Universidad Continental

FACULTAD DE INGENIERÍA

Escuela Académico Profesional de Ingeniería Mecatrónica

Tesis

Design of a mechatronic assistant in the treatment of cognitive abilities using musical stimuli for people with dementia

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Para optar el Título Profesional de
Ingeniero Mecatrónico

Huancayo, 2021

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ABSTRACT

This research presents the design and control of a mechatronic assistant for the treatment with music therapy in dementia patients, in emphasis on Alzheimer's disease, through control software implemented in a mechatronic system. The development of research shows that the proposed mechatronic system detects and records the behavior of brain waves, through communication in order to perform some corrective action against a possible unwanted unforeseen response during therapy. This communication can be in real time by communicating via Bluetooth through an application to a family member or patient manager and regulates the musical style according to the type of brain wave that best effects the patient with dementia and additionally, with a cloud record for further analysis of the improvement and progress of the patient. With this, the implemented mechatronic assistant will improve the well-being and quality of life of dementia patients.

CCS CONCEPTS

• **Hardware**; • **Electronic design automation**; • **Hardware description and compilation languages**;

KEYWORDS

Alzheimer's, Control Software, Music Therapy, Mechatronic Systems

1 INTRODUCTION

Currently mental health care is becoming increasingly important, dementia is a term used for diseases that demonstrate memory impairment and other thinking-involving skills [1]. According to the World Health Organization, 50 million people worldwide suffer from dementia, with an expectation of an increase by 2030 to 82 million people [2] and by 2050 to 152 million people [3]. The most common dementia is Alzheimer's, with 60% to 80% of people with dementia [4]. Alzheimer's is a degenerative disease that increases over time due to progressive damage of neurons and possible subsequent destruction, which causes memory loss, reasoning, personality changes and behavior [5], increasing dependence on its surroundings [6]. There are pharmaceutical treatments with delayed effects or to appease some symptoms reflected in the patient's behavior, it is considered that in reality there is no cure and the mortality rate is increasing, for example, between the years of 2000 and 2018 Alzheimer's deaths rose by 146.2% in the United States producing expenses of billions of dollars in patient care and treatments [7].

In previous studies, music therapy treatment was performed, resulting in significant improvements in verbal fluency, it also reduced depression, apathy and anxiety, but due to the study with few patients the variation in significant changes in the functioning and cognition of the person with dementia [8] could not be determined. In a similar case, music therapy was analyzed under the capabilities model for patients with neurological disorders showing results where it was concluded that music provides patient well-being and better quality of life [9], starting with the prototype of a control software model with infrared sensors to detect human body temperature [10].

We want to obtain an automated machine, which has control software, that is able to control and monitor patients with dementia, to record the effects of music therapy on dementia patients and analyze its impact on cognitive and behavioral systems [11].