Enhancing the creativity through engineering competitions for students

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Abstract: *This paper presents the students and mentors experience from student competitions in various fields of engineering science and technologies. Students of Subotica Tech – College of Applied Sciences took a part in lot of contests. Basic concepts and development phases of realized projects-tasks and competition rules are presented. These competitions can be divided in two groups: first, when a problem is given and you have to solve it and second, when the domain is known but you have to create innovative and original project. The biggest challenge in creating a project for the broad mass is to find good idea and motivation for idea's implementation.*

Key Words*: student competition, idea, project, challenge*

1. INTRODUCTION

Co-Creation engages not only the company and its customers but also the entire network of suppliers, partners, and employees, in a continuous development of new experiences with individuals [1]. This approach can be introduced at the University when various competitions are organized. Usually, the competitions are organized by Companies. Beside the company, the whole process engages teachers-mentors and students, and sometimes sponsors, which are other companies or civil organizations. All of them participate in the process, with the aim of providing the best solution (final product or just an idea) for the given task.

2. STUDENT COMPETITIONS

Students of Subotica Tech – College of Applied Sciences took a part in lot of contests. These competitions are an opportunity for students to work on new technologies and complex projects implementing their knowledge. Within that, students receive a great practical experience in few areas of engineering life.

3. IMAGINE CUP

The Imagine Cup is a skill-based competition comprised of more competitions. The object of this competition is to create innovative and original software applications. Open to students around the world, the competition spans one year, beginning with national and online competitions, and culminating at the World Finals, which is hosted in a different country every year [2].

In the beginning of Imagine Cup, competitors had to solve one of problems that are defined in millennium goals; education, diseases, help to people with special needs, ecology, and environmental problems. Project had to be realized with the mainly use of Microsoft technologies on different platforms. Competition consists of several phases, and each of them is elimination. Name of this competition category was Software development.

3.1. Eco Volunteer project

With this project students from Subotica Tech started their career in Imagine Cup competition. Aim of Eco Volunteer project was to help solving the problem of garbage and illegal dumps. As human society gets more and more developed, the more garbage we produce. It is a huge problem by itself, but it gets more serious when one does not care about his or hers garbage, just throws it away on the street, takes old domestic machinery to fields, forests, lakesides and leaves it there.

There were and are actions against it. Activists clean dozens of illegal dumps every year, but they are not effective. There is a gap between people who are upset about the garbage, activist who want to clean it, and businesses, who would like to make money from recycling the materials.

People like to socialize and spend lot of time talking with their friends; we care about each other, interested in what's happening with our friends. It also shows us how much interactivity is important.
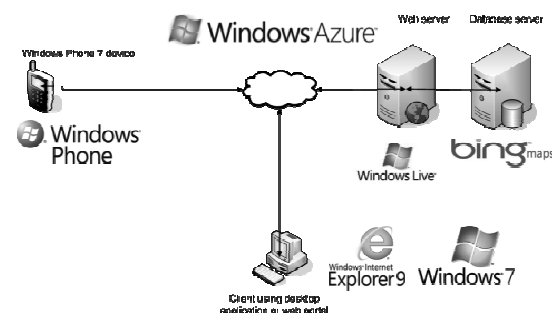

Figure 1. The schema of system

Eco Volunteer project is complex eco system that integrates computers, smartphones and the internet.

Using the website and mobile app, people could make reports of illegal dumps, put the photo of it and mark the position of it on Bing Maps. Volunteers could organize events as illegal dump cleaning. After successful action, marker of illegal dump became green and the area on map containing position of dump became also greener.

On index page of web site, users can see map of Serbia divided in regions. Every region showed number of illegal dumps, number of cleaned dumps and number of eco volunteers. Using smarthphones, reporting illegal dumps became easier. After taking the picture of dump, phone send GPS coordinates to web service and the report is archived in web site's database. This made the instant response on Bing maps, showing the new report.

Technologies used in this project were: Microsoft Silverlight, C#, Bing Maps API, Windows Live SDK, Windows Internet Explorer 9, PHP and MySQL.

With this project our team took fourth place in Serbia.

3.2. DRAC

First year of competition gave more courage to students to take a place in the development of other projects. In 2012. , Subotica Tech's students wanted to help blind people. It was only one team from our school.

The life of the blind people is very hard, even today in the 21. Century, when there are several things that make their life easier. Their biggest problem is traffic, because people sense the environment mostly trough their eyes and sadly, the other organs cannot substitute sight. On the other hand, in traffic one risks the lives of others too [3].

DRAC stands for *Digital Radar Aided Cane*. This project helps in this problem by developing a device and corresponding software. Handling should be easy, dynamic and minimalistic.

The solution consists of two parts: software running on a Windows Phone based mobile phone, and the custom built DRAC hardware. The hardware contains an ultrasound sensor which detects the distance between the objects and the phone, and then the software processes the signal and notifies the user [3].

The hardware is a Parallax PING sensor and its mandatory components, like the power supply or the DA converter. Connection between the DRAC hardware and the phone is made on the 3.5mm jack. On the mobile phone, the software processes the signal and by the frequency of the "beeps" notifies the user about the distance of the nearest object in the way the hardware is pointing [3].

For developing the application, Visual Studio 2010 SP1 and Expression Blend 4 was used.

The source code is hosted on a preview of Team Foundation Server Online, which provides excellent access to all team members to the code, tracks versions, and makes easy to do the development process in agile way.

The Windows Phone SDK was used for creating application to the Windows Phone platform. The code is written fully in C#.

Figure 2. The DRAC hardware

With this project our students won the national competition and became the official representatives of Serbia in World Finals in Sydney.

