StoryFactory: towards using virtual characters at high-schools

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Teaching computer science and ICT at high schools is a never-ending challenge. Core knowledge of every discipline is advancing, necessitating adaptations in respective curricula, but the progress we witness today in ICT is much more rapid than progress elsewhere. Today children grow in stimulating ICT-rich environments, surrounded by computers, cameras, social networks and so on, all of which did not exist a couple of years ago. There are several major ICT innovations every year.

Our department runs annually a two-week long summer school for high-school ICT teachers in the Czech Republic, attended by more than 30 persons every year. Thus, we have the opportunity to learn how teachers cope with this rapidly changing ICT world. Our experience is that while above-average teachers do their best to familiarize themselves with innovations, they can hardly become experts on everything. For instance, many of them already know quite well social networks and have started to use the networks' educational affordances swiftly, but a lot of them are not able to use virtual laboratories and serious games.

Yet exactly these teachers should attract attention of technology-talented students and promote their ICT skills and motivation and engagement for ICT. Due to ubiquity of modern technologies and new media, students often understand some aspects of the ICT world better than their parents or teachers (see e.g. Prensky, 2006), but their understanding is usually fragmented and superficial. But if teachers' knowledge is also fragmented, how they can promote knowledge of students and increase their engagement for ICT? And in fact, even if teachers have all the knowledge needed, would constraints of the formal schooling systems permit them to explain everything in detail?

The risk is that without perceiving that the teacher can really teach them something new and without feeling appropriate support, many talented students will become frustrated and lost for further ICT studies. Our experience is that these students often ask themselves questions like "why should I continue at an ICT oriented university when I am able to learn more effectively myself than in a school?"

However, this does not mean that the students must know everything in detail when they are leaving a high-school. Fortunately, if the goal is really to attract students for ICT, it might be sufficient - though this is more our working hypothesis than a statement based on empirical facts - to teach students only some "engaging" ICT topics in detail (after covering compulsory basics such as usage of word processing software). This would lessen the requirements on teachers' knowledge. Eventually, universities, which can cover various ICT topics better than high-schools, would fill the gaps in the knowledge.

But what these "engaging" topics should be? Due to present-day hyper-stimulating environments, it is unlikely that the majority of today students would be fascinated by

programming a quick-sort in Turbo Pascal as many students were in 90ties. What else can we offer?

As a part of a larger project, called Robotomie, we have started to develop an educational toolkit that can help us to address this problem. This toolkit - we believe - can attract attention of technology-interested high-school student yet be simple enough to be easily usable by high-school teachers. The key topics this toolkit is addressing are 3D graphics, animations, virtual characters, films, and virtual storytelling. Our hypothesis is that such topics are interesting enough for high-school students because there is an innate appeal that films featuring 3D graphics, computer games, and 3D virtual reality environments have for a substantial part of this target group. Additionally, the graphical content of the toolkit has strong social aspect that is meaningful to teenagers. This, we believe, can further increase their interest. However, we do not claim that our toolkit is a silver bullet; rather, we propose that it can become one possible solution. As such, it should be, of course, supplemented by other engaging and meaningful ICT-based activities.

