

Technical Report Series of DCGI, Volume 2, Year 2012

Department of Computer Graphics and Interaction

Czech Technical University in Prague, CZ

Faculty of Electrical Engineering

Website: <http://dcgi.fel.cvut.cz>

DCGI Annual Report 2011

Jiří Žára, Petr Felkel, Pavel Slavík,
Jiří Bittner, Alena Mrázková

Authors' Addresses

Jiří Žára

Department of Computer Graphics and Interaction
Czech Technical University in Prague, FEE
Czech Republic

Petr Felkel

Department of Computer Graphics and Interaction
Czech Technical University in Prague, FEE
Czech Republic

Pavel Slavík

Department of Computer Graphics and Interaction
Czech Technical University in Prague, FEE
Czech Republic

Jiří Bittner

Department of Computer Graphics and Interaction
Czech Technical University in Prague, FEE
Czech Republic

Alena Mrázková

Department of Computer Graphics and Interaction
Czech Technical University in Prague, FEE
Czech Republic

Publication Notes

This report describes the teaching and research activities of the department in year 2011. The text formatting style of the report is slightly different to standard technical reports.

Technical Report Series of DCGI, available at <http://dcgi.fel.cvut.cz/techreps>,
Department of Computer Graphics and Interaction, Czech Technical University in
Prague, Faculty of Electrical Engineering, Czech Republic.

ISSN 1805-6180

Copyright © Department of Computer Graphics and Interaction, Faculty of Electrical
Engineering, Czech Technical University in Prague, September 2012.

Content of the Annual Report

1. Personnel.....	2
1.1 Highlights	3
1.2 Summary	3
2. Education	3
2.1 Highlights	5
2.2 Summary	6
3. Scientific results	6
3.1 Highlights	7
3.2 Summary	7
4. Projects	8
4.1 Research projects	8
4.2 Cooperation with industry	8
4.3 Labs at the department	9
4.4 Highlights	9
4.5 Summary	9
5. Finance	10
5.1 Highlights	10
5.2 Summary	11
6. Other activities.....	11
7. Plans.....	12
7.1 Planned habilitations	12
7.2 Planned residencies in abroad.....	12

The Department of Computer Graphics and Interaction (DCGI) was founded in 2008. This Annual Report presents DCGI achievements in its 4th year of being part of the Faculty of Electrical Engineering, the Czech Technical University in Prague. Further information about department can be found on the website of DCGI: <http://dcgi.fel.cvut.cz>.

Management

Head:	Prof. Jiří Žára
Deputy heads:	Dr. Petr Felkel (education) Prof. Pavel Slavík (HCI research) Dr. Jiří Bittner (CG research)
Administrative head:	Dr. Alena Mrázková

1. Personnel

The DCGI consists of two research groups - Computer Graphics group (CG) and Human-Computer Interaction group (HCI), both closely co-operating.

Full and Associate Professors

Prof. Jiří Žára, CG

Prof. Pavel Slavík, HCI

Doc. Vlastimil Havran, CG

Lecturers and Researchers

Dr. Roman Berka, CG and Institute of Intermedia (IIM)

Radek Bien, HCI

Dr. Jiří Bittner, CG

Dr. Ladislav Čmolík, HCI and CG

Dr. Petr Felkel, CG

Dr. Martin Klíma, HCI

Jaroslav Kučera, HCI

Dr. Zdeněk Míkovec, HCI

Jaroslav Sloup, CG

Dr. Adam Sporka, HCI

Dr. Daniel Sýkora, CG

Ak. mal. Lucie Svobodová, Graphics and Art Education

Jan Vystrčil, HCI

External education and research assistants

David Ambrož, CG

Tomáš Barák, CG

Jan Buriánek, CG

Jakub Franc, HCI

Ondřej Macháček, CG

Hynek Pakosta, CG

Přemysl Rucký

Jiří Štěpán

Jiří Trnka

Dr. Ondřej Žára

Ph.D. students

Elena Dušková, CG

Václav Gassenbauer, CG

Filip Hanzl, HCI

Michal Hapala, CG

Michal Lukáč, CG

Miroslav Macík, HCI

Ivo Malý, HCI

Lukas Matthias Novosad, CG, up to September

Ondřej Poláček, HCI

David Sedláček, CG

Administrative and Technical Support

Klára Dvořáková

Lukáš Heřbolt

Dr. Alena Mrázková

Ivana Přádová

Martin Vaňko

1.1 Highlights

The main success in the professional situation of the personnel was the achievement of the associate professor („doc.“) degree by Dr. Havran. Further, Ing. Čmolík and Ing. Gassenbauer have successfully completed their doctoral studies and achieved the Ph.D. degrees.

