our cluster, our SGI community and for more general dissemination of research and development outputs. Many SGI research reports will be made available for download through the SGI web site.

Social software applications such as YouTube channel and Flickr have been integrated with the content management system underpinning the web site to offer greater functionality for users of the intranet and internet services. The web site also has a large archive of multimedia files including events that have been streamed live into virtual worlds. In addition, we have been using IntroNetworks with links to Second Life for supporting our events and facilitating more effective networking at the live events.

All events are live streamed onto the web, via DatMedia technologies. SGI companies have developed a unique service for streaming events via the web and into Second Life (CNUK and Walk in Web Ltd have commercialized this service).

The next version of the web site will integrate the mailing groups into the content management system and extend the showcasing section.

3.0: SERVICES

The SGI offers a range of services, as listed in this section. These services help to bring added value to the SMEs based in the SGI, and aim to develop a high profile for the applied research team.

3.1: SPECIALIST CONSULTANCY

The SGI will develop expertise through building capacity within the applied research team. This approach will enable us to facilitate high quality specialist consultancy for industry and educational institutions including SMEs within the SGI as well as working with schools, colleges, universities and companies within and beyond the region.

3.2: WORKING WITH SMEs IN SGI

All SGI research work has been undertaken in collaboration with the SMEs based in the SGI, facilitated through targeted funding applications. See **Appendix E** for list of funding attained to date. This success with funding is allowing the SGI to undertake leading edge research and development that has benefits for the regionally based companies and is helping to identify areas of competitive advantage within the region. The SGI also plays a brokerage role bringing together key partners and identifying where extra support is needed. See **Appendix B** for an indication of the models being employed to support knowledge transfer between industry and academia.

The SGI involve SMEs in applied research strategy meetings, through the Second Wednesday events and conferences, and through regular informal meetings with the Research Group. Through this regular interaction new areas of collaboration are being established and supported. Future collaboration will also seek to continue this interaction and extend it to greater involvement with the SGARG group meetings. During 2008-2009, research priorities and a road map for future collaborative research and development have been developed. Following this, Prof Sara de Freitas has aimed to provide funding to support onward work. Future ideas for collaboration with industry will extend to co-supervisions between industry and the SGI PHD studentships (2010-2011).

The aim of the SGI applied research group with this respect is to support leading edge development, support collaborative research outputs and contribute towards opportunities for maximising SME production and innovation through targeted initiatives.

3.3: ACCESS TO HIGH QUALITY RESEARCH FACILITIES ON SITE

Facilities at the SGI include a business incubation centre, hot desking facilities, teleconference facilities and storage, access to platforms.

4.0: COLLABORATION

Collaboration through partnerships and inter-working are important for achieving the mission of the applied research group. These need to be cultivated as strategic partnerships over the longer term in some cases. The Director of the SGI will be in charge of managing business relations, and the applied research group will support these relationships in practice through maintaining relations with academic departments and partners.

4.1: PARTNERSHIPS WITHIN COVENTRY

It is essential to support strong partnerships with the other research groups in the University and with the related Labs and Institutes within CUE. The main points of contact have been through the Applied Research Advisory Group, Dean of the Faculty of Computing and Engineering, Prof Paul Ivey, the Pro-Vice Chancellor for Research, Prof Ian Marshall, the SGI Fellowship scheme (see **Appendix F**) and the SGARG (see **Appendix G**).

4.2: APPLIED RESEARCH ADVISORY GROUP

The SGI Applied Research Advisory Group will be made up from the stakeholder community, and will include specialists from the UK in the area of serious games, multimedia development and e-learning. The advisory group will include representation from industry and academia. The aim of the group will be to give a steer on matters relating to the SGI Applied Research Group, and will be distinct from the SGI steering group. The advisory group will advise on strategy, and be consulted with on matters relating to policy and strategy developments.

4.3: SERIOUS GAMES APPLIED RESEARCH GROUP (SGARG)

Prof Sara de Freitas currently leads the Applied Research Group in serious games and virtual worlds. The group includes all the key academics involved in serious games and virtual worlds research and development across the University. The group is interdisciplinary and includes representation from all the University faculties. The aim of the group is to promote and disseminate key outcomes and outputs from the university with respect to the field. The group is involved with collaborative bids, writing and presenting. The key ambition for the group is to become a national hub for research and development in the field, with reach into a range of different disciplinary contexts including health, business studies, computer science and science education.

4.4: SGI FELLOWS

The University has funded three Coventry University fellowships this year. Drs Fotis Liarokapis, John Halloran and Peter Samuels have joined the scheme 2008-2009/10, and are based with the SGI for two days per week to facilitate research development, publications and funding applications. See **Appendix F**.

4.5: VISITING FELLOWSHIPS

The SGI Applied Research Group has brought in Professors Tim Foresman (Digital Earth Initiative) and Lizbeth Goodman from Smartlab, University of East London as visiting Professors. The SGI has already hosted visiting fellows from abroad, Dr Mark McMahon from Australia and Toru Fujimoto from Japan have spent time based in

the soft landing zone area of the SGI. Further fellows are planned for the Autumn term.

Visits from a wide range of academics from countries such as Australia, Brazil, Canada, Portugal, South Africa and the United States have been supported at the SGI as part of its collaborative activities. Future targets will aim at increasing the numbers of visiting fellowships given and extend them to industrial experts.

4.6: ASSOCIATE MEMBERSHIP

For those individuals and organisations who have developed particularly close links with the Institute, the Directors will confer associate membership of the Institute. This will involve reduced rates at conferences and access to executive summary reports from research outputs. Members will also be invited to special open days, and will have a closer involvement with the activities of the Institute.

4.7: LINKS WITH OTHER LEADING RESEARCH GROUPS

The SGI will seek to develop closer links with specialist Labs from around the world e.g. IRIT, University of Toulouse, Mixed Reality Lab in Singapore. This will create a wider reach for the SGI outputs and products that can be tested in different locations. The scheme will also allow for exchanges of academics and will also utilise the 'soft landing zone'. Links with the Lab Group will also be formed and supported through co-organised events relating to serious games and e-learning areas of interest. The SGI has already signed a number of memoranda of understanding and bilateral agreements with several academic institutions, and other strategic partners to facilitate onward collaboration.

