Development of a web shop based on augmented reality

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***Abstract*—The aim of this paper is to develop an electronic store based on augmented reality. In the first part of the paper, augmented reality technologies will be analyzed. The concepts of e-commerce will be described with a focus on the analysis of the possibilities of applying augmented reality (AR-commerce). The possibilities of integrating augmented reality into existing solutions for the development of electronic stores will be analyzed, too. In the practical part of the paper, the development of an web shop using WooCommerce solutions will be presented. The web shop will implement augmented reality-based services that provide support to customers when shopping online. Appropriate tools will be used to monitor the performance of the developed system.**

Keywords—e- shop, augmented reality, AR-commerce

I. INTRODUCTION

One of the basic and currently most common forms of communication is the Internet. With the progress and discovery of new technologies, its use is increasing, so it is used every day in order to find information faster, as well as easier to perform life activities. Its development completely changes the way of doing business and enables the creation of new business models[1]. One of the most current business models are e-shops that focus on the customer. Given that modern age is characterized by rapid change, a large number of products and services that change quickly and become obsolete, the customer tends to spend his time rationally. The development of e-shops enables him to do that. That's a place where customers can shop 24 hours a day without leaving their home or workplace.

The development of the e-commerce is growing every day. E-commerce is the purchase and sale of goods and services that takes place with the significant application of modern information and communication technologies. Its basic components are products, services and participants in the e-commerce process (buyers, sellers, intermediaries and other business partners). Some of its main advantages are: large selection and the ability to quickly search and select specific offers available globally, low costs of placing products on the market, easy and fast entry into the world market and easier communication with customers, modest initial investment and process automation[2].

One of the biggest disadvantages of e-commerce is the lack of a social aspect of classic stores, where the user can see and try out products that interest him and buy them immediately. In order to solve this problem, the application of augmented reality in e-commerce has begun.

Augmented reality (AR) is defined as "the superposition of virtual objects (computer generated images, texts, sounds etc.) on the real environment of the user"[3]. Represents an upgrade of the real world through digital content, so that it improves the environment in which we currently find ourselves. AR is supposed to be an innovative technique having three key prerequisites: a combination of the real and virtual article/objects in a real environment[4], adjusting real and virtual article/objects[5] with each other, and real-time interaction[6]. The possibilities of applying augmented reality are enormous. AR applications are widespread in industries such as manufacturing, navigation, healthcare, education, communications, military, retail, gambling and e-commerce. Many companies use an AR mirror that enables customers to experience virtual facial makeup. Some of them are Sephora and L'Oréal. Other large companies such as Nike, eBay, Snap, Ikea and Converse have been adopting various forms of AR. This allows their consumers to experience their products more realistically.

AR-commerce is a term that refers to the application of 3D product models during the purchase process. It allows the use of augmented reality in order to observe products in real life at accurate size and scale. In the online shopping context this enriches a consumer's shopping experience by displaying product visualizations on images of consumers' physical features[7].The result is a more informative and interactive shopping experience. That leads to increased consumer confidence in both the product and the retailer.

The aim of this paper is to develop an electronic store based on augmented reality. The development of an web shop using WooCommerce solutions will be presented. Also, the implementation of augmented reality in order to improve the user experience will be shown.

II. AR-COMMERCE

With the advancement of technology and new solutions, the world is closer to a situation where the digital environment is no different from the real. Such changes redefine modern business conditions. Companies are facing the acceptance of digital transformation and its introduction into their strategy. A completely new layer of business environment is emerging, that provides great opportunities for business. Strategic approach to digital innovation and

digital development is needed to make these opportunities seized[8].

The development of computer technologies makes it possible to push the boundaries of experience, both in the personal and business spheres. In addition to the reality that a person experiences thanks to the physical senses, the impression of the experience can be supplemented - with virtual objects, multimedia content and augmented reality [9].

The business environment as it exists today imposes conditions by which interactions are mediated and increasingly guided by technologies. Jobs that do not contain virtual elements are rare. Man learns about the world around him with the help of his senses and system perceptions. The basic idea is to trick the system perceptions in such a way that artificially generated stimuli replace the real stimuli received by the senses. Using computer systems the real environment is modified and provides the possibility of interaction and research thus creating augmented reality. AR implies a real world that is extended by computer-generated data and objects. With the help of appropriate devices and algorithms in space is added something that does not exist. That's how it occurs a combination of real and virtual world. [8].

