Multimedia in Optoelectronics and Sensorics

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Abstract— **This paper deals with various multimedia elements in microelectronics education and their use in Virtual tour presentations. Virtual tours of laboratories of Department of Microelectronics are assigned for general public, but most of all for potential students of Bachelor Study Programme Electronics and Master Degree Programme Microelectronics. Author's experience in creation of Virtual tour of Optoelectronics and Sensorics is described. It shows the important role of students' team work in process of making a web presentation better. Different types of present-day multimedia implementations as the main presentation elements help to make any scientific branch more popular and more accessible for a variety of visitors.**

Keywords-multimedia; microelectronics education; team work; Virtual tour; Optoelectronics; Sensorics;

I.   INTRODUCTION

Optoelectronics and Sensorics are two of the fastest developing branches in Microelectronics. Thanks to the technological progress, optoelectronic and sensoric materials and devices are mass produced and widely used in everyday life. Precise production and progressive technologies allow to produce more efficient, reliable, and relatively cheap products.

The range of optoelectronic and sensoric products comprises LED lightening (from car industry, interior lightening to advertisement, in torches); laser equipment (e.g. in optical drive units); photovoltaic devices (e.g. high efficient thin layer solar cells); various devices for modern optical communication systems (fiber optical repeaters, new generation of optical fibers); chemical sensors (e.g. atmospheric monitoring, detection of explosives); touch sensors ("touch screen" displays, keyboards…); LVDT sensors (in tool inspection and gauging equipment), and many others.

In spite of the increasing importance of Optoelectronics and Sensorics in new technologies, there is a lack of students interested in studying these disciplines at Dept. of Microelectronics on Faculty of Electrical engineering and Information technology at Slovak University of Technology in Bratislava. Therefore there is need for helping students to get basic information about Optoelectronics and Sensorics and motivating them for study and experimental work in these progressive branches.

One of the ways to accomplish these goals is by presenting research and pedagogical work in laboratories of Optoelectronics and Sensorics via internet presentation. These presentations were realized as a virtual tour by two separate students' team projects. The virtual tours are available for all Internet community and they provide basic information for laicuses; more interested visitors can also find here details of the present research in the laboratories.

A.   Team projects on Department of Microelectronics

Since 2005 team projects are a part of education at our department. Nowadays, students are encouraged to work collaboratively on academic projects and in various competitions. These projects aid students in developing their essential skills, which they will need when they enter the working environment.

B.   Multimedia in the role of design attraction item

A variety of multimedia elements are used within these virtual tours. Multimedia represent the convergence of text, pictures, video, and sound into a single form. The term is used in contrast to media which only use traditional forms of printed or hand-produced material. The power of multimedia and the Internet is in the way how information is linked. In education, multimedia is used for creating electronic educational materials, such as computer-based courses or web presentations that let the user go through series of videos, text, and illustrations describing the particular topic.

II.   MULTIMEDIA

For realization of a multimedia project that would popularise Optoelectronics and Sensorics a platform was needed to be analysed as a first step.