4.8: ASIA COLLABORATION

The SGI has been developing close links with Asian partners. This strategy has been developed by Mervyn Levin. In particular, recent visits to China Japan and Korea have helped to secure new links with targeted universities and industrial partners. Funding is being sought to extend these activities.

4.9: STRATEGIC PARTNERSHIPS WITH CORPORATIONS

The SGI will aim to develop strategic partnerships with strategically important corporations in order to facilitate deeper development of specialised and targeted goals in line with the SGI mission. This will build upon previous university contacts and past work from key personnel at the SGI. The dedicated SGI business development manager in association with the university business development managers will provide support for these links through funding proposals and networking activities.

5.0: CONCLUSIONS

To conclude the SGI Research Group have prioritized profile-raising in the first year of activities 2008-2009, in the next year capacity building and funding has been prioritized, this will aid with growing the team and maintaining and consolidating the profile raised in the first year of operations. The main priority is to fulfil the mission set out in the first section and to extend the reach of the SGI networks. Towards this

end, this document also sets out future planning areas for the coming year 2009-2010. See **Appendix H**.

APPENDIX A: BIOGRAPHIES OF KEY PERSONNEL

Director

David Wortley

David Wortley, the Director of the Serious Games Institute, is recognised internationally within the Digital Earth movement as a pioneer in the application of technology to local development and was a session chair at the Digital Earth Symposium at which Al Gore was a keynote speaker. David previously instigated a virtual city development project for Leicester in the East Midlands, and led by De Montfort University. He was also a Project Manager for NTI Creative Industries Centre for Knowledge Exchange. David Wortley has been working with partners to establish Coventry University's island in Second Life which is home to a number of pilot cross-faculty projects and which is due to be launched in September. David leads on business relations, SGI strategy development and overall direction of the SGI.

Director of Research

Professor Sara de Freitas

Sara is Director of Research at the Serious Games Institute at the University of Coventry where she leads an applied research team working closely with industry. Recently appointed Professor of Virtual Environments she holds a visiting senior research fellowship at the London Knowledge Lab, London and is a Fellow of the Royal Society of Arts. In 2003 Sara founded (and continues to Chair) the UK Lab Group, which brings the research and development community together to create stronger links between industrial and academic research through supporting collaborative programmes and for showcasing innovative R&D solutions for the knowledge economy. Sara publishes in the areas of: pedagogy and e-learning; change management and strategy development for implementing e-learning systems and educational games and electronic simulations for supporting post-16 training and learning. Voted the 'Most Influential Woman in Technology 2009' by US Fast Company, Sara chaired the IEEE Serious Games and Virtual Worlds conference in 2009, and is a regular speaker at international conferences. Sara currently holds funding from the Advantage West Midlands, Erasmus Scheme, European Regional Development Fund, European Union, Higher Education Funding Council for England and the UK Technology Strategy Board. Her current lines of research are examining multimodal interfaces, experience design and perceptual modelling in games and virtual worlds.

Business Development Manager

Jacqueline Cawston

Jacqueline Cawston MBA is the Business Development Manager at the Serious Games Institute. She facilitates links with industry and the cluster of cutting edge digital media companies that make up the Serious Games Institute community. She

joined the Serious Games Institute from De Montfort University where she was the Employer Development Manager and gained her MBA. She facilitated links with employers and event managed several large events including the largest creative industry event in the East Midlands.

SGI Research Staff

Dr Genaro Rebolledo-Mendez

Genaro is a senior research fellow at the Serious Games Institute at the University of Coventry. Genaro completed his doctorate in Computer Science and Artificial Intelligence at [Sussex University](#) in September 2007. Genaro's interest is in designing and evaluating educational technology that adapts sensitively to affective and cognitive differences among students. Genaro studies how cognitive and affective differences impact students' behaviour with educational technology and how in turn technology impacts students' learning using a variety of techniques from Artificial Intelligence, Computer Science, Education and Psychology.

Dr Panagiotis Petridis

Panagiotis is a Senior Research Assistant of the Serious Games Institute (SGI) at Coventry University. He holds a PhD in Computer Graphics from Sussex University titled "Interactions in Digital Heritage Systems". He is a member of the Serious Games Applied Research group and he is currently involved in an EU funded project. Panagiotis is currently working on the integration of Artificial Life techniques with virtual worlds in order to re-create life in Ancient Rome. His research interests are mainly in the areas of cultural heritage, smart buildings, immersive learning, 3D Interfaces and interaction devices.

Dr Ian Dunwell

Ian has joined the Serious Games Institute as a Research Assistant leading in the hub area of health. He holds a PhD in Computer Science from Hull University in the area of distributed virtual environments. He received a Masters in Science with distinction also from Hull University in Internet Computing and completed his first degree in Physics at Imperial College, where he also received his Associateship of the Royal College of Science (ARCS). His current work includes research with the UK Technology Strategy Board Serious Games-Engaging Training Solutions project, Project Lead on the EU funded M-Educator project and work on the EU e-Vita Project.

Dr David Haniff

David has a degree in Computer Science which had a business focus as well as technical components. This involved systems analysis as well as well as programming. During this degree David worked at Electronic Data Systems (EDS). David completed his MSc in Cognitive Science at the University of Birmingham where he focused upon statistical evaluation of human performance. His PhD was in the area of Augmented Reality at the University of Birmingham combining psychology with computer programming. David has published in conferences as well as journals.

SGI Research Fellows

Dr John Halloran

John is a Senior Lecturer in the Department of Computing and the Digital Environment at Coventry University. His expertise is the area of human-computer interaction (HCI). He holds a DPhil in HCI (2000) and an MSc in Artificial Intelligence (1996) both from the University of Sussex. His BSc in Psychology was awarded by the Open University in 1995. John has over a decade of research experience, centring on analysis and design of interfaces to support collaborative work and learning. He has worked in a variety of areas, including travel agency, multiplayer game design, and the use of ambient computing to enhance visitor experience of heritage sites. His international research standing is evidenced by over 25 peer-reviewed scientific publications in internationally recognised journals and conferences.