This victory was the turning point in the motivation of other students. More and more student teams were created and all of them wanted to work together. Mainly, the big obstacle was the idea. They had the technical knowledge, but the lack of ideas declined some potential competitors. The biggest problem was that our country was not listed in the next year competition for local finals in this category.

3.3 SharpShooter

In 2013., only category that was available to the students from Serbia was Game development in online qualifications.

Idea was to implement education in game with the project SharpShooter. It was a game for window mobile phones and it communicated with web service to update local data.
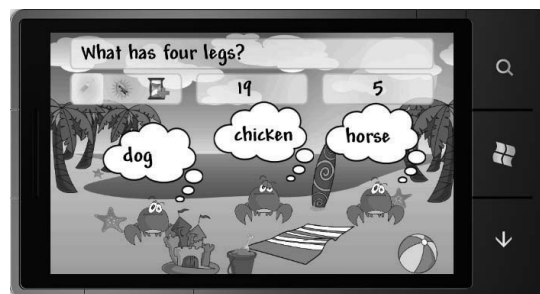

Figure 3. SharpShooter game play

The goal of this project is to raise the level of education, to make it more interesting for the next generations. Today's generations were born in a digital world, and tutorial methods have to adapt to that. Education has to be improved with the use of interactive study methods [4].

Future plans were to make a web site like a social network to give opportunity to teachers and educators to make questions in different categories.

Team passed all competition development phases, but of 220 teams just 10 were sent to the world finals.

3.4. EduSign

In 2014. Microsoft changed the name of Software development category to World Citizenship. The aim was the same but the rules of competition changed with additional round. All countries that had local finals send

their winners to online world semi-finals. After semi-finals, best 20 teams were selected to the world finals.

Students from our school won second place in this category in Serbia. This wasn't enough to the next step-world semi finals. This year Microsoft organized more challenges that were held during the every phase of competition. Our students won the honorable mentions award in User Experience Challenge and it was the only team from Europe that got this award.

Project EduSign was developed with the aim to help communication among people that are deaf and those who are not. This is a huge problem that can lead to misunderstanding and much worse problems like ignoring or not respecting those who are not able to hear or have a hard time hearing. Students recognized that problem exists in educational systems that they do not teach sign language or they do not offer those learning skills as a part of their normal program. Even when there is such institution or learning program that supports sign language, ways of learning this are often not intuitive neither fun.

EduSing platform contains non-traditional learning methods through game and fun and it is made of:

- Kinect learning software with mini-games (everything is achieved using Kinect sensor) for desktop PC

- Windows phone application that is going improve learning

- Windows 8 application for tablets

- Website that has high-scores (that are achieved from the games listed above) and some additional content.
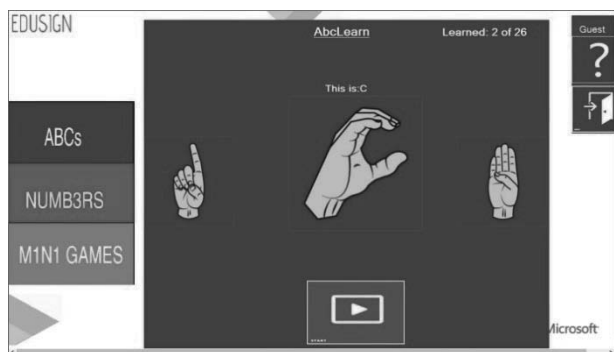

Figure 4. ABC learning

In addition to this project, there were two projects in Game Development category for online qualifications. Both of projects were done for Windows phone.

Three teams of students were involved in projects. This is the greatest number of teams for this year from our school. Some of them were very interesting to compete in previous year but as mentioned earlier, there was no local finals in Serbia.

4. ELECTROMOBIL

Electromobil competition is an international competition organized by Bosch Hungary. The main task is to design and build a vehicle, that is powered by hand drills produced by Bosch in their factory in Miskolc,

Hungary. These vehicles are engaged in a race, and the fastest one wins. This competition belongs to the group of competitions where a problem is given and the students have to solve it. In this case, strict rules and constraints had been introduced. Some of them were:

- To use six hand drills provided by the manufacturer

- To build a vehicle that has all the necessary features required for participating in a race

Students had to make teams of five (one driver, and four members of the crew). The students had four months to prepare the vehicles. That period of time was divided in several stages. After each stage, teams that did not manage to fulfill the requirements were excluded from further competition.

Fig.5 shows the final preparation of the vehicles before the race.

Figure 5. Preparation for the race

Fig. 6 and Fig.7 shows two teams from Subotica Tech during the race.

Figure 6. Team from Subotica Tech during the race

Figure 7.   Team from Subotica Tech during the race

5. RACE OF ENGINEERS

Race of engineers were firstly organized last year by IAESTE Hungary. The aim of the project is to bring technical intelligence to leading institutions and companies of Hungary.

Figure 8.   Students after getting a prize

This competition was not like an Imagine Cup when students had to make some innovative projects. Here students had to solve 7 tasks in the field of computer science and 7 from the field of electrical engineering. In online race 23 teams were competed, and the best 10 were competed in University of Óbuda (Hungary), where they had to solve problems obtained from firms. Team from our school won the third place.

6. CONCLUSION

In this paper some experience from student competitions in various fields of engineering science and technologies was presented. These competitions can be divided in two groups: first, when a problem is given and you have to solve it and second, when the domain is known but you have to create innovative and original project. The biggest challenge in creating a project for the broad mass is to find good idea and motivation for idea's implementation.

In Subotica Tech we tried to motivate the students to be involved in project development. Motivation was the opportunity to work on projects for problems and tasks of real life. This engagement gave students great experience of engineering work. They had to learn new technologies and met with new approaches of using it.

7. REFERENCES

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