A case study of the development of a 3D virtual object handler and digital interactives for museums by Canalside Studios (University of Huddersfield).

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Introduction

Presented with the problem of how to design and develop digital interactive content for museum displays that would satisfy the expectations of younger audiences (the Xbox generation), academic staff from the Serious Games Research Group and the Arms and Armour Research Groups at the University of Huddersfield worked with staff from the Royal Armouries in Leeds to develop a series of prototype digital interactives for display at the museum.

The Interactive media projects included a 3D virtual object handler, armour fighting game and a variation of the Top Trumps game. This poster presents a case study of this work, reflecting on both the development of the digital interactives and what Canalside Studios learnt about the differences in ways of working between the commercial and third sector clients. It highlights the multidisciplinary nature of heritage visualisation and the complexities of designing software for the Xbox generation within the constraints of a museum environment. We reflect on how our experience of working with the Royal Armouries developed our understanding of the role of universities in Knowledge Exchange and Translational Research.

Canalside

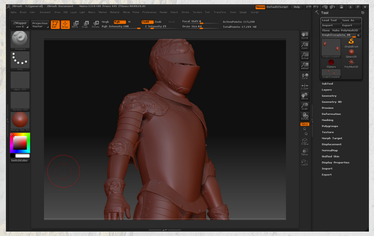
In 2005 the University of Huddersfield launched a small in-house computer games studio, Canalside Studios. Funded by the University the studio was created to provide work placement opportunities for students from the BA Computer Games Design and BSc Computer Games Programming. The studio team is made up of undergraduate students and is supported by two enterprising members of academic staff.

The studio first published in 2007 entitled "Yo Ho Kablammo", developed for Xbox Live Arcade under contract to Microsoft, building on this success "Missing Reel" was released in 2008.

The knowledge exchange and experience of developing and releasing a game with the support of the XBLA team in Seattle provided the studio with invaluable insights into the world of games development, including managing the technical complexities of production and dealing with the financial and legal issues around software publication for an international market.

Since the initial success the studio has explored the Interactive media value chain through a range of projects including: - prototyping an interactive children's book, a health promotion game and a game to celebrate International Researchers night. The studio has been working in partnership with the Royal Armouries Museum in Leeds to produce computer games and interactive 3D applications for display in the museum galleries. Whilst the studio's main focus is on Academic Entrepreneurship, Enterprise and Commercial experience for the entire team it has a unique position within the University. It provides an effective interface to facilitate two-way knowledge exchange between students, academic staff and the games industry partners. This exchange facilitated the fore mentioned projects and the translational approach of cross-disciplinary research feeding through to product.

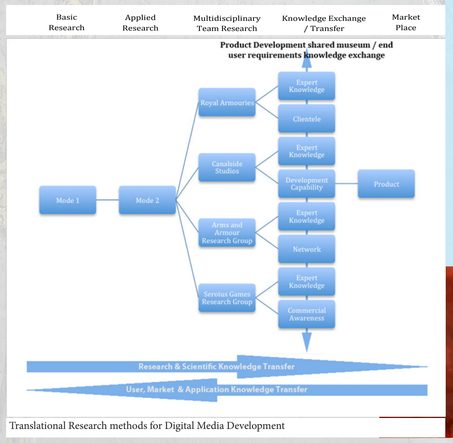
The studio is currently working on mobile development (iPhone and Android devices) with two new titles due for release in spring 2012.



Knowledge Transfer and Translational Research

Translational research is traditionally seen as the domain of the life sciences. The translational research methods are being applied across the research sector within many disciplines, embracing this methodology to deliver product. We see translational research as a means of ensuring that all parties are involved in knowledge transfer ensuring that the best result is obtained for all concerned with a two-way flow of information resulting in best practice and an accelerated product development timeline.

The UK Technology Strategy Board (TSB) defines the following when supporting innovations in the life sciences(Watu et al., 2011),



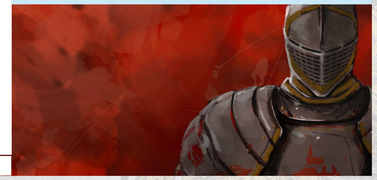
Translational Research methods for Digital Media Development

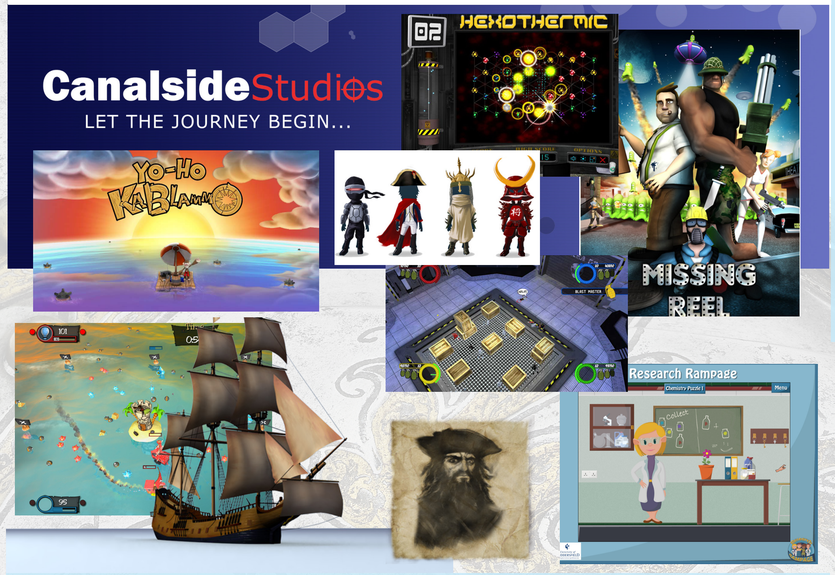
Translational Research - the new scientific methods and technologies, interdisciplinary approaches, and collaborative institutional arrangements being developed to narrow the gap between basic science and its application to product and process innovation.