Dr Fotis Liarokapis

Fotis holds a DPhil in Computer Engineering at the University of Sussex, an MSc in Computer Graphics and Virtual Environments at the University of Hull and a BEng in Computer Systems Engineering at the University of Sussex. In September 2004, he joined the Department of Information Science at City University as a Research Fellow and Visiting Lecturer and worked on an EPSRC, Location and Timing KTN funded research project called LOCUS until April 2007. Before that he worked as a research officer at an FP5 European Union funded research project called ARCO. In April 2007, he joined the Department of Computing and the Digital Environment, Faculty of Engineering and Computing at Coventry University in the position of Senior Lecturer and the Serious Games Institute in the position of research fellow. Since January 2009 he became the director of Interactive Worlds Applied Research Group (iWARG). He is also a visiting lecturer at the Centre for VLSI and Computer Graphics, University of Sussex and a visiting research fellow at the giCentre, City University. He co-organised the 1st IEEE International Conference in Games and Virtual Worlds for Serious Applications and is organising the STARS session of the 10th VAST International Symposium on Virtual Reality, Archaeology and Cultural Heritage.

Dr Peter Samuels

Peter obtained an MA in Mathematics from Cambridge University and a PhD in Mathematics from the University of Reading in which he explored the use of knowledge representation techniques in the development of advanced mathematical theories. He is currently Senior Research Fellow with the sigma Centre for Excellence at Coventry University where he also coordinates the Serious Games Applied Research Group. His current research interests include: discrete mathematics education using self-paced learning; appreciative Inquiry research into mathematics support leadership; mathematics study skills and mathematics self-efficacy; serious games and mobile learning in Higher Education mathematics; the training of mathematics education PhD students; and collaborations between mathematics support and academic writing.

APPENDIX B: INDUSTRY TO ACADEMIA MODELS EMPLOYED IN THE SGI

The team at the SGI Applied Research Group has over its first year of operations worked with industrial partners in a range of different ways. The following gives some examples of these models.

1) **Serious Games: Engaging Training Solutions project.** Technology Strategy Board-part-funded research and development collaboration with TruSim, Selex Systems and Coventry University. This is a £2million investment into developing three serious games demonstrators. The demonstrators include: Triage Trainer, a web-based infection control game for medical staff, and a physiological trainer for young doctors. In addition to the demonstrators, the project has produced a wealth of academic papers (see publication list below), metrics for developing serious games and an exploratory learning model. The comparative studies between game-based learning and traditional training methods with Triage Trainer have demonstrated significant difference in favour of game-based learning.

2) **Floodsim serious game evaluation.** With some seed funding from the University of Coventry, researchers at Coventry and Sussex undertook an evaluation of the PlayGen developed game Floodsim, commissioned by Aviva a UK insurance company, aimed to educate general users about flooding policy. The evaluation has led to the acceptance of a paper at SIGGRAPH 2009 (10% acceptance rate). The evaluation showed a positive link between the game-based learning and greater knowledge of the flood policy.

3) **Eden Project programme.** The Research group has also been working with the Eden Project, funded through ERDF and IDM funding to develop a Virtual Eden on Second Life and OpenSim virtual world platforms. Work with PlayGen will focus upon the development of an Alternate Reality Game and web-based assets as part of the Living Stories project. The work involves a range of different activities including the Live Virtual Sessions, training activities and the alternate reality game, as part of an ongoing collaboration with the Eden Project to engage new visitors and to extend the Eden experience beyond the actual visits. The development work has involved students at Coventry University as part of the Eden Edge visualisation work, and the Walk in Web Ltd company.

4) **Rome Reborn project.** The group has also been working with the Rome Reborn model (owned by UCLA). The work has involved technical testing of the transfer of the model onto several games engines and virtual world platforms. The work will also explore the use of the model for integrating advanced artificial life techniques with partners in Toulouse University. In addition the work will involve testing the model with history students. A virtual tourism serious game has also been proposed by partners in Rome. Additional partners may include RedBedlam, CDV and Instinctmaker.

5) **Understanding communications in Games and Virtual Worlds.** Funded through the Applied Research Fellowship and the SGI Fellowship, this research is

centring upon voice communications. The work is being undertaken with Sun Microsystems, and their virtual world platform, Project Wonderland.

6) **Neurosky and games.** The SGI have introduced EEG reader technology into the UK, including work with Neurosky which reads brainwave signals, allowing for a range of applications including gaming. Two companies in the SGI cluster: Sinewave Company and Roll 7 have already used the technology for games applications. The research group has published two peer reviewed journal articles from testing in Veracruz University, Mexico with students. See references in **Appendix C**.

7) **Serious Games Exposed.** The Interactive Digital Media fund supported the Serious Games Exposed study; working with Digital 2.0, the main project outputs have included a mapping study, efficacy of game-based learning studies and a web site for selling serious games. The resultant spin out company Buy Serious Games is being led by Jude Ower from Digital 2.0 and provides an excellent example of how through industry-academic collaboration can lead to direct commercial benefits for the sector.

SELECTED PUBLICATIONS AND PRESENTATIONS

This appendix includes a list of selected publications produced by members of the SGI Research Group and Fellows. It also includes a list of presentations by Prof Sara de Freitas.

Publications since 2007:

- Mayes, T. & de Freitas, S. (2007). Learning and e-Learning: The role of theory. In H. Beetham & R. Sharpe (eds) *Rethinking pedagogy in the digital age*. London. Routledge
- de Freitas, S. (2007). Post-16 e-learning content production: a synthesis of the literature. *British Journal of Educational Technology (BJET)*, 38(2): 349-364.
- de Freitas, S. & Griffiths, M. (2007). Online gaming as an educational tool in learning and training. *British Journal of Educational Technology*, 38(3): 535-537.
- de Freitas, S. & Jarvis, S. (2007) *Serious Games – Engaging Training Solutions: A research and development project for supporting training needs*. *British Journal of Educational Technology*, 38(3): 523-525.
- de Freitas, S. & Smith, R. (2007). Introduction to *Innovating e-learning Practice*. *Innovating e-Learning Practice*. G. Minshull and J. Mole (Eds) *Proceedings of Theme 3 of the JISC Online Conference: Innovating e-Learning 2006: 13-16*. See: http://www.jisc.ac.uk/media/documents/programmes/elearning_pedagogy/a5_ebook_3.pdf
- de Freitas, S., Oliver, M., Mayes, T. & Mee, A. (2007). The practitioner perspective on the modelling of pedagogy and practice. *Journal of Computer Assisted Learning*. Available at *OnlineEarly Articles*.
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- Haniff, D. (2007). *Mental Health Issues and Pervasive Computing*. In: Ramdumy-Ellis, Devina and Rachovides, Dorothy (eds.) *The 21st British HCI Group Annual Conference - Volume 2 September 3-7, 2007, Lancaster*. pp. 171-172.
- Liarokapis, F. & Conradi, E. (2007). *User Interfaces for Mobile Navigation, Library Hi Tech, Special Issue on 3D Visualization*. Emerald Press. 25(3): 352-365. ISSN: 0737-8831.
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- Liarokapis, F. & Newman, R. (2007). *Design Experiences of Multimodal Mixed Reality Interfaces*. *Proc. of the 25th ACM International Conference on Design of Communication (SIGDOC '07)*. ACM Press. El Paso. TX. USA. 22-24 October. 34-41. ISBN: 978-1-59593-588-5.

