Literature Review -2

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Aiming High: Undergraduate Research Projects in Computer Graphics and Animation

(Secondary Paper)

Abstract:

Among educators, the promotion of undergraduate research is a much debated topic, with issues arising from questions as to how it can be integrated with undergraduate degree programmes and how to structure its delivery.

Undergraduate research is also considered important by employers, as can be seen in case of the computer game development and visual effects industries who demand that universities produce graduate software developers with not only vocational but also with rather advanced research skills. In this paper we present a successful undergraduate research course, implemented for one of our undergraduate degree programmes.

It includes teaching and learning focussed on the nature of small team research and development as encountered in the creative industries dealing with computer graphics, computer animation and game development.

We discuss our curriculum design and issues in conducting undergraduate research that we have identified through several iterations of the course.

Summary:

This article explains about the importance of having undergraduate research projects in computer graphics. It further explains the importance of research in CG, by claiming that it can be advantageous to Computer Science education in general.

Research skills are also highly sought by industry and Research and Development (R&D) is a big part of a modern life of practically all the companies whose main business is concerned with Computer Graphics and its applications, such as visual effects.
This is especially true in the case of large international companies.

Although different companies have different research policies, mostly the research is project-based i.e improving the existing system or methods primarily concerned only with the project. But the course of the research should be more long-term than just be specific to the project.

This serves as the motivation for introduction of research based course for undergraduates that is developed and implemented and further explained in this article.

The course designed had the following challenges that were presented to the students as part of collaborated research projects:

1. Solving real world problems
2. Show n Tell Student Seminars

The outcome of the course also suggests that some of the students were able put their research for submission at conferences and one of which resulted in publication of a paper at an established computer graphics conference and another student has embarked on a doctoral degree programme.

The course can be considered successful until now although the students participating have only been a small number. However, the rapidly evolving nature of Computer Graphics technologies demands a lot changes in the curricula every now and then which can be demanding and its success is always in scrutiny.

Distinctive Approaches to Computer Graphics Education

(Primary Paper)

Abstract:

This paper presents the latest advances and research in Computer Graphics education in a nutshell. It is concerned with topics that were presented at the Education Track of the Eurographics Conference held in Lisbon in 2016.
We describe works corresponding to approaches to Computer Graphics education that are unconventional in some way and attempt to tackle unsolved problems and challenges regarding the role of arts in computer graphics education, the role of research-oriented activities in undergraduate education and the interaction among different areas of Computer Graphics, as well as their application to courses or extra-curricular activities.
We present related works addressing these topics and report experiences, successes and issues in implementing the approaches.

Summary:

The main motivation behind this paper is the link between Computer Graphics and other domains. Here, they primarily focus on the relation between Arts and Game technology, teaching students knowledge in a "scholarly" way and also the role of research components in Computer Graphics Education.
The experiments are described which tackle with problems in Computer Graphics that are related to:
1. Arts and its relation to Computer Graphics courses.
2. Whether or not a Visualization course can be advantageous in Game Development.
3. The importance of research based curriculum for Undergraduates

This paper claims that Arts and game technologies are connected to CG. Traditionally, CG productions are like a collaboration between artists and CG experts, in which artists learn some CG basics that they can be used in their domains creatively.

They demonstrate by having collaboration of an art and graphics design course that conversely immersed science students into the field of art. This course showed that in many projects, art and CG science comes closer together.
Precisely, CG students have been able to design and develop new graphics tools for artists in close cooperation with them. The experiment demonstrated that science students can

understand the requirements of artists better, as a result produce new tools, which are of high quality and well-tuned to artistic needs.

The visualization course in game development introduces an emphasis on visual analytics, scientific and information visualization for a game development programme.
This experiment showed that teaching visualization in game development can actually be relevant for students.It also showed that distinguishing such a course from traditional visualization courses, for example by providing more concrete case studies in games, is necessary.
The figure below depicts (taken from the article) the use of eye tracking technology that was used to generate data from games as a part of visualization in game development project exploring what interface elements are used and important for the game experience: (left) original game with areas of interest used in the eye tracking analysis, (middle) transparent heat map of attended areas and (right) redesigned game based on the analysis.
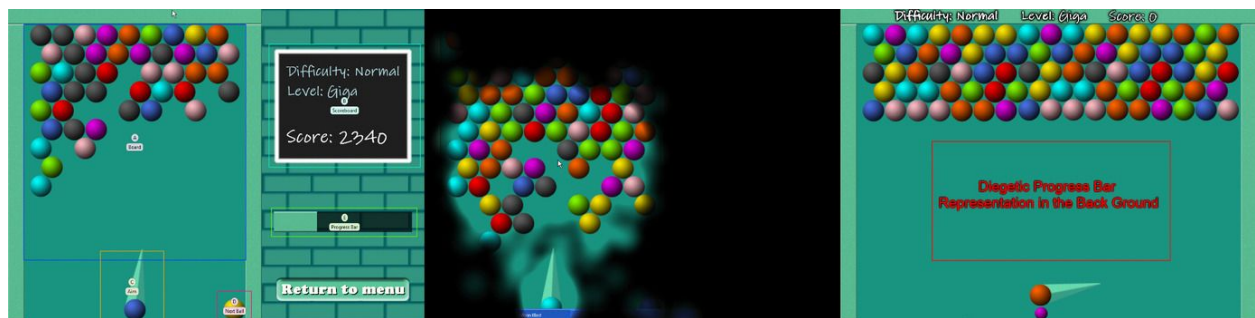