The instruction of the project was to choose a website as a form of virtual tour presentation. Virtual tour (Virtual reality tour) is a virtual reality simulation of an existing place or a location. Usually it consists of 2D panoramic photos, series of audio or video footage, real object models, and many other multimedia elements (audio effects, music, text). In comparison with the real tourism, Virtual tour is usually reachable on your personal computer via Internet. People interested in particular places do not need to travel long distances, but they can "walk around" and get real feeling about the desired unknown locality [1]. Virtual tour is one of the best forms of uniting variety of multimedia elements and combining them in a way to catch visitor's eye and attract his attention to the presented content.
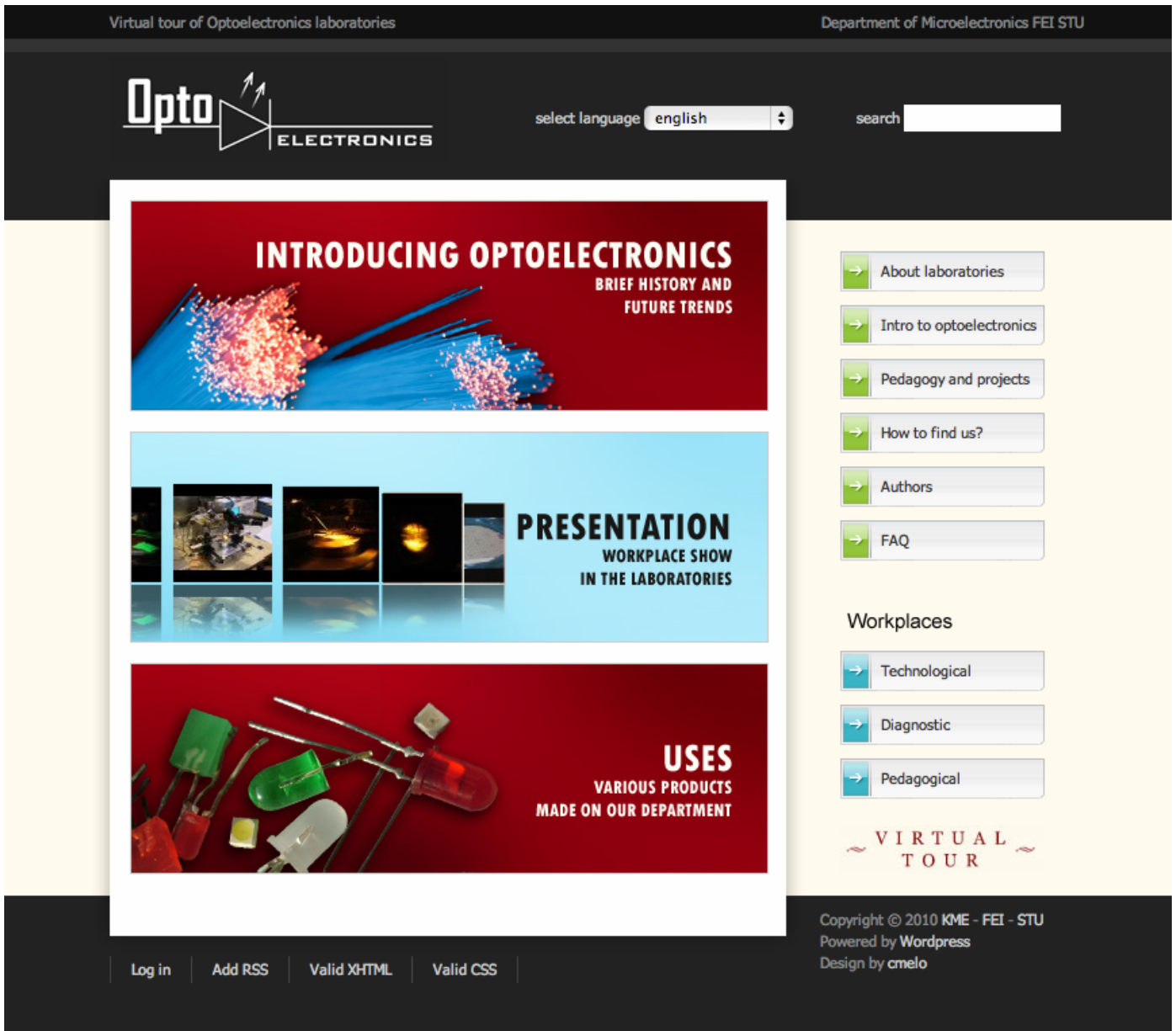
Figure 1. Homepage of Virtual tour of Optoelectronics laboratories

Presentations "Virtual tour in the Optoelectronics laboratories" (Fig. 1) and "Virtual tour in the Sensorics laboratories" are supplemented with video clips, an interactive flash presentation, photos, a glossary, and also with a short overview on historical, present, and future trends in optoelectronics, microwave engineering, and sensorics. It is designed in both Slovak and English language.

Taking into an account the demands of these virtual tours and maintaining graphical, administrative, and editing unity for all Virtual tours of Department of Microelectronics [2], the content management system WordPress was used [3]. WordPress is an open source blog publishing application powered by PHP and MySQL which can also be used for content management. It implements hundreds of various features and allows additional plug-in implementation. WordPress is the most popular blog software used nowadays. Most important features of WordPress in our project are open source licensed, including simple implementation and modification, user-friendly administration interface and free updates. Two sections of Department of Microelectronics already had their Virtual tours designed in CMS WordPress. This fact was one of the crucial in choosing the same system.

In the web presentations, the following multimedia elements were used: interactive flash photo gallery, video clips, dozens of photos, text, and interactive flash map. Each of them is used to deliver certain information to users in form of a multimedia element [4].

A. Interactive flash presentation and map

Adobe flash software is a powerful environment for web developers with many useful tools. It offers many advantages but most of all are interactivity and modern graphic design production. Its popularity and usefulness is based on the ability to comprise all media forms together: text, graphics, audio, video footage and computer animation. That's why it can be used for various applications.