- du Boulay, B, Rebolledo-Mendez, G, et al. (2007) Motivationally intelligent systems: Diagnosis and feedback. In *Artificial Intelligence in Education: Building Technology Rich Learning Contexts*. Proceedings of AIED2007, Los Angeles, pages 563-565, 2007.
- Petridis, P., Mania, K., Pletinckx, D., White, M. (2007) *The EPOCH Multimodal Interface for Interacting with Digital Heritage Artefacts*, Lecture Notes in Computer Science, Springer Berlin / Heidelberg, 408-417, ISSN: 0302-9743
- de Freitas, S. & Griffiths, M. D. (In press) Massively multiplayer online role-play games to support learning and training communities. In R. Ferdig (Ed.) *Handbook of Research on effective electronic gaming in education*. Idea Group Publishing.
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- de Freitas, S., Jarvis, S. (2008). Towards a development approach for serious games. In T.M. Connolly, M. Stansfield, & E. Boyle (Eds) *Games-based learning advancements for multi-sensory human-computer interfaces: Techniques and effective practices*. IGI Global. Hershey, PA.
- de Freitas, S. (2008). *Serious Virtual Worlds: a Scoping Study*. Bristol: Joint Information Systems Committee. See: www.jisc.ac.uk/publications/publications/seriousvirtualworldsreport.aspx.
- Dunwell, I. and Whelan, J. C. (2008). Spotlight Interest Management in Distributed Virtual Environments. In *Proceedings of EuroGraphics Virtual Environments '08 (EGVE08) Conference*, Eindhoven, NL, 2008
- Liarokapis, F. (2008). Evaluation of a Mobile MR Geovisualisation Interface. Proc. of the 29th annual conference of the European Association for Computer Graphics (EUROGRAPHICS 2008). Eurographics. Crete. Greece. 14-18 April, 231-234, ISSN: 1017-4656.
- Gatzidis, C., Liarokapis, F., Brujic-Okretic, V. & Baker, S. (2008). Virtual City Maker And Virtual Navigator: A Modelling And Visualisation Solution For The Creation And Display Of Mobile 3D Virtual Cities. Proc. of the 10th IASTED International Conference on Computer Graphics and Imaging (CGIM 2008). ACTA Press. Innsbruck. Austria. 13-15 February. 224-230. ISBN: 978-0-88986-719-2.
- Goldiez, B. & Liarokapis, F. (In press). Trends and Perspectives in Augmented Reality Training. *Virtual Environment Training Handbook*. The PSI Handbook of Virtual Environments for Training and Education: Developments for the Military and Beyond, Schmorrow, D., Cohn, J. & Nicholson, D. (eds).
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- Rebolledo-Mendez, G. S. de Freitas, D. Burden (2008). A model of motivation for virtual-worlds avatars. Accepted as poster in the *Intelligent Virtual Agents Conference, IVA' 2008*.
- Rebolledo-Mendez, G., de Freitas, S. (2008) Attention modeling using inputs from a Brain Computer Interface and user-generated data in Second Life. In *Proc. of the Workshop of Affective Interaction in Natural Environments (AFFINE) 2008*. In association with ACM Tenth International Conference on Multimodal Interfaces (ICMI), Crete, Greece.
- Chen, Y. F., Rebolledo-Mendez, G., Liarokapis, F., de Freitas, S. & Parker, E. (2008). The use of virtual world platforms for supporting an emergency response training exercise. In *Proceedings of*

the 13th International Conference on Computer Games: AI, Animation, Mobile, Interactive Multimedia, Educational & Serious Games

- Samuels, P. C. (2008) Appreciating and encouraging excellence in mathematics support through collaborative research, *MSOR Connections*, 8(1), 17-18
- Samuels, P. C. & Deane, M. (2008) Academic writing training for mathematics education PhD students, *MSOR Connections*, 8(3), 41-44
- Samuels, P. C. & Patel, C. (2008) Scholarship in mathematics support services, *The London Scholarship of Teaching & Learning 7th International Conference*, London
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- Rebolledo-Mendez, G., Dunwell, I., Martvnez-Miron, E.A., Vargas-Cerdan, M.D., de Freitas, S., Liarokapis, F., Garcva-Gaona, A.R., (2009). Assessing the Usability of a Brain-Computer Interface (BCI) that Detects Attention Levels in an Assessment Exercise, To appear in the 13th International Conference on Human-Computer Interaction, *Springer Lecture Notes In Computer Science*, San Diego, California, USA, 19-24 July.
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- John, D., Gatzidis, C., Liarokapis, F., Boucouvalas, A., Brujic-Okretic, V., (2009). A Framework for the Development of Online, Location-Specific, Expressive 3D Social Worlds, *Proc. of the 1st IEEE International Conference in Games and Virtual Worlds for Serious Applications*, IEEE Computer Society, Coventry, UK, 23-24 March, 219-220, ISBN: 978-0-7695-3588-3.
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- Halloran, J., Hornecker, E., Stringer, M., Harris, E. and Fitzpatrick, G. (2009) The value of values: resourcing co-design of ubiquitous computing. In CoDesign, International Journal of CoCreation in Design and the Arts. Taylor and Francis, In Press.
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- Halloran, J. (2009) It's talk, but not as we know it: Using VoIP to communicate in war games. In Proc VS-Games 2009. IEEE, 133-140.
- Jarvis, S., de Freitas, S. (2009). Evaluation of a Serious Game to support Triage Training: In-game Feedback and its effect on Learning Transfer. Proc. of the 1st IEEE International Conference in Games and Virtual Worlds for Serious Applications, IEEE Computer Society, Coventry, UK, 23-24 March
- Petridis P., Nadim W., Bowden S., Goulding J., Alshawi M., (2009). ManuBuild Construction Site Training Simulator for Offsite Manufacturing. In IEEE First International Conference for Serious Application (VS-Games '09), Coventry ,UK, March 23-24, 170-173, (2009), ISBN: 978-0-7695-3588-3
- Nadim, W., Alshawi, M., Goulding, J., Petridis, P. and Sharp, M. (2009) Virtual Reality Interactive Learning Environment, In Open Building Manufacturing Key Technologies, Applications, and Industrial Cases, Book Chapter, 153-182, ISBN 978-951-38-7144-4
- Pletinckx, D., Petridis, P., Know How Books: Virtex, In Press, EPOCH Interactive Institute, ISBN:978-91-85960-02-6
- Liarokapis, F., de Freitas, S. (2009). A Case Study of Augmented Reality Serious Games, Looking Toward the Future of Technology Enhanced Education: Ubiquitous Learning and the Digital Native, Ebner, M., Schiefner, M. (eds), In Press.
- Samuels, P. C. (2009) Design of a mobile mathematics creativity laboratory for contemporary learners, IEEE VS-Games, Coventry

