Presentation of Projects in Various Engineering Competitions for Students

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Abstract— This paper presents various student projects from competitions in different fields of engineering science and technologies. Students of Subotica Tech – College of Applied Sciences participated in a number of contests and competitions. Basic concepts of the realized projects are presented. These competitions can be divided into two groups: first, when the scope is known but the requirement is to create innovative and usable project and the second, when a problem is given and it has to be solved it.

Keywords— student competition, ideas, project, challenge;

I. INTRODUCTION

Companies which are involved in technical development, usually organize competitions for students and innovative people. Beside the company, the whole process engages professors-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 for the given task with the best approaches [1]. Involving students in such competitions is a challenge for professors as well as the students. Professors need to encourage and motivate students. Students need to convince themselves that these competitions are good for acquiring new skills in various fields of engineering and science. In most cases, the awards are not the main motivation for participation, it is rather acquisition of new knowledge, friendship, team work and real life projects that are decisive.

The Second chapter gives some information about competitions of students from Subotica Tech. The third chapter provides some insight into the Imagine Cup competition and presents the most significant projects. In the fourth chapter the competition “Electromobil” is presented. The fifth chapter is dedicated to all other competitions and conferences where the College’s students participated. Projects that are described in this paper are mostly from the fields of computer science and electrical engineering.

II. COMPETITIONS FOR STUDENTS

In recent years the students of Subotica Tech – College of Applied Sciences have taken part in numerous contests. Subotica Tech is college that has 5 study programs: Informatics (with two modules), Electrical engineering (with two modules), Mechanical engineering (with two modules), Mechatronics and Technical Communication Management. This is an optimal situation with regard to students participating in various competitions, since it is likely that teams will consist of students from different study programs, which contributes to good cooperation within the team. These competitions are an opportunity for hardworking students to test their abilities to learn new technologies and to implement their knowledge working on different projects within different teams. Before, during and after the competition, students receive a great practical experience in some areas of engineering life.

III. IMAGINE CUP

Imagine Cup is a global student technology program and competition that provides opportunities for students across all disciplines to team up and use their creativity, passion and knowledge of technology to create applications, games and integrates solutions that can change the way we live, work and play. 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 for people with special needs, ecology, and environmental problems. Projects should be realized mainly with the use of Microsoft technologies on different Microsoft platforms. The competition consists of several phases, and each of them is an elimination phase. The name of this competition category was Software development [1]. In recent years new competition categories were defined as: Games, Innovation, World Citizenship, Break into Code, Code Hunt etc.

A. Eco Volunteer

This was the project that the students from Subotica Tech started their career with in the Imagine Cup competition. The aim of the Eco Volunteer project was to help solving the problem of garbage and illegal dumps. As human society is becoming more and more developed, mankind produces more garbage. It is a huge problem by itself, but it is more serious
when one does not care about their garbage, just throws it away on the street, takes old domestic machinery to fields, forests, lakesides and leaves it there.

Activists and volunteers 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 [1].

The Eco Volunteer project is a 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, the marker of an illegal dump became green and the area on map containing position of dump became also greener [1].

Landing page of web site contains map of Serbia divided in regions. Every region shows the number of illegal dumps, number of cleaned dumps and number of eco volunteers. With the use of smartphones, reporting of illegal dumps became easier. After taking the picture of the dump, phone send GPS coordinates to web service and the report is archived in the 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 the VTŠ team took the fourth place in Serbia at the National Finals.

B. DRAC project

In 2012. Subotica Tech's students wanted to help blind people with their innovative project DRAC.

The idea for this project came from the fact that the life of the blind people is very hard. Their biggest problem is traffic, because people sense the environment mostly through 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. 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 of system [3].

The hardware is a Parallax PING Ultrasonic Distance Sensor and its mandatory components, like the power supply or the DA converter. The 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].

Visual Studio 2010 SP1 and Expression Blend 4 was used in the development of the application.

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

The team CatchCake from Subotica Tech won the national finales with this project and became the official representatives of Serbia in World Finals in Sydney in 2012.

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 greatest obstacle was finding the right idea. They had the technical knowledge, but the lack of ideas discouraged some potential teams [1].

C. PRS project

Team Nepenthes created project Plant Recognition System (PRS). This project consists of application for Windows Phone and administrative interface (with more options) which communicates with each other using Windows Communication Foundation. It is project that wants to help teaching botany and biology with the use of modern technology as mobile phone. Using the telephone’s camera view the user can take pictures about the plants. It is important to put the leaves on a white
paper, that way the program can easily recognize the plant. If the user successfully took a picture of a plant, and the program recognized it, then he will see a picture of the captured plant from the system’s database, and this page will also display the plant’s name, type and family. The Next page contains much useful information about the captured plant. That way the user can learn a lot of interesting things about that plant.