Augmented reality allows the unification of virtual information of the unreal world in such a way that participants perceive that information as part of the real environment. Information management is a very important item of modern society, where augmented reality implies a qualitative change of information about the handling and formation of knowledge[10]. That also implies that real objects appear in the virtual world, ie that the physical environment is covered with digital information[11].

The main feature of the augmented reality interface is that the line separating the real from the virtual experiences does not exist directly, but can appear anywhere within the mixed reality[13]. Augmented reality is characterized by a combination of virtual and real dimensions, real-time interactivity and 3D display[12]. System based on the augmented reality directly presents to users the information registered in the real environment, with such a user perception by which digital information is integrated into the real environment[14]. Thus, the experience of the environment by the user is improved in such a way that the basic senses (sight, hearing, tact) are stimulated by additional information from the digital world. Augmented reality is characterized by simplicity, interactivity and attractive approach. Offers interactively experience in upgrading the real user environment[8].

Augmented reality has real and strong effects to people and brands must consider their application in within their campaigns. Application of 3D product models during the purchase process is known as AR-commerce. That's how users are enabled to visualize and experience products and services before purchases. Online shopping has become commonplace and has come to life is a few years ago. Restrictions like mistrust are outdated, but some still choose to go to the store because are supporters of tasting and detailed examination of pieces which they buy. AR combines the convenience of online shopping with the confidence that visualization and opportunity give trials, as if the consumer had visited the facility. So they can choose the right shade, plan the next one tourist destination and find the right size clothing items. That extra level of trust before buying which shows selected things on man becomes useful both for him and for the advertisers[8].

One example of AR-commerce can be seen at the Sephora company. They have created an application with the help of which customers can try out make-up after a few clicks. It is enough for those interested to have a phone with a front camera, so that they can use augmented reality to change eyebrows, eyes, lips, and all other parts of the face (Figure 1).

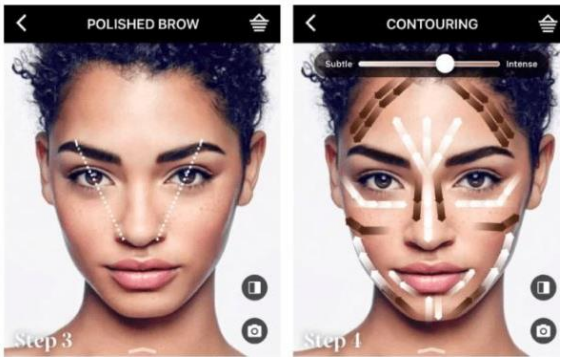

Figure1. Sephora Virtual Artist App

This company also use ModiFace, virtual try-on mirror that simulates cosmetics on a user's face photo-realistically in real-time. This makes color testing easier by simulating makeup products on a user's face to show what they would look like in real-time and without having to upload a photo. This trend is seriously affecting the cosmetics industry and affects a better experience, as most users are reluctant to go to an store just to try on makeup (Figure 2).

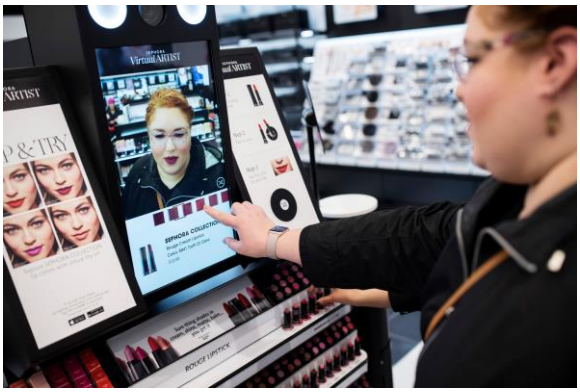

Figure 2. Sephora Try on mirror

The next good example of AR-commerce is company Converse. Their Shoe Sampler app offers customers the ability to simply point the phone's camera at their feet, scan it and then see what different types of Converse sneakers would look like on their feet (Figure 3).

Figure 3. Shoe Sampler app by Converse

An interesting application based on augmented reality was also created by the company Ikea. The application allows you to place virtual furniture in your house and see if a certain piece will suit you (Figure 4).

Figure 4. Ikea Place App

These are just some of the many examples of the use of AR-commerce. That use is increasingly growing and evolving and completely changing the whole process of online shopping.