Presentations

The following lists the main presentations and guest lectures, keynotes and invited lectures undertaken by Prof Sara de Freitas.

- CeBIT conference, Hannover, Germany. Presented session on participatory design methods for developing game-based learning solutions, March 2007
- Oxford University, Oxford. Presented session on the challenges of social collaboration and forming social networks, March 2007.
- vizNET Conference, Loughborough. Presented session on the use of game-based visualisation to support exploratory learning, April 2007.
- European Union Accessible and Inclusive ICT Information Day, Brussels, Belgium. Presented on Serious Games Institute activities, May 2007.
- Vienna Subotron Lectures, Vienna, Austria. Gave a lecture entitled: 'Building effective exploratory learning experiences with serious games applications', May 2007.
- Whitehall Games Group, Becta, Coventry. Presented on 'An introduction to Coventry University's Serious Games Institute and serious games research', May 2007.

- Eduserve conference on Second Life, Trades Union Congress, London. Presented on the Serious Games Institute and Serious Games Research at the Panel session, May 2007.
- vizNET Workshop, University of Central England, Birmingham. Presented visualisations from TSB project. June 2007.
- JISC Pedagogy Experts Group Meeting, Bristol. Presented on the Learners experience of immersive worlds. June 2007.
- Serious Virtual Worlds, TechnoCentre, Coventry. September 2007. Session Chair on Serious Virtual Worlds for Education.
- Serious Games Workshop, Skovde University, Sweden. September 2007. Presented on Serious Games research: An Overview.
- Legal IT Forum, Turnberry Resort, Scotland. Presented on legal applications of serious virtual worlds. October 2007.
- Virtual Worlds Forum. Harnessing Enterprise Virtual Worlds Workshop, Serious Virtual Worlds: The impact on education. London. October, 2007.
- Higher Education Academy Legal education lectures, University College, London. Keynote on social collaboration and the immersive: a new vision for legal education. November 2007.
- Game On conference. University of Bologna, Bologna, Italy. November 2007.
- Pervasive Learning conference. Keynote lecture. University of Southern Denmark, Denmark. November 2007.
- Second Lab Group Open Day. Opening address. Oracle City of London Building, London. 20th February 2008.
- Session chair and presenter. Second Lab Group Open Day. Engaging learners in immersive worlds. Oracle City of London Building. London. 20th February 2008.
- Session chair. Culture, heritage and tourism with virtual worlds events. Serious Games Institute, Coventry University. 4th March 2008.
- Chair and presenter at Second Wednesday event: Using virtual worlds in your business. Serious Games Institute, Coventry University. 12th March 2008.
- Chair, organiser and presenter at the Muscat e-Games Conference, Oman. 1st April, 2008.
- Chair and presenter at Second Wednesday event: Using virtual applications to support health. Serious Games Institute, University of Coventry. 9th April, 2008.
- Lecture at University of Virginia: Visualising the future: the role of virtual worlds and serious games in the age of the digital. Virginia, United States. 25th April 2008.
- Chair and presenter at Second Wednesday event: Using virtual applications to support smart buildings. Serious Games Institute, University of Coventry. 14th May, 2008.
- Presenter at Serious Games Institute Partner Summit: Visualising the future with virtual worlds and serious games: an agenda for applied research. Serious Games Institute, University of Coventry. 19th May, 2008.

- Lecture at Warwick University. CENTRE seminars series. Visualising the future of learning with virtual worlds and serious games. 22nd May, 2008.
- Presenter and session chair at Second Wednesday event: From e-commerce to v-commerce. Serious Games Institute, University of Coventry. 11th June 2008.
- Presentation at the Intelligent Virtual Agents conference. Tokyo, Japan. September 2008.
- Invited Keynote Address on Visualising the future with serious games at the Serious Games on the Move conference held at the University of Anglia Ruskin, Cambridge, UK. June 2008
- Invited Keynote Lecture on serious games at the Women in Games Conference, Coventry, UK. September 2008.
- Chair for Serious Virtual Worlds conference, Coventry, UK. September 2008.
- Invited presentation at the Virtual Worlds London Conference, London, UK. October 2008.
- Invited Lecture on virtual worlds. British Computer Society, Oxford Branch. November 2008.
- Invited Keynote Lecture on serious games and virtual worlds. CGAMES International conference, Wolverhampton, UK. November 2008.
- Invited presentation and session chair at the Botanic Gardens Education Network Conference. Eden Project, Cornwall, UK. November 2008.
- Invited lecture on serious games and virtual worlds. Cambridge Wireless event. Cambridge, UK. November 2008.
- Invited lecture on serious games and virtual worlds. Learning Sciences Research Institute, Nottingham University, UK. November 2008.
- Invited lecture on serious games. British Computer Society, Coventry Branch. January 2009.
- Invited lecture on games technologies. Workshop on Challenges in Serious Games, VR Lab, Lausanne, Switzerland. March 2009.
- Invited presentation on serious games for training. European Training & Simulation Association (ETSA) seminar 'Engaging Your Future Workforce'. March 2009.
- Chair of IEEE Serious Games and Virtual Worlds conference. Coventry, UK. March 2009.
- Presentation at IEEE Serious Games and Virtual Worlds conference. Coventry, UK. March 2009.
- Invited lecture at the Immersive Education Summit, London School of Economics, London. April 2009.
- Invited Keynote Lecture on serious games and virtual worlds. International Simulation and Gaming Association 2009, Singapore. June 2009.

