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Mini Review Article

Use of ICT in the Biomedical Industry

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Introduction

The biomedical industry is of great relevance in the development of implants, and for this reason a lot investigations were made in linking educational institutions that have research laboratories and industries that are installed in any region of the world. Various types of information and communication technologies (ICTs) [1] are used in these processes, where one of these technologies that are of great importance for manufacturing areas, which is known as Augmented Reality (AR) technology [2]. This technology has been used in the educational sector mainly to improve teaching-learning processes, achieving great advances in the acquisition of school knowledge at levels from primary to postgraduate university [3,4]. One of the main objectives of AR is to apply it in training activities, for a better understanding of knowledge, especially in the biomedical industry, and to generate maximum efficiency for workers quickly [5]. With this technology, operational performance can be optimal and the personnel required for this activity and will be able to develop other operations at the same time as the training takes place without the need to be laid off. AR can be used with cell phones, tablets, and desktop or laptop computers, which use computational algorithms to help evaluate industrial processes and new implant designs in three dimensions (3D), so they are better understood the functionality characteristics of each manufacturing stage and product manufactured in this type of industry [6]. ICTs have greatly supported manufacturing activities in biomedical industries. This is, for optimal control of industrial processes and thus be able to determine errors or failures of functionality of industrial equipment and machinery and manufactured products before starting operations in production lines, especially of the industries of the biomedical sector. This avoids the presence of downtime in industrial lines of manufacturing areas, on the part of industrial systems. Also, can be analyzed the generation of defective products in industrial production lines and with-it economic losses, in addition to optimizing material, human and economic resources; managing to increase productivity and quality indexes. In addition, a large number of manufactured products are obtained, reaching objectives planned by the directors and managers of each biomedical industry. One of the ICT technologies, in which the biomedical industry has placed its trust for industrial processes and the manufacture of new products, and which has generated great impact in the last ten years, is AR, with which it can be developed In 3D, each stage of the manufacturing areas and manufactured items [7], evaluating each action of the industrial equipment and machinery and the movements of the workers to achieve maximum operational efficiency

Augmented Reality

This technology refers to the visual perception of a physical scene by means of a mobile device, tablet or desktop or laptop computer, through which images are projected in real time accompanied by previously preconstructed objects with a specific objective [8]. Another concept of AR is to increase the natural feedback for the operator with simulated ideas; based on a form of virtual reality where the device mounted on the participant's head is transparent, allowing a clear vision of reality [9]. Augmented reality can also be considered as a system that fulfills three basic functions: A combination of real and virtual worlds, interaction in real time and the 3D register that requires the formation of virtual and real objects [10]. Mixed reality or diminished reality combines real objects and information using augmented virtuality, that is to say, superimposing reality in a virtual world [11]. This is a technology that allows adding virtual entities such as images, video, multimedia, audio, text and others, which are superimposed in a real world, through the use of a mobile device such as a tablet

or cell phone with the camera that these devices carry. With this, the image is interpreted by an application or software and the information read through visual or positioning markers generate or activate the multimedia object enlarged on a screen [12]. From the previous definitions, a definition of AR in education was built, conceptualizing it as an augmented reality environment that combines the real world with information or superimposed tools to generate an interactive environment using educational objects and achieve the expected learning in a way kinesthetic to reach a metacognitive level in the planned topic [13].

Manufacturing in the Biomedical Industry

There are various ways of representing the biomedical industry, from the manufacturing processes that develop industrial processes with advanced technologies, such as the use of ICTs, such as the special case of the application of augmented reality in industrial plants of this sector installed in the city of Mexicali, where factors of trained personnel at the operational, supervisory and managerial levels are considered [14]. In addition, aspects of air pollution are taken into account, analyzing climate indices (especially temperature and relative humidity), that in this region of the northwest of the Mexican Republic there are extreme conditions of these parameters [15]. Another relevant aspect is the concentration of air pollutants that in most periods of the year, and essentially exceed the quality standards that are regulated by the Ministry of the Environment and Natural Resources (SEMARNAT-Mexico) and the Protection Agency. Environmental (EPA-USA) [16]. The factors and aspects mentioned must be evaluated, because certain situations of low operation of equipment and industrial machinery and workers, are presented by the lack of control of atmospheric pollution. Even when industrial systems are installed in the biomedical industry installed in Mexicali, with advanced technology they can deteriorate faster than their normal period, and their life span can decrease [17]. The biomedical industry has a wide variety of industrial processes and with it a diversity of opportunities to apply technology with ICTs, which have various tools and technological developments such as augmented reality.

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