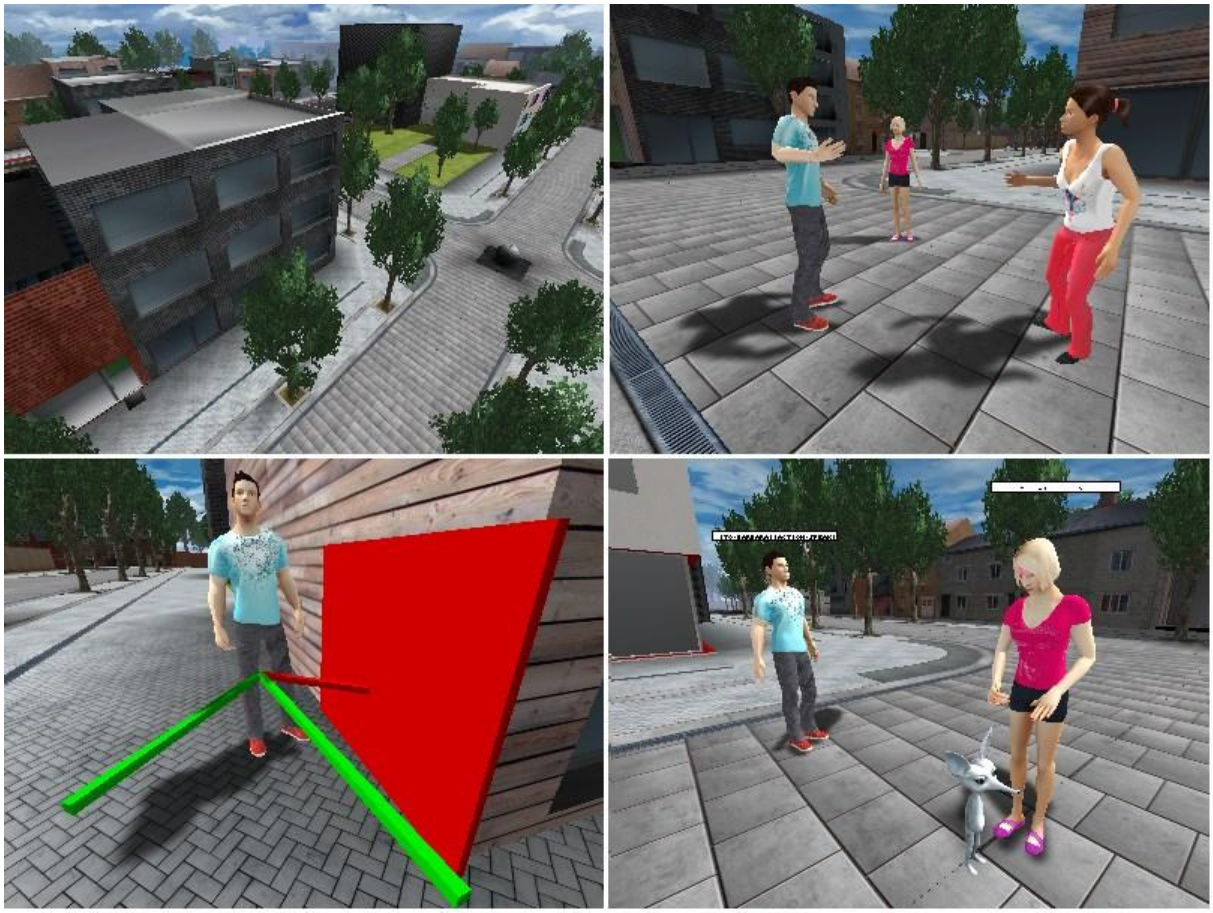

Fig. 1. Emohawk content in Unreal Engine 2: a) a virtual city, b) three characters arguing, c) a character with ray-tracing visualization, and d) girl caressing the emohawk creature.

Technically, this toolkit is intended to be a loose set of several educational applications featuring the same graphical content running on a freely available version of Unreal Engine 2 (UE2) (Epic, 2010). This engine is 6 years old, making it more likely that the applications will run on usually slightly out-dated school hardware. The graphical content is organized around

a scenario in which a teenage boy dates with two girls at the same time. The scenario is situated within a 3D virtual town with modern architecture (Fig. 1). Additionally, the scenario features a fantasy element; an emohawk creature. The emohawk is a pet having the ability to steal emotions of people and transfer them on other people. Because this fantasy element may not appeal to everyone, we treat it as optional at this moment.

Pedagogically, each application of this toolkit is intended to have its own educational objective and to be supplemented by a methodology for teachers. Based on a particular curriculum, teachers may utilize in their classes only some of these applications. In fact, more advanced applications can be also used at the college level for teaching basics of artificial intelligence for virtual characters.

Presently, substantial part of the graphical content has been already finished. Also three of the applications are being completed at the time of writing this text.

