

Dr Silvester Czanner  
Collaboration Fund Project

### 1. Project Title

Computer Graphics Virtual Textbook

### 2. Keywords

Computer Graphics, Java Applets, E-learning, Interactive WEB pages

### 3. Summary

In this report we present an ongoing project entitled 'Computer Graphics Virtual Textbook', which will have both local and international outcomes.

The objective of this project is twofold:

1. It will enhance undergraduate research activity at the University of Warwick and at the Comenius University (Slovakia) by involving more than a hundred undergraduate students in developing the Computer Graphics Virtual Textbook.
2. It will create an interactive series of web pages called 'Computer Graphics Virtual Textbook' with Computer Graphics (CG) content. It will be used as supplementary material for CG courses but it will also be an independent source of information for all people interested in Computer Graphics. It will contain description of the very basic CG methods such as the plot of a point, a line and a circle and also the advanced methods such as modelling, rendering and visualization techniques, fractals etc. Small interactive java applets are used to support the interactions. Java applets allow users to try and see how the described algorithm/method is working in real time.

### 4. Activities

This project started in June 2007. Initially we tried to establish collaboration and to involve some undergraduate students from the Computer Science Department, University of Warwick. This initiative was not successful. We then switched our attention to the School of Engineering, University of Warwick and found more interest, particularly from Mr Richard Belfit, a 3<sup>rd</sup> year student of Social Engineering. Based on his background and experience we offered him the opportunity to collaborate; he accepted the offer and we are very pleased to note that he is a great addition to the project team. The rest of the team members are students and academics from Comenius University (CU), Slovakia. The team leader from the CU site is Professor Andrej Ferko.

We organised an initial meeting at CU in Bratislava on 20-21 September 2007, and established a project team including the following team members: Dr. Silvester Czanner (U Warwick), Prof. Andrej Ferko (CU), Dr. Pavla Nunukova (CU), Dr. Jan Lacko (CU) and Dr. Juraj Stugel (CU). During this meeting it was decided that the project would be mostly developed at CU, due to the lack of interest from students at the University of Warwick. We also discussed the content of the virtual textbook. We took into account general recommendations of the ACM Computing Curriculum, part Graphics and Vision, related and specialized fields [BAN01] [BRO87], [CHA96], [RF00], [GW93], [LEB01], and last but not least the recent SIGGRAPH Knowledge Base Report [ALL06].

We took into account nearly all these materials when innovating the courses at Comenius University. In particular, the *Computer Graphics Introduction* course for mathematicians (Bs study program) covers the following topics: computer graphics definition and reference model; history,

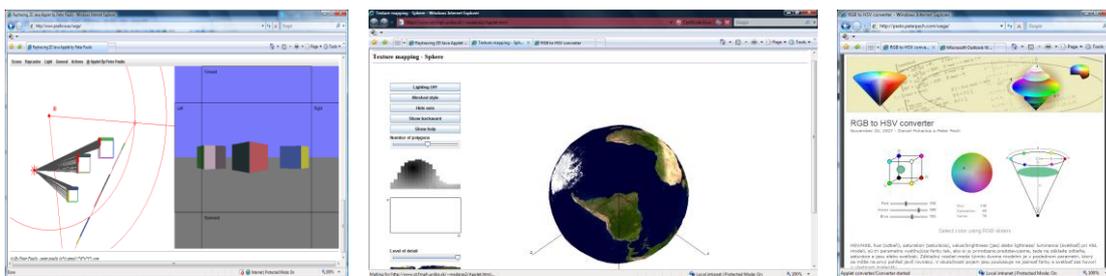
fundamental problems and their solutions; transformations in the plane; basics of functional specification of graphic systems and standards; graphical objects creation, modification, and coding; rasterisation; clipping and intersections; image processing algorithms. The same course for computer science students covers not algorithms but focuses on tools. An optional course named *Web Graphics* offers know-how and hands-on experience in a dynamic area of internet communication using multimedia objects.

We decided to offer the development of the applets to 3rd year students who are taking the course named *Web Graphics* offered by Department of Applied Informatics at Comenius University. The development of the java applets was a part of a class assignment. A partial motivation for this stems from the fact that many students at Comenius speak poor English. Therefore, the terminology and explanations from a local textbook [RF95] was adapted [SF01]. We see the contribution of this project both in English and local language versions in enrichments of the global graphics community with the largest family of applets, which will grow and grow. The best parts of this textbook aim at being contributed to CGEMS finally [CGE07].