APPENDIX D: SGI PROGRAMME OF EVENTS 2009-2010

Due to the successful run of the Second Wednesday events 2008-2009, we will be running another year of events from September 2009.

Serious Games & Virtual Worlds: Converging Technologies, Hybrid Spaces Season (2009-2010)

The second year of Second Wednesday events takes the theme of converging technologies and hybrid spaces. The theme highlights the rapid development of games and virtual world technologies and their deployment into a range of uses beyond training and education. The season will explore visualisation, simulation and multimodal interfaces exploring how converging technologies are changing our everyday lives and opening up new spaces for us to explore. Areas explored by industrial and academic speakers will include: alternate reality games that bring together mobile and casual gaming practices, brain computer interfaces that allow users to game using their brainwave signals and artificial intelligence techniques that are being integrated to allow for smarter interactions with information systems.

The series of lectures, master classes and workshops will aim to explore and debate these with the community of academics, developers, managers and entrepreneurs. The events are aimed at teachers, tutors, trainers, academics, researchers, managers, developers and entrepreneurs, and aim to continue the process of constructing a serious games research and development network in the UK (with links to international organisations). The events will also allow for new collaborations to emerge and to support leading edge research and development at the SGI and with its key partners.

The events will be held on the Second Wednesday of each month at the newly founded Serious Games Institute at Coventry University, and in the virtual Serious Games Institute in Second Life. The events are also all archived as video files with links from www.seriousgames.org.uk.

Schedule: Second Wednesday 2009-2010

Provisional timetable of events:

2009	
16-17 th September	Serious Virtual Worlds conference, Coventry, UK (Chaired by David Wortley)
Wednesday 14 th October	Networking and inspiration (Organised by Jacqueline Cawston)
Wednesday 11 th November	Alternate Reality Games (Chaired by Sara de Freitas). Sponsored by Screen West Midlands and BAFTA (tbc). Speakers (tbc): Adrian Hon (Six to Start) Mike Bennett (Oil Productions) Nicola Whitton (Manchester University) Alice Taylor (Channel 4)
Wednesday 9 th December	Networking and inspiration (Organised by Jacqueline Cawston)
2010	
Wednesday 17 th January	Brain-Computer Interfaces and Gaming (Chaired by Sara de Freitas). Speakers (tbc): Dr Itiel Dror (University College London) Simon Bennett (Roll 7) Rohan Freeman (Sinewave Company)
Wednesday 10 th February	Networking and inspiration (Organised by Jacqueline Cawston)
Wednesday 10 th March	Artificial Intelligence and Games (Chaired by Christopher Peters) Speakers (tbc): Simon Coulton (Imperial College, London) Joanna Bryson (Bath University)

	Daniela Romano (Sheffield University) David Burden (Daden Ltd) Genaro Rebolledo-Mendez (SGI Research)
Wednesday 14 th April	Networking and inspiration (Organised by Jacqueline Cawston)
Wednesday 12 th May	Developer's Session (to be held at BAFTA, London - tbc) Speakers (tbc) Kam Star (PlayGen Ltd) Ron Edwards (Ambient Performance)
Wednesday 9 th June	Networking and inspiration (Organised by Jacqueline Cawston)
June-August	Summer Break
September	Serious Virtual Worlds 2010 (Chaired by Sara de Freitas)
Wednesday 13 th October	Multimodal and Experience Design (Chaired by Sara de Freitas) Speakers (tbc) Prof Alan Chalmers (Digital Lab)

The monthly events will be held in parallel with bi-monthly Serious Games Applied Research events, networking activities in Second Life and informal open evening receptions where visitors can meet the SMEs and the core SGI team. The aim of the events is to help secure the SGI as a centre of excellence and to support synergies between the SMEs, the applied research group and other stakeholders. The events will also provide a showcase for the leading edge research and development in the region and help to provide a focus for future work in serious games and virtual worlds.

The conference Serious Virtual Worlds will be held in September 2009 and 2010.

APPENDIX E: FUNDING ATTAINED BY THE SGI

The SGI have been successful with attaining significant funding during the first year of operations. The following funds have been secured. The total amount raised is **£1,767,400** between August 2007 - May 2009.

The following is a list of funding attained by the SGI.

- Advantage West Midland Interactive Digital Media fund.
Serious Games Exposed
Applicants: Sara de Freitas, Jude Ower
August 2007 – March 2008, £75,000
- Advantage West Midland Science City fund
Second Life Science City project
Applicants: David Wortley, Sara de Freitas
September 2007, £75,000
- University of Coventry
Academic conference on Games and Virtual Worlds for serious applications
Applicant: Sara de Freitas
December 2007, £20,000
- University of Coventry
Serious Games Institute Second Wednesday events
Applicant: Sara de Freitas
December 2007, £10,000
- Advantage West Midland
Additional capital funding
Applicant: David Wortley, Sara de Freitas
February 2008, £400,000
- University of Coventry
Serious Games Institute Fellowships Scheme
Applicant: Sara de Freitas
February 2008, £30,000
- Advantage West Midland Interactive Digital Media fund.
Serious Games Exposed, extension funding
Applicants: Sara de Freitas, Jude Ower
March – September 2008, £10,000
- European Regional Development Fund.
Serious Games Institute.
Applicants: David Wortley, Sara de Freitas
March – December 2008, £600,000
- European Union e-Content plus. MEducator project.
Serious Games Institute
Applicant from SGI: Sara de Freitas

January 2009 – December 2012, total £4,500,000. Value to SGI £221,000

- European Union Life Long Learning Fund, Transversal. E-Vita project.

Applicants from SGI: Sara de Freitas

January 2009 – December 2012, total value £640,000. Value to SGI £57,000

- Higher Education Funding Council for England: Employer Engagement Fund

Applicant: CUTS Ltd.

January 2009 – December 2012, total value £5,000,000. Value to SGI £120,000

- European Union ICT PSP Fund. BEPMS (Building Energy Performance Management System).