1.2 Summary


In 2011, the DCGI consisted of 2 full professors, 1 associate professor, 13 lecturers and researchers (8 of them with the Ph.D. degree), 10 doctoral students, and 5 members of the administrative and technical support staff.

Unfortunately, Lukas Matthias Novosad terminated his Ph.D. studies without completing them and left the department.

2. Education

The following tables provide an overview of the courses taught at the department. The courses are mostly taught in Czech, consequently, the course names are mostly in Czech:

Study Program: STM - Software Technology and Management, bachelor track, compulsory courses (PO)

Course Code	Course Title	Guaranteed / Lectured by	Substitute	Students
A7B39MGA	<i>Multimediální a grafické aplikace</i>	Ing. Čmolík Ladislav, Ph.D.	in progress	77
A7B39MM1	<i>Multimédia 1</i>	Ing. Berka Roman, Ph.D.	Sporka, Kadlec, Rund, Hybler, Travnicek	63
A7B39PGR	 <i>Programování grafiky</i>	Ing. Felkel Petr, Ph.D.	Sloup, Havran	94
AD7B39PGR	<i>Programování grafiky</i>	Ing. Michal Lukáč	Sloup, Felkel, Havran	9
A7B39TUR	<i>Testování uživatelských rozhraní</i>	Prof. Ing. Slavík Pavel, CSc. / Ing. Adam Sporka, Ph.D.	Míkovec, Slavík	79
A7B39WA1	<i>Vývoj webových aplikací</i>	Ing. Klíma Martin, Ph.D.	Míkovec	97
A7B39WPA	<i>Webové a podnikové aplikace</i>	Doc. Ing. Kouba Zdeněk, CSc.	Klíma	73
AD7B39WPA	<i>Webové a podnikové aplikace</i>	Ing. Klíma Martin, Ph.D.	Kouba	31

Study Program: STM - Software technology and Management, bachelor track, optional courses (V)

Course Code	Course Title	Guaranteed / Lectured by	Students
A7B39GRT	<i>Grafická tvorba</i>	Akad. mal. Svobodová Lucie	98
A7B39ITT	<i>Intermediální tvorba a technologie I</i>	Ing. Berka Roman, Ph.D.	7
A7B39ITT2	<i>Intermediální tvorba a technologie II</i>	Ing. Berka Roman, Ph.D.	3
A7B39KMA	<i>Kurz multimediálních aplikací</i>	Ing. Berka Roman, Ph.D.	19
A7B39MVR	<i>3D modelování a virtuální realita</i>	Prof. Ing. Žára Jiří, CSc.	18
A7B39PDA	😊 <i>Principy tvorby mobilních aplikací</i>	Ing. Míkovec Zdeněk, Ph.D.	84
A7B39PHA	<i>Počítačové hry a animace</i>	Prof. Ing. Žára Jiří, CSc. / Ing. Buriánek Jan	38
A7B39SDO	<i>Správa digitálního obsahu v organizacích</i>	Prof. Ing. Slavík Pavel, CSc. / Ing. Štěpán Jiří	30

Study Program: OI - Open Informatics, bachelor track, compulsory courses (PO)

Course Code	Course Title	Guaranteed / Lectured by	Substitute	Students
A4B39TUR	<i>Testování uživatelského rozhraní</i>	Prof. Ing. Slavík Pavel, CSc. / Ing. Adam Sporka, Ph.D.	Míkovec, Slavík	39
A4B39WA1	<i>Vývoj webových aplikací</i>	Ing. Klíma Martin, Ph.D.	Míkovec	74

Study Program: OI - Open Informatics, master track, compulsory courses (PO)

