WIRELESS ROBOTIC ARM MIMICKING ARM MOVEMENT WITH ARDUINO

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Abstract. *–This project consists in the planning, coding and building of a remote controlled robotic arm with 6 degrees of freedom using wireless technology (such as Bluetooth) from the mimic of the movement of rotary encoders on the emitter block.*

Resumen. *–Este proyecto consiste en el planeamiento, armado y codificación de un brazo robótico con 6 grados de libertad, controlado de manera remota mediante tecnología inálambrica (como por ejemplo Bluetooth) a partir de la imitación del movimiento de encoder rotativos en el lado del emisor.*

Key words. – Robotic arm, 6GDL, wireless, Bluetooth, rotary encoder

I. INTRODUCTION

During the COVID-19 pandemic, the lack of means for remote patient care caused deaths of physicians and patients, delayed surgery for many patients and, in general, hindered medical activity worldwide. Thus, today, it is understood that these crises will occur on multiple occasions due to globalization, so this first worldwide experience should serve as an inspiration to prevent the same situations from recurring. And this is where technological development has, as a necessity, to intervene.

II. PRESENTATION PROBLEM

The problem to be solved, then, is to achieve physical interaction, as much as possible, remotely, so that a physician can, at the very least, be able to interact in a basic way with his patient without the physician necessarily being in the same room.

III. SOLUTION DESCRIPTION

We propose the creation of a robotic arm that mimics the movements of the doctor's arm remotely, in order to achieve the most organic interaction possible between the doctor and his patient, but that keeps them safe in case one of them is in a state of vulnerability to the contagion of a disease or life-threatening condition. Thus, this arm must have six degrees of freedom and must be synchronized through some interface to the physical movement of the doctor's arm with a communication, in this case via Bluetooth, in real time and with the shortest possible delay. To this end, rotation encoders, servomotors, Bluetooth modules and the use of Arduino technology will have to be used.

IV. RESULTS

A correct simulation has been achieved with serial coding Bluetooth serial coding and correct operation of the rotary encoders. However, it has been quite a challenge to achieve this: To simulate an HC-05 or HC-06 module, it is necessary to configure the entire computer around its serial communication ports so that one of these ports "simulates" the Bluetooth connection. And even then, it is actually quite difficult to achieve a correct Bluetooth connection because it does not always appear as an available connection. In this sense, a mobile app was designed to "simulate" the input interface for the simulation. As for the coding, this project is a bit cumbersome, since even with the use of libraries, it is apparently simple, but a correct serialization of the signals must be achieved and there are several methods to achieve it. simple, but a correct serialization of the signals must be achieved and there are several methods to achieve it. In this

case, the simplest possible option has been chosen, although it is possible that this is not the best signal configuration. With respect to the configuration of the servomotors, the most important thing is the power pulse which, in this case, the ideal configuration of 1000 to 2000 ms has been chosen because it exists in a simulation environment, however, it is clear that, in a real environment, the pulse of the motors must be individually calibrated based on trial and error tests.

V. CONCLUSIONS

- It is feasible to create a prototype of this nature, but it is extremely necessary to have all the physical resources in order to test the actual correct functioning of the code and the system.
- Serial signal coding has a moderate difficulty in terms of programming language: It uses a logic that is apparently simple, but offers very interesting difficulties to be solved.
- A master-slave communication configuration is quite simple to achieve with the HC-05 and HC-06 modules, but there are other options such as 433MHz RF modules which are less expensive, but whose coding is much more complicated to transmit the information.

  The HC module configuration offers speeds up to 38400 baud, however, this is error prone as the ATMega328p serial communication is 9600 baud by default.

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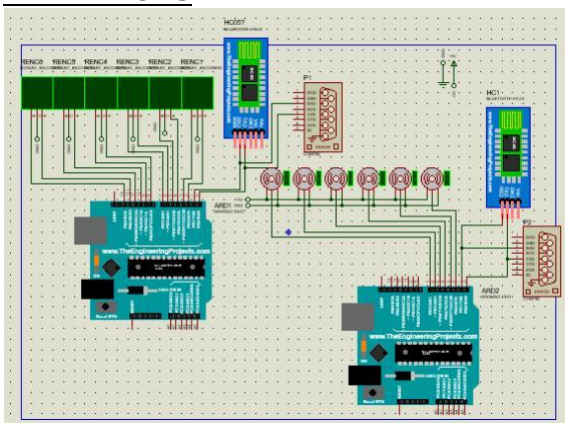
VII. APPENDICES



(Fig.1) Circuit schematic in Proteus