Students have to complete their own web page, one applet and a 3D object, e.g. a church VRML model from their village. The applets are evaluated in a contest. The best students can enter two more competitions to get themselves to SCCG and CESCg international events. In total, one student must enter one competition and two more competitions are available each year. Each student can modify an existing educational applet from [SF01] or develop an original design. Eventually, two students can cooperate, when the topic is too complex. The first three prizes consist of a copy of the book *Selling Graphic and Web Design* by Donald Sparkman, February 2007. The jury is composed of teachers and PhD students.

**Current Status:** Currently we have over 60 new or significantly improved applets. 25 suitable to enter one of the competitions. Here are the winners of the student class competition:

1. place: <http://www.pixellove.eu/wega/>
2. place: <http://www.st.fmph.uniba.sk/~madaras2/Applet.html>
3. place: <http://pesto.peterpech.com/wega>



This project is coming to its second stage, where we will collect all the suitable applets, correct the descriptions and improve the English. Finally the collection of the applets will be released as the Computer Graphics Virtual Textbook. The project will continue in future years with identifying relevant ideas from all references (curricula, textbooks, etc.) and grow the coverage of graphics textbooks with applets

## 5. Outcomes

There have been two publications derived from this project:

1. S. Czanner, J Stugel, Computer Graphics Virtual Textbook, SCCG'07, *International Summer Conference of Computer Graphics*, Budmerice, Slovak Republic, March 2007
2. S. Czanner, P. Nunukova, *Java Applets as an Efficient Tools for Computer Graphics Education*, in: 8<sup>th</sup> International Conference Virtual University 2007 proceedings, Bratislava, Slovakia, 2007

One invited talk at an international conference Virtual University 2007:

1. Java Applets as an Efficient Tools for Computer Graphics Education, 8<sup>th</sup> International Conference Virtual University 2007, Bratislava, Slovakia, 2007

## 6. Implications

We are planning to use the outcomes of this project as supplementary material for undergraduate engineering students that we are supervising during their 3<sup>rd</sup> year projects. We are also planning to establish a Masters program at WMG, WDL, which will involve Computer Graphics. The outcomes from this project will be very suitable as a supplementary course material for some of the courses from this program.

## 8. References

- [BAN01] BANNATYNE M. W.: Addressing ethical issues in computer graphics curricula. In *Fifth International Conference on Information Visualisation* (2001), pp. 263 – 268.
- [BRO87] BROWN M. H.: *Algorithm Animation, PhD thesis*. ACM Distinguished Dissertations, The MIT Press, 1987.
- [CHA96] CHAZELLE B.: Application challenges to computational geometry. *online, TR-521-96* (1996). <http://www.cs.princeton.edu/~Chazelle/taskforce/CGreport.ps> .
- [RF00] R. FISHER S. PERKINS A. W. E. W.: Image processing reference (hipr). *Edinburgh: University of Edinburgh* (2000). <http://www.dai.ed.ac.uk/HIPR2> .
- [GW93] GONZALES R. C., WOODS R. E.: *Digital Image Processing*. Reading MA: Addison-Wesley Publishing Company, 1993.
- [LEB01] LEBER F.: Bildanalyse und computergrafik. *online* (2001). <http://www.icg.tu-graz.ac.at/~Education/Vorlesung>
- [ALL06] ALLEY T.: Computer graphics knowledge base. <http://education.siggraph.org/resources/knowledge-base/CKB-report>
- [RF95] RUZICKY E., FERKO A.: *Pocitacová grafika a spracovanie obrazu [Computer Graphics and Image Processing, in Slovak]*. Bratislava: SAPIENTIA, 1995.
- [SF01] STUGEL J., FERKO A.: Vyucba pocitacovej grafiky (computer graphics teaching). *online* (2001). <http://pg.netgraphics.sk> .
- [CGE07] Cg educational materials source. *online* (2007). <http://cgems.inesc.pt> .

## 9. Contact details

Dr. Silvester Czanner  
RCUK Academic Fellow

Warwick Manufacturing Group  
Warwick Digital Laboratory  
The University of Warwick  
Coventry, CV4 7AL  
United Kingdom

e-mail: [S.Czanner@warwick.ac.uk](mailto:S.Czanner@warwick.ac.uk)  
tel. : +44 (0) 24 765 28028