III. METHODOLOGY

In order to get to know the augmented reality in more detail, we are developing an example of an e-shop based on it. For the needs of web shop development, WooCommerce technology and Virtooal Try on plug-in are used.

WooCommerce is one of the most popular open source Wordpress e-commerce plug-ins. It is fully customizable and offers a simple and efficient user experience. The plug-in is completely free, but it also offers Premium extensions that enable greater efficiency. Offers unlimited customization options and very easy maintenance.

Some of the wide range of features provided by this WordPress plug-in are the following: selling any product and/or service through your site in a simple way, easily managing and editing existing products and/or services on your site, inserting new ones products, support for various product varieties (color, size, details, etc.), review and manage all orders of your customers, statistical reports on sales performance, providing various discounts to your customers via electronic coupons, accounting for various taxes, choice of delivery and payment methods, support for social networks, etc. That is why this technology was chosen for the development of our web shop.

There are many ways to implement augmented reality in WooCommerce. Various themes and numerous plug-ins have been created to make this possible. Ozisti AR WordPress Theme can be singled out. Also, plug-ins such as AR for WordPress, 3D Product configurator for WooCommerce, AR Play, AR for WooCommerce, Grab AR, WebAR are often used and offer a variety of options.

For the development of our web shop augmented reality integration is enabled by using the Virtooal Try on plug-in. Since we are creating an e-shop for makeup and cosmetics, choosing this plug-in was the best option. It is reliable, simple and easy to use and specially adapted to different make-up categories. This plug-in allows us to see for each of the products how it would look on a person. It is used by many well-known brands such as Rossmann, Avon and Dermacol. It allows us to display the so-called Try on mirror, where for the desired product we see how it stands for the person in the picture. Also, the user can add a picture of himself and see how the product would suit him and whether he likes it.

IV. DEVELOPMENT OF A WEB SHOP BASED ON AUGMENTED REALITY

Web shop development begins with the installation of the WooCommerce plug-in. After that we create a catalog of our products. Since it is a matter of creating a cosmetics store, we will provide a wide range and a large offer to customers. We group products into categories for easier navigation and the best possible user experience. When adding a product to our catalog, we take care to enable it to be displayed on a separate page with all the detailed information, different product variants and a defined price. From the catalog itself, but also from the product page, we enable adding to the cart.

The cart allows users to see all ordered products, their quantity, price and total order price. It also allows users to modify and delete products and enter coupons that would reduce the overall price. From there, the user can complete their purchase by filling out a form with their details. Depending on where the order is made from, the user has different delivery methods and payment methods available. Available payment methods are Check payments, Cash on delivery, Direct bank transfer and PayPal. Use of PayPal is enabled by using API credentials which we can find on the official paypal website after logging in.

Augmented reality integration is enabled by using the Virtooal Try on plug-in. Before installing the plug-in, an account was created at https://try.virtooal.com. There we can see our API credentials with which we connect to the store. The store needs to be online in order to be used. After installing the plug-ins and entering the API credentials, we define where we want our virtual mirror to be located. For each of the products, we choose the category to which it belongs and, accordingly, connect it to the mirror that will be on all product pages. That way, before adding the product to the cart, the user will be able to try it out and be sure that it is what he wants.

In the Figure 5 below we can see the detailed product page for one lipstick. Its picture, price and short description are shown. Also, there is a Try-on mirror in the corner which allows user to try lipstick in different colors and shades quickly and easily. Here user can see what this lipstick looks like on one of the already added face pictures, and can also add his own picture for a complete impression (Figure 6).

Figure 5. Detailed product page

Figure 6. Virtual Try-on mirror

Google analytics is used to monitor the performance of the developed system. It allows us to track whether a purchase has taken place and how augmented reality has prompted the purchase. In this way, we have an insight into the success of our web shop and the application of augmented reality in order to improve the user experience.

V. CONCLUSION

The possibilities of applying augmented reality in e-commerce are enormous. There are many examples that confirm this, and it is expected that there will be even more in the future. That enriches a consumer's shopping and leads to increased consumer confidence in both the product and the retailer.

This topic is of great importance in the field of modern e-commerce ecosystems. Created and presented solution is very interesting and cost-effective and could be easily integrated with other components of an e-commerce system. Also has potential to expand and provide customers better experience and a more complete service.

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