Knowledge Exchange - the multi-directional flow of information of all kinds that is required as a basis for decision making in the translational research process.

Value chain - the range of activities required to bring a product or service from conception, through the different phases of production, to delivery to consumers.

Value system – the wider system within which the value chain operates including: policy and regulation, finance and markets, and public and stakeholder perspectives.



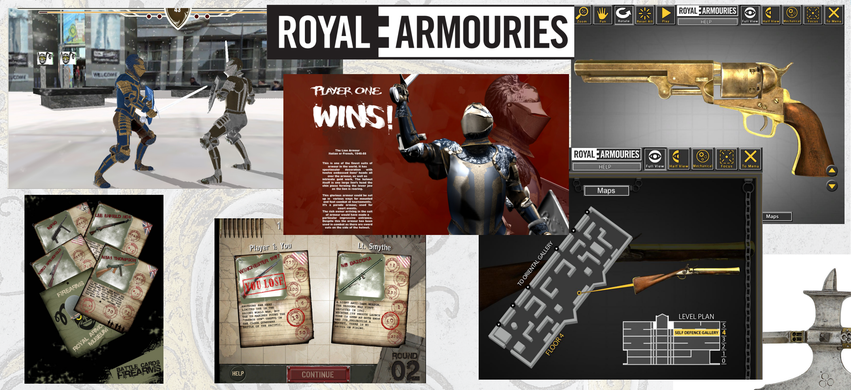


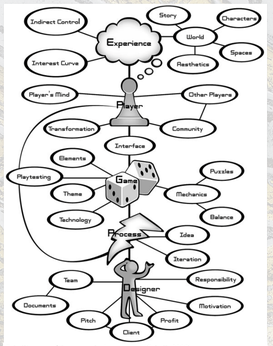
Royal Armouries Collaboration

The studio team initially produced a series of prototype games and digital interactives based on a brief set by the Royal Armouries. The majority of the museum's existing digital displays have been in place since opening of the Leeds site in 1996 and need updating to meet audience expectations. The main requirements of the brief were to develop interactives to complement the existing gallery displays that would engage a visitor for two to three minutes.

The first prototypes included a 2D "Top Trumps" style game comparing various weapons and armours, a 3D naval warfare game, a 3D combat game comparing different armour (similar to the "Street Fighter" game) and a 3D object handler. These were presented to delegates at the International Committee of Museums of Arms and Military History (ICOMAM, 2009) symposium at the Royal Armouries Leeds 2009 and were also made available to museum visitors. The museum's preferred prototypes were the Top Trumps games and the 3D object handler. Although younger museum visitors expressed greater enthusiasm for the combat game the curatorial staff were concerned that this might present items from the collection inaccurately and was more entertainment than educational so this prototype was not taken forward.

It was arranged for artists from the studio team to visit and liaise with curatorial staff from the museum in order to photograph and accurately record objects from the collection which needed to be modelled for the 3D object handler. In the case of the firearms it was necessary for artists to be able to see the weapons stripped and examine the mechanisms alongside the curators in order to recreate these digitally and to animate the inner workings correctly.





Schell's map of the game design process (Schell, 2008)

Designing software for Xbox generation

The Xbox generation expect to be engaged at ever increasingly sophisticated levels of technology and interaction. When designing software for this generation it is important to ensure that the end user is identified and the software is designed around the user expectations and requirements. Working with the Royal Armouries in reality meant that the studio was working for multiple clients, the end user and the museum curators.

Schells diagram (left) highlights the complexities of Video Game design and the iterative process of ensuring that the game is engaging and playable to all. The game must be within the capabilities of the studio team and be deliverable to the specified technology within a timely manner. The software must engage the user at a level that is rewarding, giving the user a sense of achievement while not being too obviously a piece of edutainment, leaving the user either frustrated due to an overly complex mechanic or too immersed so that the software acts a block in the overall flow of the museum. The museum needs to also ensure that theatrical licence does not interfere with the educational value of the software.

Translational research methodology ensures that knowledge is transferred at all levels seeking to ensure that all parties are educated so that all parties see the final product as a success, ensuring all requirements are met.