Course Code	Course Title	Guaranteed / Lectured by	Substitute	Students
A4M39APG	<i>Algoritmy počítačové grafiky</i>	Prof. Ing. Žára Jiří, CSc.	Bittner	36
A4M39DPG	<i>Datové struktury počítačové grafiky</i>	Doc. Ing. Havran Vlastimil, Ph.D.	Bittner	33
A4M39MMA	<i>Multimédia a počítačová animace</i>	Ing. Berka Roman, Ph.D.	in progress	19
A4M39NUR	<i>Návrh uživatelského rozhraní</i>	Prof. Ing. Slavík Pavel, CSc.	Míkovec	67
A4M39VG	<i>Výpočetní geometrie</i>	Ing. Felkel Petr, Ph.D.	Havran	15
A4M39VIZ	<i>Vizualizace</i>	Prof. Ing. Slavík Pavel, CSc.	Čmolík	19
A4M39WA2	<i>Vývoj webových aplikací 2</i>	Ing. Klíma Martin, Ph.D.	Šedivý	52

Study Program: OI - Open informatics, master track, optional courses (V)

Course Code	Course Title	Guaranteed / Lectured by	Students
A4M39PGR2	😊 <i>Programování grafiky 2</i>	Ing. Felkel Petr Ph.D.	22
A4M39PUR	😊 <i>Psychologie v HCI</i>	Ing. Felkel Petr Ph.D. / Mgr. Franc Jakub / Ing. Míkovec Zdeněk, Ph.D.	23
A4M39RSO	😊 <i>Realistická syntéza obrazu</i>	Doc. Ing. Havran Vlastimil, Ph.D.	9
A4M39GPU	😊 <i>Obecné výpočty na grafických procesorech</i>	Ing. Sloup Jaroslav	37

Doctoral Study Program: Informatics and Computer Science (IVT)

Course Code	Course Title	Guaranteed / Lectured by	Students
XP39PMV	<i>Pokročilé metody vizualizace dat</i>	Prof. Ing. Slavík Pavel, CSc.	3
XP39PUR	<i>Psychologie pro uživatelské rozhraní</i>	Mgr. Franc Jakub	2
XP39VPG	<i>Výpočetní geometrie</i>	Ing. Felkel Petr, Ph.D.	1
XP39VR	<i>Virtuální realita</i>	Prof. Ing. Žára Jiří, CSc.	0



😊 *Smiley denotes courses recommended by the Open Informatics Study-Program Advisory Board. By this recommendation, the board guarantees the quality of the courses.*

2.1 Highlights

We have successfully developed teaching of the modern graphics processors programming. With respect to the trends in modern computer hardware, we have innovated the fundamental Computer graphics course to OpenGL v3.3 Core Profile. Further we have evolved the course on the General Purpose Computing on GPU.

We have enhanced the cooperation with the Faculty of Information Technology (FIT). We have successfully taught two courses (BI-PGR - Fundamentals of Computer Graphics by Vlastimil Havran and MI-DZO - Digital image processing by Daniel Sýkora) there and offered 20 students from FIT to attend the Computer Games and Animation Course.

We have intensified teaching of Human Computer Interaction (HCI) by overtaking the Software engineering branch of Open Informatics study program and enhancing it to *Software engineering and interaction*. To fulfill the aims of the IEEE HCI strategy, we have created a new humanity course for the students of the Human Computer Interaction branch - A4M39PUR - Psychology for HCI (*Psychologie v HCI*).

Eight courses have been approved and added to the list of courses recommended by the Open informatics Study program advisory board.

2.2 Summary

We concentrate on teaching in three study programs: Software technology and management (bachelor), Open informatics (bachelor and master) and Informatics and Computer Science (doctoral). We innovate our courses to be on top in teaching of Computer graphics and Human computer interaction. We cooperate with the Faculty of informatics (FIT), teach there and invite their students to take parts in our projects.

In comparison to previous years, we have a dropout in number of students of computer graphics and human computer interaction study programs, but the sum of students taught in the semesters in all courses is stable (from 2464 in 2010/11 to 2226 in 2011/12 - these numbers show the sum of all students subscribed to all courses taught by our department).