We used the flash technology for the photo gallery and the map showing the location of the laboratories in created Virtual tours. A classic photo gallery shows a group of photos which describes some events and places. Interactive flash photo gallery shows photos, their descriptions; it makes nice and fancy transitions between the photos; easy-to-use environment. All this is coated in a modern look animation. The software used for creating this kind of flash photo gallery was Flash Slideshow Maker [5]. It's a free licensed software with a simple interface. It offers powerful features that allow faster generation of flash applications, although with less options than the original Adobe Flash application package.

Students usually search sections that provide as much information as possible in the shortest time. That's why the virtual tour students' production team decided to create a flash [6] based photo gallery. Photos from all laboratories were ment to help students to get an idea what is done in the laboratories (Fig. 2 and Fig.3).
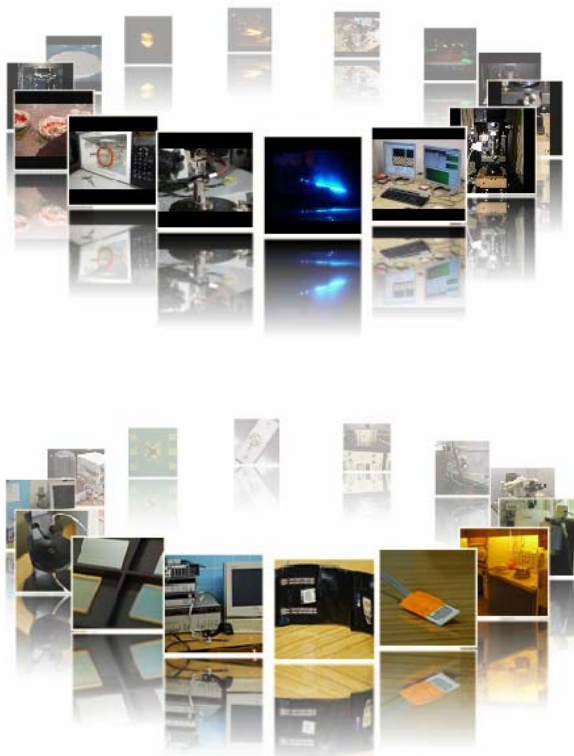

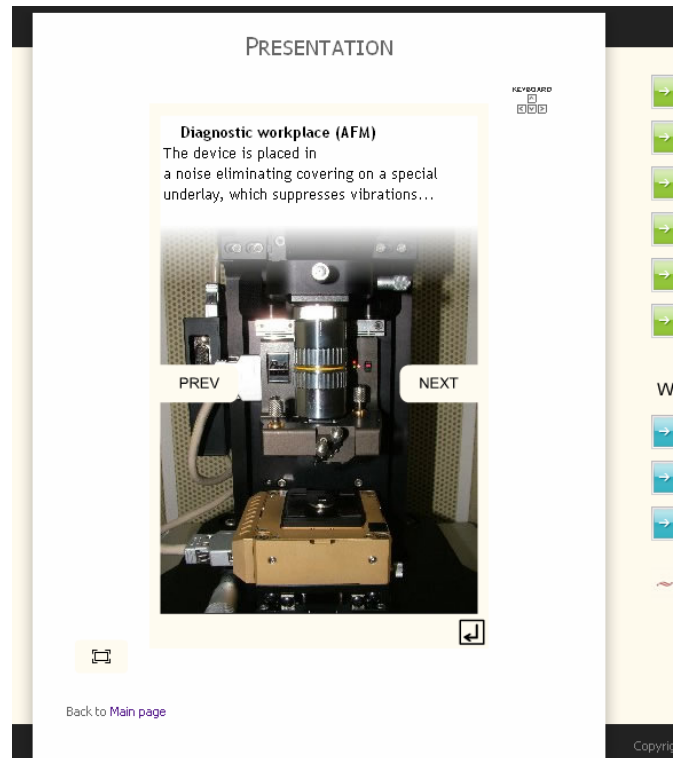Figure 2. Interactive flash presentation in Virtual tours

Figure 3. Photo of diagnostic workplace (AFM) in interactive flash presentation in Virtual tours of Optoelectronics laboratories

The location map of the department section is designed in flash, too. It loops zoom-in animation of the map that can be stopped/resumed, zoomed-in/zoomed-out, and observed by user. The map helps students to easily find the location.

B. Static pictures and text

Nowadays, a text is usually supplemented with pictures. It does not require any special skills. On the other hand, it is important to use pictures which clearly describe what is written in the text. Introduction article shortly describing the history of the Optoelectronics or Sensorics, present and future trends was created for virtual tours. All articles are supplemented with pictures, charts, and also hyperlinks, so that students interested in certain subject can find out more on other external sources.