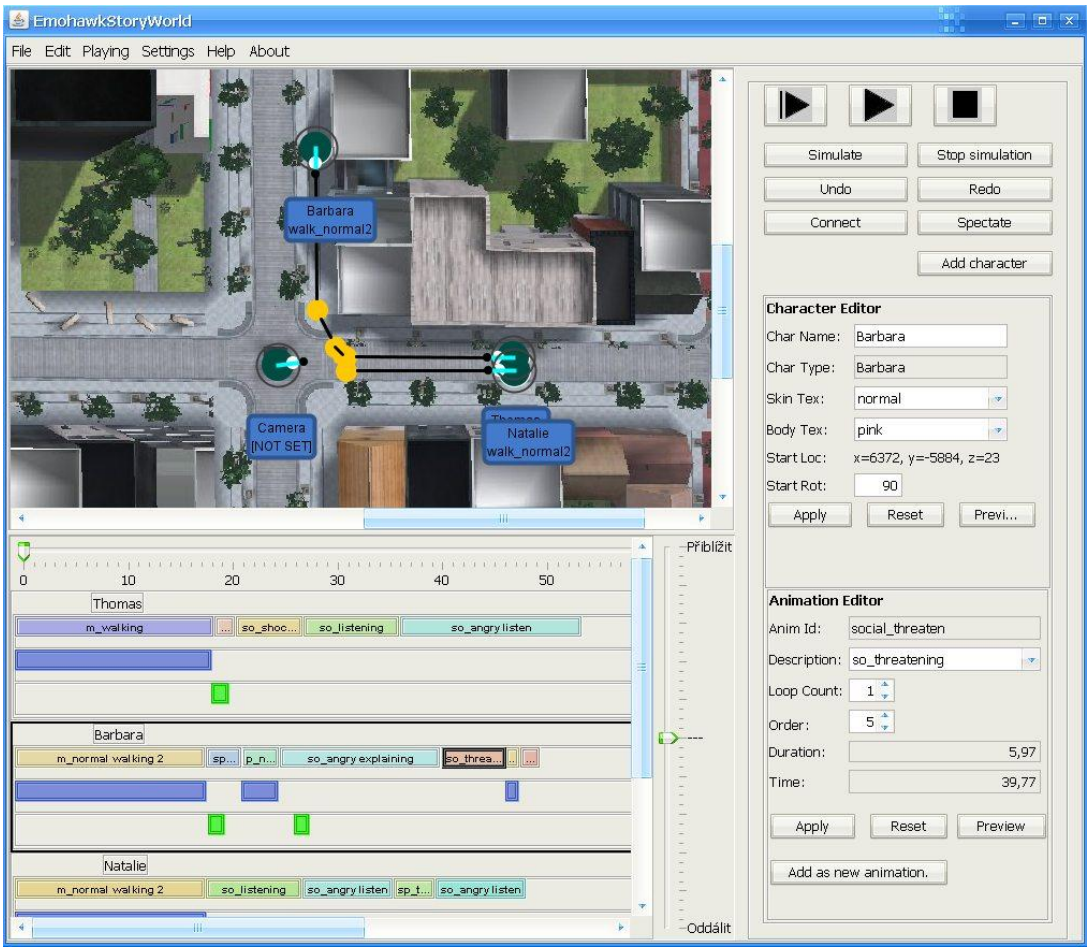

Fig. 2. StoryFactory – the graphical editor for scripting out a simple stories. Notice bird overview of the city in upper left corner and story definition visualization in lower left corner.

The first application is called StoryFactory (Fig. 2). In a nutshell, it is a toolkit for rapid development of simple silent machinimas in our virtual world. The educational objective is to familiarize students with basics of 3D animations, story composition, scene composition, and film editing. The teaching methodology is as follows: StoryFactory should be used as a

supplement after expository lecture on basics of 3D graphics and animations. The goal of the student is to produce a short (up to two or three minutes) silent machinima employing two or three main characters. The machinima should feature a simple narrative arc. Then, the machinima is to be exported to a movie clip and either dubbed or subtitled.