3. Scientific results

In 2011 the members of the department created in total 45 registered research results. As the most valuable we consider two papers in impacted journal Computer Graphics Forum and papers presented at important conferences in the field such as ACM I3D, NPAR, and SIGCHI. Another important research result is our first international patent application. The members of the department actively participated in the computer graphics and human computer interaction community by being members of numerous international conference programme committees and compiling reviews for prestigious journals.

Research results overview

In total 45 records in VVVS, 28 have been submitted to the RIV national database.

Publication results

- 4 journal papers (CLA)
 - 2 in impacted journals (V. Gassenbauer et al., M. Hapala and V. Havran)
- 15 papers in proceedings (STA)
- 13 papers in electronic proceedings (EST)
- 2 chapters in a book (KAP)
- 2 dissertation theses (PHD)
- 1 functional sample (FVZ)
- 1 patent application (PAP)
- 1 research report (VZP)
- 4 invited talks (PRE)
 - 3x D. Sýkora, 1x J. Žára et al.
- 1 workshop organization (WSH)

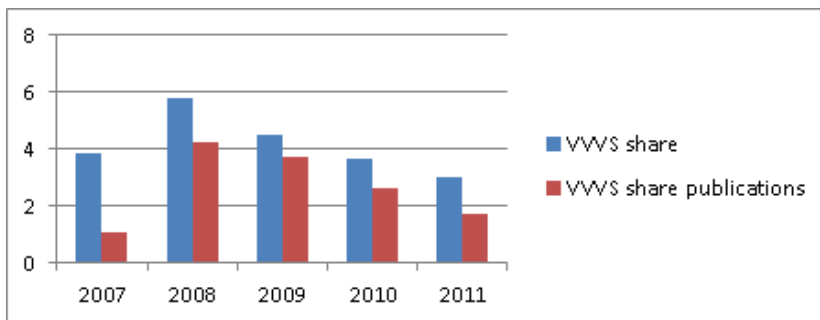
Acknowledgments of the research community

- 1x Awarded work – D. Sýkora – NPAR Best Paper (Animation)
- 8x Study program committee (J. Žára, P. Slavík)
- 1x Scientific board committee (P. Slavík)
- 1x Associate editorship for impacted journal (V. Havran)
- 24x Conference international programme committee
- 32x Journal reviews

Importance of the research results within the faculty

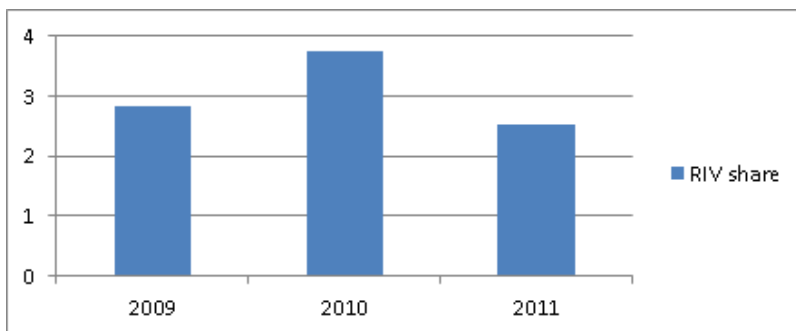
The share of the department on the research results within the faculty according the VVVS in 2011 was 3.03%. The share of the department according to RIVV 2011 (years 2006-2010) was 2.53%.

The development of the results share of the department within the faculty according to VVVS (blue bars represent the relative share of the total amount of points in VVVS, the red bars represent the relative share of the points related to publications only):



The results share of the department according to RIV:

- RIVV2011 (2006-2010): 2.53%
- RIVV2010 (2005-2009): 3.75%
- RIVV2009 (2004-2008): 2.83%



3.1 Highlights

We highly acknowledge the journal publications in Computer Graphics Forum of Václav Gassenbauer, Michal Hapala, and Vlastimil Havran. We also acknowledge the effort of Zdeněk Míkovec who worked as a leader of three larger research projects (ACCESSIBLE, AEGIS, TIP).