New logos for Optoelectonics laboratories and Sensorics laboratories were designed (Fig. 4) as part of intro process of creating of virtual tours. Basic principles for logo creation were followed: simplicity, graphical unity, and easy to use in other applications (MS Word documents etc.). Logos for both virtual tours were designed in two variations (black and white) so they can be used on various backgrounds.

C. Video clips

A great part of both Virtual tour of Optoelectronics laboratories and Sensorics laboratories is concentrated on video documents. In cooperation with pedagogues and researchers in chosen laboratories, the students' team selected few measurements methods and production processes.
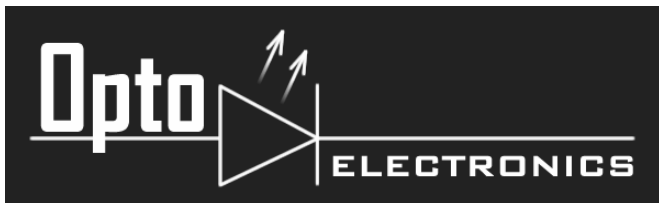
Figure 4. Logos for Virtual tour of Optoelectronics in English, Virtual tour of Sensorics in Slovak and Virtual tour of Sensorics in English

These processes were captured by camera and afterwards edited and cut in Sony Vegas Pro [7] video software. Final video footages were exported for web video flash player.

The videos demonstrate technological process of manufacturing organic electroluminescent diodes, measurement of S parameters (Fig. 5), AFM measurement, manufacturing process of thin layers on the substrate and their applications (Fig. 6), photolithography processes, and many others.

Video clips are addressed to laity, so that they can understand what optoelectronics or sensorics is in practice. Short video footage is supplemented with an audio commentary and a short article below the video.
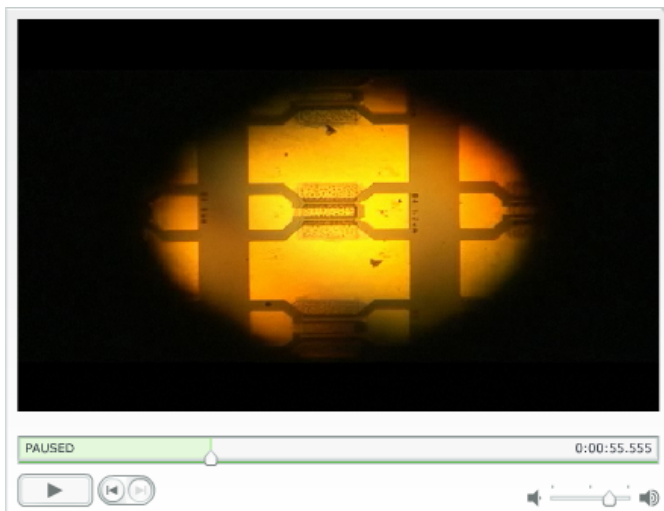

Figure 5. Video clip about measurement of S parameters

Figure 6. Video clip about thin layers preparation

III. TEAM WORK

In modern educational curriculum students are encouraged to work collaboratively on academic projects and in various competitions. Projects presented in this article aid students in developing the essential skills they will need when they enter the world of working. A team project encourages members of the team to work interdependently towards the same goal. It also leads to responsibility because every member in the group feels a sense of ownership of their role.

Behind all the students' team work there is an environment of an online course application, created on educational portal "eLearn central" and based on course management system Moodle [8]. This platform enables all team members to manage the course content, chat with each other, collaborate on the same document, and upload files. Each team member can work on his tasks whenever it is suitable for him, he can also react on posts or queries sent by other team members. Students are forced to cooperate with each other in a way to accomplish the goal of the team project. Students can use and present their skills by working on partial tasks which are from their field of interest. They are also forced to learn new information and skills on self-educational basis. The most important is that students can get a valuable experience in team work, cooperation, and advocacy of their own statements in front of other team members. From the students' point of view, team work gives them much more space for organizing their time and the way they will accomplish goals of the project. The driving force of the project was independence, new way of working together, and opportunity of teams' competition at the end of the semester.

However, very important fact is a structure of the team. Members need to be interested in the project they are going to collaborate on. The experience in organizing students' team projects on the Department of Microelectronics on Faculty of electrical engineering and information technology shows that the best way is to let students themselves choose project they will participate in. Thereby students' active approach in team project is most probable. Students' interest, activity, and motivation are very important for reaching the project goals. If properly motivated, members of the students' team project

stimulate each other in common team work. So we can see that the significant step is the proper selection of team members with complementary knowledge and abilities. In case the mentioned condition is fulfilled, the result of the students' team project can be very interesting and with a high quality.

