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Tesis

**Design of an Automated Machine that Projects
Ultraviolet Rays for the Safety of Food Products for
Supermarkets**

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Abstract—This research presents the design and control of a machine for use in shopping centers and markets, which has been designed using mechatronic systems and artificial intelligence. In this research, a control is established for each moment of use, thus being more autonomous and efficient. The development of the project shows that the action of a reconnaissance camera with artificial intelligence before the disinfection chamber and mechanized pivoting arms at the outlet improves the autonomy of the machine. Also, a control panel was added that regulates the selection and control process in case of inconveniences; In addition, the type C UV disinfection chamber is covered with ABS polymer to prevent the rays from going outside. From the above, the mechatronic system implemented will improve the quality and disinfection time of the products in supermarkets.

Keywords—*disinfection, artificial intelligence, UV rays, automation, mechatronic systems*

I. INTRODUCTION

Taking care of health is important to have a better quality of life without diseases, currently more than 200 diseases are caused by the intake of contaminated food either in production and/or in marketing; producing diseases from the simplest such as diarrhea to cancer [1]. The bad disinfection of the products and the indirect contamination that occurs in the markets and supermarkets, all this problem causes monetary losses, loss of life; According to the WHO, it is estimated that each year there are 600 million illnesses caused by contaminated food and an approximate of 420,000 deaths [2], currently foodborne illnesses produce an expense depending on the country, depending on the industries in the production of food, etc. [3]; This begs the question: how many lives can be saved and how much money can be saved if food is properly sanitized?

In previous studies, a disinfection system with chemical products was proposed for the sterilization of products [4],

consequently, good results were obtained; but, with some difficulties that arise, such as skin irritation on contact or causing respiratory problems [5].

Similarly, disinfection systems are described mechanically, where the process is simulated through bands controlled by a control system, which processes the products in industries either for packaging or processing [6]. In addition, some agricultural companies currently use artificial intelligence as a method to classify their products [7].

Starting from the prototype of a machine with mechanical, mechatronic, control systems and the use of artificial intelligence, it is desired to obtain an automated machine capable of sterilizing the products of viruses, bacteria, pesticides, etc. In addition, reducing the risk of contracting infections that can be fatal [8], and monetary losses in investment and in the recovery of each person who falls ill from contaminated food products.

II. MATERIALS AND METHODS

The design will have 3 systems to automate the disinfection machine. The first system is the mechanical one, where it involves the transmission of the motor towards the belt giving movement for the transport of the food to the disinfection chamber. The second system is the mechatronic system where Artificial Intelligence will be used, this will allow the recognition of the product, classifying it into 3 categories (fruits and vegetables, packaged foods, sausages and meats), once the product and the category detected by the sensors with intelligence have been sterilized A pivoting arm corresponding to the category will be activated, giving order and sequence to the operation. The third system is the control system, a controller (PLC) was used to control the speed, the number of products that are disinfected for each category, brake and turn it