3.2 Summary

In 2011, the members of the department published 32 research papers (including 2 impacted journal papers), 2 book chapters, and 2 dissertation theses. Several members of the department were intensively involved in international research activities such as serving as international conference programme committee members and writing reviews for impacted journals and conferences. The number of international citations of previous research work of the department members remains reasonably high.

However, during the last four years the share of the publication results measured by points in the faculty research database (VVVS) has declined from 4.1% to 1.8%. We are particularly not satisfied with the

number of publications and specifically those in impacted journals. We plan to conduct actions in order to improve the publication output of the department in the next years.

4. Projects

4.1 Research projects

In 2011 the department was involved in 14 research projects, which include four European FP7 projects, one project from the National Grant Agency of the Czech Republic, one Marie-Curie action project, and several other project funded mostly from the national funding agencies. Out of the 14 projects 5 started in 2011 and 7 terminated at the end of the year 2011.

- Research in the Area of the Prospective Information and Navigation Technologies. MSM6840770014. 2005-2011.
- Center of Computer Graphics. LC06008. 2006-2011.
- AEGIS - Open Accessibility Everywhere: Groundwork, Infrastructure, Standards. FP7-ICT-224348. 2008-2012.
- SUCESS - SUN Microsystems, Inc. Center of Excellence. 080321-ZPX. 2008-2011.
- Efficient algorithms for synthesis of images and animations. SGS10/289/OHK3/3T/13. 2010-2012.
- Automatically generated user interfaces in nomadic applications. SGS10/290/OHK3/3T/13. 2010-2012.
- Interactive Modeling and Visualization of Virtual Urban Spaces. SGS10/291/OHK3/3T/13. 2010-2012.
- VERITAS. FP7-ICT-247765. 2010-2012.
- ToonPaint. FP7-268216. 2010-2012.
- Implementing Video-Based, Remotely Accessible Virtual Environment System. CESNET. 110006. 2011-2011.
- Global Illumination for Augmented Reality in General Environments. GAP202/11/1883. 2011-2013.
- Interactive services for digital TV broadcasting. TIP. FR-TI2/128. 2011-2011.
- ACCESSIBLE. FP7-ICT-224145. 2011-2011.
- Laboratory for computer graphics education and applications. FRVS. F1a 2279. F1a 2279. 2011-2011.

4.2 Cooperation with industry

Last year the department developed cooperation with several companies. The cooperation had two forms: students projects performed in cooperation with industry and commercial projects based on contracts with industrial partners.

IBM Research. In cooperation with IBM Research the students were involved in project targeted at intensive testing of voice controlled device developed by IBM for the use in cars. Another student project (low cost multi-touch display) won the first prize in student competition sponsored by IBM and was presented during the ceremony given on the occasion of 60 anniversary of Faculty of Electrical Engineering and 100 year anniversary of IBM.

HTC. Another company where the cooperation is based on student projects is HTC. Also in this case our students participated in competition where the best mobile application was selected. The ceremonial announcement of the competition results took place on HTC premises in Prague. The common activity of

HTC and our department is the Virtual Mobile Phone Lab. The equipment in the lab is used by students – especially for the projects that took part in the above named competition.

Microsoft. The cooperation with Microsoft runs in the framework of the Interoperability lab – the project of CTU Prague and Microsoft. Experts from the department participate in subprojects dealing with cloud technology.

Software602. Our department cooperates with Software602 company in the framework of the TACR project. The topic under investigation concerns design and implementation of user interfaces for multi-user environment.

KARAT. The project with the KARAT company deals with testing of special user interfaces, particularly with testing complex applications for accounting.

Interaction4u. The cooperation with Interaction4u company was based on the design and development of user interfaces for software products produced by SMEs.

Skoda-Auto. The department continued in the long term cooperation with Skoda-Auto a.s. In cooperation with the department for virtual reality techniques we worked on extending the jointly developed Virtual Reality Universal Toolkit (VRUT) software. This software was integrated in the company production pipeline. In this activity also students were involved in the form of seminar and diploma theses as well as three internships in the company. Another project developed for Skoda-Auto a.s. was the development of the electric car driving simulator which shall be used for human-machine interface evaluation and testing.