Of course, involvement of pedagogic supervisors of team projects is obvious. Nevertheless their role in the students' team project should be to regulate and convect, not to govern and dictate the work flow of the students' team. Otherwise the main goal in the students' team project is missed and also students lose a motivation for an autonomous team work.

IV. FEEDBACK

One of the primary ideas of Virtual tours of Department of Microelectronics was to address visitors and attract them by the content of these Virtual tours. A quality feedback can show us whether we succeeded or not. In web site industry, feedback and statistics are very important. By analysing various statistic indexes and their changes it is possible to improve the content of the web site. For example by improving local hyper linking system of the web site, pages with low visit rate can be more visualized. On the other hand pages that lack visitors can be supplemented or replaced by multimedia elements, which describes the topic in a modern and fancier way.
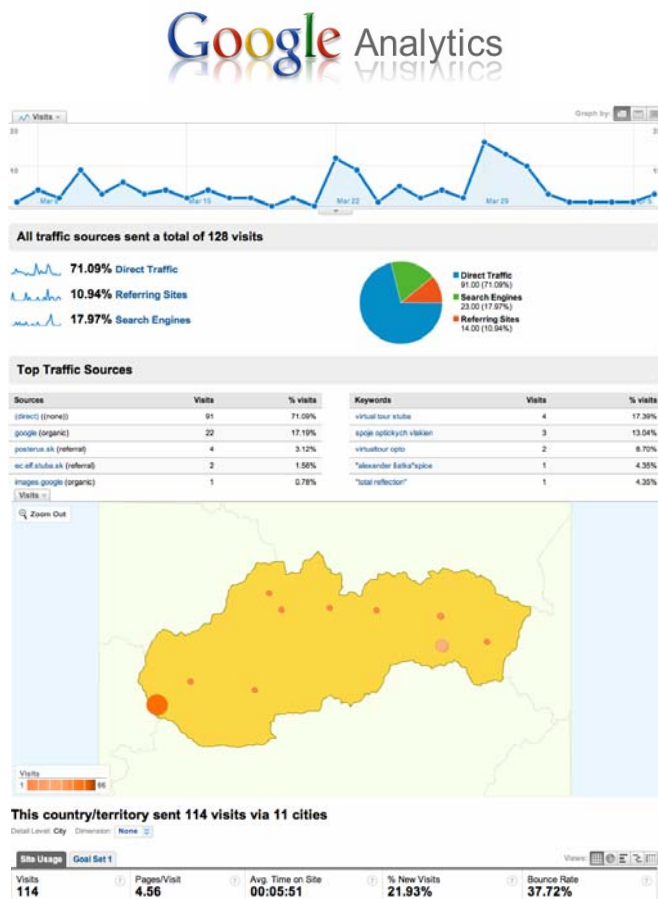

Figure 7. Logo and previews on Google Analytics statistic tool interface

Statistic tools are important in websites because they provide unprejudiced and relevant data about the website.

Both Virtual tour of Optoelectronics laboratories and Virtual tour of Sensorics laboratories use feedback system for statistic reports. Free online tool called Google Analytics (Fig. 7) is used. It provides a plenty of useful features such as visitors' localization statistics, pages' visit rate, most frequently used search engine keywords. It is a statistic tool used by professionals [9].

Virtual tour project of the whole Department of Microelectronics is still under development, although parts of it are available on the Internet. Further spreading of the project is planned and therefore more students' feedback is expected to be received. Forasmuch as these virtual tours are mainly dedicated to students, their feedback is the one that matters the most.

V. CONCLUSION

Virtual tour of Optoelectronics laboratories and Virtual tour of Sensorics laboratories were created to encourage students' interest in microelectronic education.

Very important and interesting fact is that these presentations were results of two separate students' team projects. They were created by students for students, which means that students created educational materials for themselves and their colleagues according to their own needs. Still they were supervised by experienced pedagogues and researchers.

Both students' teams worked collaboratively while gathering available information, sorting, and structuring them, creating video clips, articles, and other multimedia elements. The aim was to create an interesting presentation with useful information presented by modern multimedia elements. All virtual tours of the department of Microelectronics are accessible on http://kme.elf.stuba.sk/virtualtour/. Considering the fact that students are those who submit ideas and solutions, the virtual tour presentations are full of fresh and modern concepts and multimedia elements.

Virtual tours were created but now the public needs to be informed about existence of these free online educational materials. To address the potential students, presentations of the Virtual tours are organized for the students of secondary schools. In such a way or by other means of propagation they are informed about possibilities of their further education and importance of application in practice.

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