In fact, several tools for producing machinimas already exist (see e.g. Kirschner, 2010). However, they are often not tailored for our target group (this requires for instance very simple user interface) and/or for usage in computer labs at high-schools (i.e., simple installation, executable on out-dated hardware etc.). Short stories can be also developed in Storytelling ALICE, which can be used, in addition to teaching basics of 3D animation, to teach basics of programming (Kelleher, 2006). However, ALICE's graphical content is substantially different from our content. While ALICE's target audience is middle-school students and the graphics is tailored to that audience, we target high-school students. Even though the procedural model underlying StoryFactory may be considered as a subset of ALICE's procedural model, the surface representation in StoryFactory -- dating teenagers -- makes our tool more suitable for our target group (see, e.g., Bogost, 2007 for more on this point).

We have already made two small scale evaluations. First, we have informally evaluated graphical content with high-school students during several lectures we had at high schools about 3D virtual characters. Results suggested that the graphical content was largely accepted by this usually very critical group. Second, we conducted also a more formal evaluation with high-schools teachers as part of our summer school in August 2010 (29 teachers participated). While the results are still being analyzed, preliminary analysis suggests that a) the background knowledge of Czech ICT teachers on 3D graphics and animations is minimal, but b) can be substantially improved after one 90 minutes long lecture and 90 minutes long practical seminar with StoryFactory, and c) the acceptance of StoryFactory is positive.

The other two applications can be conceived as two levels of a serious game called Emohawk (technically, these two levels are two different programs at this moment). The target audience is not only (advanced) high-school students, but also undergraduates studying virtual characters. The game is overviewed elsewhere (Bida and Brom, 2010), suffice it to say now that each level presents a player a simple narrative in which a student should solve an interactive task. Technically speaking, characters are semi-autonomous and controlled by an appraisal driven architecture, meaning the narrative is not entirely scripted. Narratives played out are similar in complexity to narratives students should build in StoryFactory. The interaction happens from an observer perspective.

When solving a task, a student is expected to build in his or her mind mental models related to particular aspects of the topics of 3D animations and basics of virtual characters control. The first level is concerning steering rules inspired by (Reynolds, 1987), the second level adds additional complexity combining steering rules and appraisal rules.

These two applications have not been evaluated yet. We plan a formal evaluation for the 2010/2011 academic year.

Additionally, we have experience with using various parts of the Emohawk's content in our university course on virtual characters (Brom, 2009) and in tutorials at several international conferences (AAMAS 2010, CIG 2010, TIDSE 2009, Mindtrek 2009). We use either videos

demonstrating capabilities of virtual characters and/or underlying algorithms as supplements to a verbal lecture, or simulations of virtual characters.

To conclude, we have presented StoryFactory and Emohawk, supplementary tools for teaching basics of 3D graphics, animations, controlling virtual characters, films, and virtual storytelling. The main audience of StoryFactory is high-school students and the main audience of Emohawk talented high-school students and university students. Concerning virtual characters AI and the neighboring field of gaming AI, these tools are complementary to our third tool Pogamut (Gemrot et al., 2009; Brom et al., 2008). Pogamut is a more advanced toolkit for rapid development of AI of virtual characters in the world of Unreal Tournament 2004. It has been used since 2006 both at our university as well as elsewhere.

Acknowledgement. This work was partially supported by the project CZ.2.17/3.1.00/31162 that is financed by the European Social Fund and the Budget of the Municipality of Prague. The research related to this application was also supported by the Ministry of Education of the Czech Republic (Res. Project MSM0021620838), by a project P103/10/1287 (GACR) and by a student grant GA UK No. 0449/2010/A-INF/MFF. The name "Emohawk" is inspired by Emohawk: Polymorph II, an episode of Red Dward VI (BBC). Emohawk's and StoryFactory's graphical content was created by Zbynek Krulich using Mayang's Free Textures library: http://mayang.com/textures/.

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