4.3 Labs at the department

There are three core labs in the department where the research is performed. In the field of computer graphics a key role plays Virtual Reality lab that is equipped with 3D wall. Besides that also the augmented reality Spinnstube® device is also used for research and education.

In the field of HCI the research and education is performed in the usability lab, where developed user interfaces are thoroughly tested in accordance with worldwide standards. Another core labs is located at the Institute for Intermedia (IIM) that is equipped with special devices like CAVE, equipment for movie production, and several other devices used in the field of lighting design. All these labs are used both for research and education what means that the students are acquainted during their study with up to date technology.

4.4 Highlights

Five new research projects started in 2011 and also other projects were granted to start in 2012. The department succeeded in extending cooperation with industry. Especially the fact that the cooperation with foreign based companies was either established or extended is a fact that deserves attention. A number of students participated in industrial projects that allowed them to get acquainted with environment in companies (such an acquaintance in many cases resulted in internship offered by several companies).

4.5 Summary

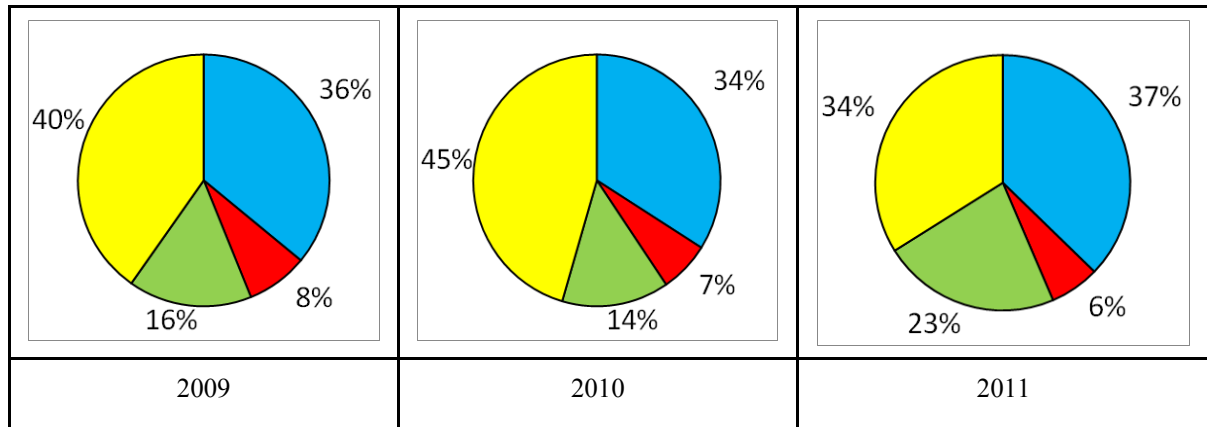
The department maintained a sufficient coverage of its research activities by the funding from research projects both from international and national sources. The cooperation with industry provides interesting research topics and is a source of practical experience for students involved in the industrial projects.

5. Finances

The budget consists of the following principal items:

- salary for employees, approx. 80%.
- travelling (conferences, meetings), approx. 10%.
- material (including computers) and overheads, approx. 5%.
- investments (servers, special laboratory instruments), approx. 5%.

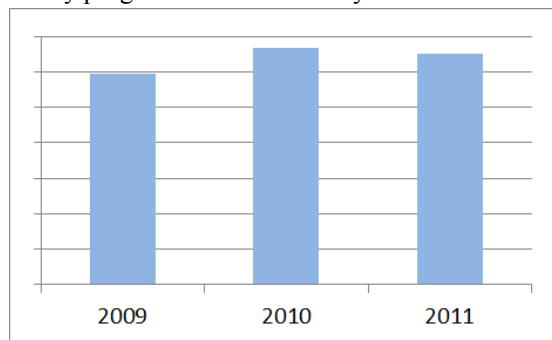
Structure of financial resources (for salaries):



Legend:

- Education
- Research support by the Czech Ministry of Education
- Czech grants and projects
- International grants and projects

Salary progress in the last three years:



5.1 Highlights

The structure of financial resources is stable. The income is a combination of:

- Education resources (from the Ministry of Education)
- Czech research grants and project
- EU research grants and project

These resources are divided approx. in the ratio of 35:20:35.