Applicant: Sara de Freitas

January 2009- , Value to SGI £70,000

- European Research and Development Awards. 7th Framework Programme.

Applicant: Sara de Freitas

February – March 2009. Value to SGI £13,000

- Erasmus Agreement Staff Exchange Programme.

Applicant: Sara de Freitas

May 2009. Value to SGI £1,400

- HEFCE Economic Challenge Investment Fund (ECIF)

Applicant: Paul Fairburn

April 2009-September 2010, total value £500,000. Value to SGI £40,000

- Advantage West Midland Interactive Digital Media fund. Living Stories project.

Applicant: Sara de Freitas

May 2009-August 2009, total value £45,000

The strategy for onward funding is to adopt a multi-stream approach. Goals for funding include: obtaining Research Council (RC) funding.

Current funding proposals include an FP7 proposal led by Prof Sara de Freitas, two AHRC & EPSRC proposals, one pending AHRC proposal and another one in the pipeline. 1 ERDF funding application. 1 TSB funding application. The ERDF v-Trade proposal (led by Sara de Freitas) is going through the submission process with AWM, we hope to have posts in place by November 2009. The grant will be worth £250,000.

Future funding proposals include: planning for a Marie Curie Fellowship scheme and an EPSRC proposal with Warwick. We are also looking at obtaining further capital funding to set up a robotics centre in the West Midlands.

It is understood that particularly RC funding is difficult to obtain (with 5% success rate) therefore the SGI team are working with leading experts including Oxford University, Imperial College, London and Warwick University.

APPENDIX F: THE SGI FELLOWSHIP SCHEME

The fellowship scheme was launched in 2008. The first fellow Dr Fotis Liarokapis has produced a report for his accomplishments during the duration of his fellowship. The main outputs are summarised here.

Research

Two research prototypes into augmented reality interfaces and one in brain interfaces were developed under my supervision. Two novel mixed reality serious games were prototyped. User studies were performed and results are encouraging for further development. A video for one of the augmented reality mixed reality games can be obtained from http://www.youtube.com/watch?v=k3r181_GW-o. In addition, I have co-organised the 1st International Conference in Games and Virtual Worlds for Serious Applications, sponsored by IEEE Computer Society. Finally, 2 software demonstrations of mixed reality games were performed including to politicians.

Publications

Until now, 5 peer-reviewed conference publications have been written in collaboration with SGI researchers and external collaborators. In addition, three more papers are under review including 1 book chapter and 2 journal publications ('Journal of Visual Computer', Springer and the 'British Journal of Educational Technology', Blackwell Publishing). In addition, Dr Fotis Liarokapis co-authored the IEEE proceedings of the 1st International Conference in Games and Virtual Worlds for Serious Applications with Dr Genaro Rebolledo-Mendez and Prof Sara de Freitas.

Submitted proposals

1 AHRC Proposal and 2 EU Proposals have been submitted during the course of the fellowship. The aim of the AHRC proposal was to support the leading edge convergence between three technologies: sensor technologies; mobile technology; and virtual worlds in different contexts. Both EU proposals relate to the use of serious games for improving the policy making process and networking respectively.

Teaching

A first draft for a new MSc in Serious Games and Virtual Worlds has been completed after two iterations. The initial outcome of this is an MRes in Serious Games and Virtual Worlds which will start running in October 2009, at the Department of Computing and the Digital Environment with joint supervision with SGI. The MSc will be further reviewed. In addition, two second year computing students were awarded SGI internships. Dr Ian Dunwell of SGI has also given 2 invited lectures to second year modules (3D Graphics Programming and Physics for Computer Graphics).

APPENDIX G: THE SERIOUS GAMES APPLIED RESEARCH GROUP

The Serious Games and Virtual Worlds Applied Research Group includes a membership base of around 35 colleagues from the University of Coventry. The group includes active participation from all the University Faculties and is the main point of communication between the SGI and the University in terms of research collaboration and communications.

The main approach that has been taken with the ARG is to build up a base of collaboration, to increase collaborative research across the faculties and to translate this into publications in high impact journal and conferences and into research funding streams. The ARG has fulfilled and surpassed expectations for the first year of operations. The main outcomes of the group have been the following:

A. Retreat.

A retreat held in February 2009 at the Woodside Residential Centre was supported by Prof Ian Marshall, with aims to produce several publications and funding applications. The outcomes of the retreat were significant and went beyond the expectations set. 13 members of the ARG attended the retreat and were supported throughout by a facilitator from the Centre for Academic Writing (CAW) and also partly by three representatives from the Business Development Office (BDO). This was the first writing retreat which has combined paper writing with project proposal writing. In terms of outputs, the retreat was very successful as it led to the writing and submission of:

- Three papers and two abstracts: one paper has already received feedback and is being revised (papers produced by Carmel de Nahlik, John Halloran, Genaro Rebolledo-Mendez)
- Eight research proposals: FP7 Viola (led by Sara de Freitas); EU Transversal Elevate (led by Mark Childs); 4iP proposal (led by Jim Hensman), Screen West Midlands proposal (led by Jim Hensman); EU proposal (led by Drs El Parker and Yung Fang Chen); EPSRC proposal (led by Michael Ondatayo); EU proposal (led by Peter Samuels; AHRC proposal (led by Panos Petridis). Of the eight proposals, five have been submitted, with another one to be submitted shortly.

It is hoped that funding can be raised for an additional retreat for the Autumn 2009, and that these retreats may be held on a regular basis. All the feedback from the 13 attendees was positive.

B. ARG Meetings

Regular bi-monthly and monthly meetings have been held, these in general explore particular research work being currently undertaken, other members of the group can comment upon and support intellectual debate which leads to improved research, collaborative research or improvements upon teaching. The group meetings also provide a collegial atmosphere for supporting cross-disciplinary engagement. Presentations from internal and external group members are

encouraged, with regular updates from the Chair (Prof. Sara de Freitas). Recent external presentations have focused upon funding streams and academic writing. The future meetings will introduce industrial colleagues undertaking PhDs in related areas, and explore the future planning of the ARG. The coordinator of the group Dr Peter Samuels plays a key role in the organisation of the group meetings. The group also have a jiscmail group address which is active for highlighting funding calls and conferences of note to the field.