3D Objects

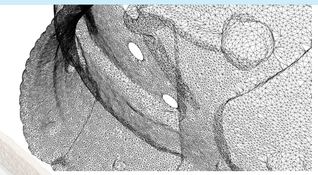
The use of 3D scanning technology to create digital reproductions of objects is now widely available and has been used extensively in the fields of archaeology and museum collections. 3D digitisation is enabling museums to provide new ways for audiences to access content and collections (Hess et al., 2009).

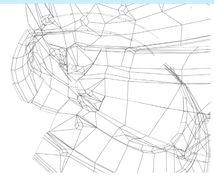
These technologies allow for accurate surface mapping and can also capture surface details such as colour and pattern along with creating the 3D model.

The disadvantages of using scanning as a single approach for 3D digitisation of artefacts is that the technology captures a very large amount of data resulting in extremely large files which can be difficult to manipulate and unsuitable for use in a 3D engine or for any type of real time interaction or animation. If an object requires animation it must have a lower poly count than that of a scanned object file and the alignment and positioning of polys must be controlled so that the object mesh will deform correctly. Automated software programmes that reduce the number of polys in a 3D object will produce smaller files sizes allowing easier manipulation but these often look clumsy and create triangles rather than polygons which can cause problems for animation and rendering. Another problem with scanning is that it captures objects as a single mass so anything that is made up of smaller parts or that may be opened, articulated or otherwise logically divided is not properly represented.

As part of the Royal Armouries project the studio adopted a variety of approaches to creating the 3D objects to overcome these problems. The weapons in the object handler were all modelled from photographs and measurements taken by the team. The museum provided supervised access to the weapons, which were stripped, so that individual components could be photographed and the mechanisms explained and understood to the modellers. The resulting 3D models produced by artists were then made to the technical constraints set by the programming team so that they would work efficiently in the 3D engine and individual components could be animated or hidden in real time.

The armour models were produced using two approaches, firstly working from photographs and measurements as above and secondly working from 3D scans provided by the museum the artists manually re-topologised the objects. To ensure that the re-topologised 3D mesh was interpreted and built correctly, the art team worked with fight demonstrators wearing reproduction armour to gain an accurate understanding of how the armour was worn and how it should move.





Object Handling

UK museums have a long tradition of object handling and loans services making real objects available for schools and visitors. The advantage to the individual of being able to see and touch the real object seem obvious; our first experiences of learning about the world as children centres around sensory exploration through sight and touch. Curiosity instinctively causes us to want to look closely at things and to reach out and touch. Object handling in museums is important because it provides an "authentic" experience and has a long lasting effect on memory and learning (Chatterjee, MacDonald, Prytherch, & Noble, 2008)p.284).

Whilst there is no substitute for the authentic tactile experience, 3D digitisation of objects can provide museum visitors with an opportunity to virtually handle objects which might be too delicate, valuable or be otherwise unsuitable for open access.

The use of interactive computer displays in museums has been shown to help visitors gain a better understanding of objects in the collections and visitors on average spend longer in galleries which have interactive materials, (Durbin, 2002). Younger visitors are particularly drawn to computer interactives (Hornecker & Stifter, 2006).

In the case of the Royal Armouries in Leeds some objects from the collection are available to handle through the educational programmes however the majority remains behind glass or in store. An important aspect of many objects from the collection that is not easily communicated through traditional static display is their mechanical operation, this applies both to the firearms in the collection and the armours which involve complex metalwork forms and articulated joints. Virtual object handling which allows a user to explore the exterior, interior and animated functions of the object has the potential for a more enriched learning experience. Virtual object handling has advantages over video or animation in that it provides the individual user with control and is interactive rather than passive and can be non linear.

Conclusion

- Translational research methodologies allow two-way knowledge transfer to take place, maximising the potential success of the project.
- Entrepreneurial and enterprising academics can support product development as part of technology/knowledge transfer.
- Universities need to act as knowledge brokers to ensure that current trends in technology are transferred to museums to ensure that end user requirements are met and satisfied.
- Interactive museum displays facilitate knowledge transfer to the Xbox generation.
- Knowledge and understanding of museum pieces needs to be fully transferred and access to the mechanics fully understood by a 3D artist to ensure accurate representation.

References

Capcom (1987) Street Fighter (Video Game)

Chatterjee, H., MacDonald, S., Prytherch, D., & Noble, G. (2008). *Touch in museums: policy and practice in object handling*. Bloomsbury.

Durbin, G. (2002). *Interactive Learning in the British Galleries, 1500–1900*. Paper presented at the Interactive Learning in Museums of Art and Design, London.

Hess, M., Were, G., Brown, I., MacDonald, S., Robson, S., & Millar, F. S. (2009). E-Curator: A 3D Web-based Archive for Conservators and Curators. *Ariadne*(60).

Hornecker, E., & Stifter, M. (2006). *Learning from interactive museum installations about interaction design for public settings*. Paper presented at the Proceedings of the 18th Australia conference on Computer-Human Interaction: Design: Activities, Artefacts and Environments.

ICOMAM. (2009). Paper presented at the Weapons and Warfare in Renaissance Europe 1400-1700, Royal Armouries Leeds.

Schell, J. (2008). *The art of game design: a book of lenses*. Amsterdam: Morgan Kaufmann

Winning Moves Ltd. Top Trumps (Game)