The Neural network interface is a part of administrative interface. It is used to train and configure the neural network. Based on the amount of images and network properties one normally needs to specify around 500-1000 training cycles to get a good result in the recognition later. If the error rate drops below 0.01 one normally should encounter no problem in recognizing different leaf images.

The amount of input neurons for the network is normally twice the amount of tokens because of the sinus &cosine value for one token. If the training is complete then the result will be shown on the left side of the interface.

Technologies used in this project are: Microsoft Visual Studio, Microsoft Expression Blend, Windows Azure Platform, Windows Phone 7, Windows Communication Foundation (WCF), Microsoft Silverlight, MVVM (Model View ViewModel), Light Toolkit.

D. SharpShooter

This project was your first video game developed by Subotica Tech’s students for Imagine Cup competition. In 2013 the students from Serbia were able to participate only in the online qualifications.

The Idea was to implement education through a game with this project. It was a game for window mobile phones and it communicated with the web service for updating local data, like questions, answers, scores etc.

The goal of this project was to raise the level of education, to make it more interesting for the young generations. Today’s generations were born in a digital world, and the professors need to use modern methods which will adapt learning material for the needs and habits of young [4]. The complete game is to have ten Chapters. Each Chapter consists of ten Levels. Each Level has one question and multiple right, and wrong answers. Each Chapter is a different country from all over the world.

The user has to answer the question. Every question has multiple right and wrong answers. The answers are above the animals in thought clouds (these are the animal’s thoughts). The user has to tap the animals with the right answers above them (they are not hurt, they are marked with paintball and disappear). It was a plan to make a web site like a social network to give opportunity to teachers and educators to create questions in different categories.

Team Brainy-X passed all competition development phases, but it was not qualified for the world finals.

E. EduSign

In 2014, Microsoft changed the name of the Software development category to World Citizenship. The aim was the same but the rules of competition changed with an additional round. All countries that had local finals send their winners to the online world semi-finals. After the semi-finals, the best 20 teams were selected to the world finals.

Team CMOS (Coding Masters of Serbia) won the second place in this category in Serbia. Last year Microsoft organized more challenges that were held during the every phase of competition. The College’s students won the honorable mentions award in User Experience Challenge and it was the only team from Europe that received 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 are hard of hearing. Students recognized that there is a problem in educational systems, namely that they do not teach sign language or they do not offer those learning skills as a part of their normal program [5]. Even when there is such an institution or learning program that supports sign language, ways of learning this are often not intuitive, or much fun.

The EduSign platform contains non-traditional learning methods through game and fun and it consists of the following:

- 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 [5].

F. Bee or Not to Be

This project is a 3D video game mainly designed for tablets with windows OS but it can run on every personal computer with windows OS. The game is about the honey bees and their importance for humans and nature. While playing this game, players can learn some educational facts about the bees and they can improve their logical and strategic skills.

The main goal of the game is to keep alive the hive as long as possible and increase the bee population. Whole colonies of honey bees are dying all over the world. This has disastrous consequences for our biodiversity and agriculture. Without honey bees 80% of the plants will disappear. Without specific plant species, butterflies will extinct and our fruits and vegetables will diminish.

This game is part of an integrated system that contains a website blog. The website is a multiplatform and is used for exchanging information, storing high scores and read educational texts about bees and their preservation. The project is developed with the expert assistance and cooperation of beekeepers from Subotica and its surrounding area.

Starting a new game, the map will be randomly generated and the hive will be located in the middle of the map. The map is built from different fields: water, flowers, trees and some undiscovered parts. The bees pollinate the flowers and make honey, i.e. points. With these points, the player can upgrade the hive and their bees’ army. The bees also need enough water to produce honey.

During the game, the bees are at risk from diseases, nasty weather and enemies. During rain, bees must leave the field and hide in hives, unless they have a special ability to survive the rain. The disease may be the result of spraying plants or small pest that could be dangerous for the entire hive. The bees’ enemies are wasps, bears, etc.

Core technologies of this project are: Unity, C# and Blender. The future plan is to introduce geo location that would affect the environment and conditions of the game, so the game will become personalized. With this project the team MiB (Make it Bee) participated in national semifinals of Games category in 2015. The national semifinals were held as a Hackathon, 24 hours programming marathon.