APPENDIX H: FUTURE PLANNING FOR SGI APPLIED RESEARCH GROUP

The overarching aim of the SGI Applied Research Group is to build a team of leading academics in the field of serious games and virtual worlds and to become a world class group by 2012. The measures of this success will be quantified in terms of high quality research and publications, sustainable funding from different international and national funding streams, and strong links into teaching and training practices in the university.

To achieve this objective we are setting the main targets for planning for the SGI Applied Research Group 2009-2010. These are categorised as Research, Funding, Collaboration, Teaching, Training.

While 2008-2009 was a year for building profile for the SGI; 2009-2010 will focus upon funding and building capacity in research.

A: Research

Research group includes the following groups: the SGI Applied Research Group (RAs/SRAs), the SGI Fellows and the SGARG. We intend to extend this to a PhD seminar group which will include participation from Prof Maggie Savin-Baden's group of PhDs.

The main future planning for the Research is to continue to grow the core team from four RAs to ten by the end of the year.

▪ **SGI Research Team**

The research hub areas are now: health, education and the environment. Each cluster area is led by our RA/SRAs: Education (Dr Genaro Rebolledo-Mendez); Environment (Dr Panos Petridis); Health (Dr Ian Dunwell). An additional area for Training is being led by Dr Dave Haniff. To date the SGI Research Team (including SGI Fellows) has produced 50 publications. We have followed a policy of targeting high impact journals and conferences. Together the SGI Research Team and Fellows had six papers published in the Proceedings for the IEEE Conference. See Appendix C for complete list of publications. We believe we can increase our research outputs for 2009-2010 due to our increased staff and better links into the Faculties via the fellowship scheme.

The quality of the research being undertaken by the team is very high, partnering with universities including Imperial College, London, Oxford University, Veracruz University, Mexico, Warwick University, Institute for Advanced Studies, Princeton, Stanford University, Beijing University, Toulouse University and others will ensure that we maintain high levels of quality, and develop world class research.

Target	Outline
1	Increase publications in high impact rated journals

2	Undertake high quality research building upon the areas established in 2008-2009
3	Build capacity in the SGI Research Team (10 RAs in the team by spring 2010)
4	Build upon existing academic networks and continue to develop high quality research based upon questions developed in concert with the companies
5	Set up the PhD Seminar group to meet every month
6	Bring in three PhD students in September 2009-January 2010

▪ **IEEE Conference**

Due to our success with the IEEE conference (the first held at Coventry University with 70 delegates from 20 countries) in March 2009, we have developed a package of further activities including:

Target	Outline
1	Setting up a new IEEE Journal: 'Serious Games and Virtual Worlds'.
2	Setting up VS-GAMES Association which will determine where next VS-GAMES conferences will go as well as manage the IEEE journal and other internal and external workshops/events.

▪ **SGI Fellows**

This scheme has been excellent for bringing in research active members of the university, In the first year the scheme has supported three fellows, see **Appendix D** for outline of outputs from first SGI fellow: Dr Fotis Liarokapis.

The scheme has also facilitated research with Sun Microsystems. The SGARG has been used as a feed for this scheme. Once the member meets and starts to work with the SGI through the SGARG they can then be taken through the route of SGI Fellow and onto Faculty-Supported Residency status.

The future targets for the scheme are to use it as a stepping stone for Faculty-Supported Residencies (FSR) that may involve fellows and other targeted research active colleagues to be based full time at the SGI. The residencies may be six months initially and subject to agreement 1-3 year residencies. The main advantage of the scheme would be to generate high quality research and to support income generation (through consultancies and public funding applications). Each resident would need to meet publications and application targets each year.

Target	Outline
1	To put into place a structure for Faculty-Supported Residencies, to commence the scheme in 2009-2010

2	To continue to support SGI Fellows scheme 2009-2010
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▪ **SGARG**

The role of the SGARG has been central to our policy for engagement with the university faculties. The SGARG include 30 members and is growing in membership gradually. The group includes active participation from at least 20 members and has members from every faculty.

The main accomplishments of the group have been to co-present papers at conferences, to work on funding proposals together and to have regular face-to-face meetings. In addition, the group has a successful retreat in February 2008.

Target	Outline
1	To continue to hold regular meetings on research and funding opportunities, to share current research findings and provide a support mechanism for mentoring colleagues
2	To hold another retreat in Autumn 2009 and at least one in 2010

B: Funding

See **Appendix D** for outline of successful funding applications. The main future planning for funding is to put into place an 'early warning' system for funding applications, working with the BDSO to set up more preparation time for submissions.

Target	Outline
1	To continue to hold regular meetings on research and funding opportunities, to share current research findings and provide a support mechanism for mentoring colleagues
2	To hold another retreat in Autumn 2009 and at least one in 2010

C: Collaboration

The SGI Research Team have been working on developing relationships with particular groups and labs. Collaborative research and development work includes:

- Dr Panos Petridis' visit with IRIT Toulouse University work under the Erasmus Agreement, undertaking technical integration work.
- Dr Genaro Rebolledo-Mendez's visit to Veracruz University, Mexico, undertaking studies with Neurosky technology. Leading to successful paper into SIGGRAPH 2009 (10% success rate).
- Prof Sara de Freitas' invited retreat to the Institute of Advanced Studies, Princeton, to set up research projects and work on book.

- Dr John Halloran's ARF and SGI Fellowship facilitating research of voice in virtual world with Sun Microsystems.
- Dr David Haniff's work with Acua Ltd to develop training packages including serious games and multimedia content.

Target	Outline
1	Extend the Visiting Fellowship scheme to six by end of 2010
2	Involve SGI Research with networking events hosted at the SGI
3	Support exchanges with key partners for developing technologies and advances in state of the art

D: Teaching

In 2008-2009 Dr Fotis Liarokapis has been looking into the possibilities for setting up a Masters in Serious Games and Virtual Worlds. The panel including industrial presentation from TPLD, TruSim and Pixelearning have considered the options for an industrial-centred Masters. A twin MA/MSc track may be the best option to explore due to the need to attract business students as well as computer scientists and multimedia designers. A plan for the Masters will be developed by mid 2009. The plan to run the MRES for 2009-2010 has been agreed in principle between the Faculty of Computing and Engineering and the SGI.

Target	Outline
1	Set up a plan for the Masters Degree

E: Training

The general proposal of offering training via Acua and SGI has been considered, further consideration may be given 2009-2010.

Target	Outline
1	Consider options for training packages to be offered