5.2 Summary

Although the overall salaries were slightly lower than in the previous year, they were still on a very good level. The portfolio of financial resources is well-balanced.

6. Other activities

Semestrals Exhibition

Two exhibitions of student works (SEMESTRALE V, SEMESTRALE VI) were organized. These regular exhibitions concentrate both on artistic and technical student results created as semestral works in courses Graphical Design (*Grafická tvorba*) and Multimedia Applications (*Kurs multimediálních aplikací*) lectured by Lucie Svobodová, Roman Berka, and David Sedláček.

Center for Computer Graphics [LC 06008] successfully completed

The national project of excellence supported by the Ministry of Education lasted for 6 years and concentrated 4 research groups from Czech leading technical universities (Prague, Pilsen, Brno). The project manager was Jiří Žára. Within the whole project, 47 journal papers, 160 conference papers, and 6 book chapters were published, 25 doctoral students obtained Ph.D. degree, and a number of other scientific results (e.g. software packages or prototypes) were achieved. After the final review meeting in April 2012, the project was finished and officially awarded with the best mark V = excellent results (*vynikající výsledky*).

Invited Talks

In 2011, the department hosted three invited talks of researchers from foreign institutions:

- Martin Čadík (Max Planck Institute for Informatics, Saarbruecken). Video Quality Assessment for Computer Graphics Applications.
- Miloš Šrámek (Austrian Academy of Sciences). Voxelization of geometric objects with sharp details.
- Andrej Ferko (Univerzita Komenského v Bratislave). Multidimensional Urban Vision.

Institute of Intermedia

The IIM Institute (<http://www.iim.cz>) has been formally attached to the DCGI department in 2011. The IIM Institute promotes study and advanced transdisciplinary research in technology, science, performance and the arts. IIM activities in 2011 included:

- 24th March - the creative group of IIM managed audiovisual performance at the Opening of the new building of CTU in Prague – Dejvice.
- 11th June - IIM made a technical support for Prague Museum Night in National Technical Library in Prague - Dejvice.
- From May 26th to June 1st - IIM organized the regular student presentations. Within the open exhibition called "Presence" in the Gallery of the National technical Library in Prague – Dejvice, students of following schools showed their projects:
 - Faculty of Electrical Engineering, CTU in Prague
 - Faculty of Architecture, CTU in Prague
 - Film and TV School, Academy of Performing Arts in Prague
 - Theatre Faculty, Academy of Performing Arts in Prague,
 - Academy of Arts, Architecture and Design in Prague,
 - Jan Evangelista Purkyně University in Ústí nad Labem.

- November 25th - the workshop on sound processing in real time with Hans Tammen from New York took place in IIM
- December 2nd - the creative group of Hana Železná presented publicly the performance "Intensity of the (non)visible" in IIM.
- December 2nd - a document about the IIM was broadcasted in the Czech TV.

7. Plans

7.1 Planned habilitations

- 2012 Jiří Bittner
- 2013 Zdeněk Mikovec
- 2014 Adam Sporka, Daniel Sýkora
- 2015 Petr Felkel

7.2 Planned residencies in abroad

Adam Sporka

- Baylor University, Waco, TX, USA. 30.4.- 2.5. Sereral invited speeches
- University of California, Santa Cruz, CA. Autumn 2012 (2 weeks or more). As a part of the TextAble project.

Vlastimil Havran

- First half of 2013, three months residency, place TBD.

Ladislav Čmolík

- TU Vienna post-doc since 2013. The residency depends on the acceptance of a Marie Curie - Funding.

Jiří Bittner

- Several short residencies at TU Vienna depending of the acceptance of a Aktion OE/CZ. funding.



Technical Report Series of DCGI, Volume 2, Year 2012

Department of Computer Graphics and Interaction

Czech Technical University in Prague, CZ

Faculty of Electrical Engineering

Website: <http://dcgi.fel.cvut.cz>

Karlovo nám. 13
121 35 Praha 2
Czech Republic

Tel: (+420) 2 2435 7557
Fax: (+420) 2 2435 7556