G. Revive

Revive is a first person 3D game developed using the Unity engine. The idea for Revive was first born after the 2014 floods in Serbia, Croatia and Bosnia and Herzegovina. This natural disaster took many lives and a year later there are still many who need help. Besides this natural disaster, there are a lot of accidents that were caused by the human factor, where car accidents are the major reason of taking human lives. In situations like this, knowing first aid can make a difference between life and death.
Revive is a game that is created for the promotion of first aid as a basic tool of saving lives. This game will provide a lot of useful information about how to act in different situations that cause threat of losing life, so people can do their best to help others. With a major part of the world’s population playing video games, the team hopes to encourage those people in a fun and engaging way to think more about first aid. The player will go through situations designed to teach them to be resourceful, to think fast and to improvise. With this project team AA Development participated in national semifinals of the Games category in 2015.

H. The Cup

The Team Mad Wake was the only competitor from Subotica Tech in 2015 National finals in Innovation category. Their project was The Cup. The concept is the opportunity to enter the emerging and expanding smart device market and to try to solve the problem of diseases caused by lack of water intake in cases where water is accessible.

Most people from developed countries could drink a sufficient amount of water, but they do not do so for a number of reasons. Lack of water intake causes symptoms like headache and nausea. After a night of partying one is likely to have a hangover, because of dehydration. One sometimes has headaches and takes painkillers, while some research shows that drinking enough water could solve this problem, without taking any medications.

This solution is the union of separate hardware device and client software which uses the API and communicate with the device. The device communicates with the cloud via the client app. The device communicates with the app via Bluetooth

The device consists of a basic plastic, glass or metal bottle, the electronics and the battery. The API is a simple set of requests and responses between the app and the device.

The software is basically a smart dashboard for the device. Water intake is determined by the software by several basic personal information. These include weight, gender, whether the user does some sport, whether or not they smoke and the current temperature. When the user drinks, the water intake synchronizes between the hardware and the software. From that moment, the clients know all the information they need to schedule the time of the next cup of water. It is not necessary to consume the whole cup at once, the system takes care of that.

The device consists of three main parts:

- A water bottle
  - A common or custom built water bottle.
- Water flow sensor
  - Attached to the bottle
  - Measures the amount of water which flows through it
  - Takes place between the top and the bottom straws, directly under the top cover
- Main module
  - Power source
  - A module to process and transmit the data

Used technologies:

- Windows Phone 8.1 SDK
- Windows 8.1 SDK
- .net
- WinRT
- Arduino – Micro C
- Microsoft Azure
The team Mad Wake won the third place in the National finals in 2015.

IV. ELECTROMOBIL

The competition Electromobil 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. Some of rules and constrains 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 into several stages. After each stage, the teams that did not manage to fulfill the requirements were excluded from further competition [1].

V. OTHER COMPETITIONS AND CONFERENCES

Students from Subotica Tech took a part in other competitions in which a problem is given and they have to solve it or to create a solution for that. Further, participating in scientific international conferences is important for students as well as professors from Subotica Tech. These competitions are presented in the following text.

A. Race of Engineers

The race of engineers was firstly organized in 2013 by IAESTE Hungary. The aim of the project is to bring technical intelligence to leading institutions and companies of Hungary.

Here students had to solve 7 tasks in the field of computer science and 7 from the field of electrical engineering. In the online race 23 teams were competing, and the best 10 competed at the University of Obuda (Hungary), where they had to solve problems obtained from firms. Team SU-Tech won the third place [1].

B. PLC programming

The College’s students participated in the National competition in Hungary in PLC programming. This year they won fourth place among 24 teams. This competition mainly attracts students from the study program of Mechatronics and Electronics.

C. Conferences

Presenting their own work and project to a wider audience at conferences is very important in the life of engineering students. They gain confidence in public speaking which will help them in future work and job applies. Students from all study programs were involved in preparing conference papers and some of them were in organization committee. Conferences that are important for our students are: AIIT (International conference on Applied Internet and Information Technologies), SISY (IEEE International Symposium on Intelligent Systems and Informatics), MechEdu (International Conference and WorkShop – Mechatronics in Practice and Education), TDK (Student Science Conference), E-trgovina (International Conference of E-commerce and E-business) and YU Info.

VI. CONCLUSIONS

In this paper some student projects from competitions in various fields of engineering science and technologies are presented. Students of Subotica Tech – College of Applied Sciences have participated in a number of contests and competitions in recent years. Projects that are described in this paper are mostly from the fields of computer science and electrical engineering.

Involving students in such competitions poses a challenge for professors and also for the students. Professors need to encourage and motivate students. Students accept to participate because acquisition of new knowledge, friendship, team work and real life projects.

Working with young, talented and ambitious people always turns into a positive experience.
REFERENCES