Bringing undergraduate students into research, that are more usually experienced by post-graduate students proved to be an effective method. The undergraduate CRP in CG and animation of the NCCA provided students with skills that are required to develop a software artefact solving a CG research problem, not just by providing the software but also by delivering a report in the form of an academic paper.

This activity seems to help in further engaging students who would otherwise be disengaged due to lack of challenge. Results demonstrate that this course has led to some conference submissions to established CG conferences, also showed that integrating research components into curricula can serve as an incentive for faculty members to become involved.

The relevance of research components in an undergraduate programme has also been confirmed by the annual CESCG that are described in the paper.

The figure below (taken from the article) shows the number of authors who pursued a graduate study after the CESCG (blue) compared to the total number of authors for the respective year (orange).
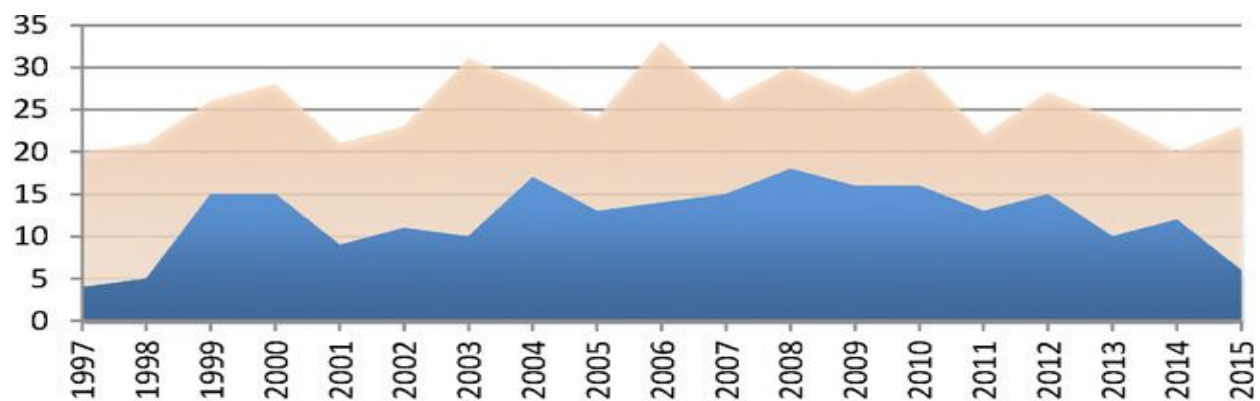
However, integrating a research component at undergraduate level remains still remains quite challenging. Also, the methods to increase the interest and availability of supervisors, which is a significant factor for research-related education activities still needs to be explored further

Engaging undergraduate students in research is primarily constrained by the interest of faculty members. Designing courses and curricula that increase this interest is pivotal. Computer Graphics is a quick evolving Computer Science field which is holding a more and more central place in our lives.

Beyond the more traditional CG-related fields of game development and visual effects for media productions, that were in this paper, Computer Graphics is steadily introducing novel application domains like recently computer-assisted fabrication and computational photography.

Maintaining relevant courses for teaching CG, in the light of these emerging applications will be a key challenge for future research in CG education. The article concludes by posing several questions such as: "should novel applications systematically be integrated into CG curricula, and if yes, how can links with the corresponding scientificfields be created? How can we evaluate the success of these courses given the specificities of CG and related fields?", which leaves us with the scope for further research on this domain.

Conclusion

The two papers cite the importance having research based learning in Computer graphics to be beneficial to Computer science education as a whole and also to provide the students an exposure of writing an academic paper along with software development skills from a undergraduate-level.

The number of submissions at conferences can also gain the interest of an instructor which is an important component for research to be part of the curricula as prescribed by both papers. However, the rapidly evolving nature of Computer Graphics technologies demands a lot changes in the curricula every now and then which can be challenging to deal with, and its success is always in scrutiny.