Pulmonary rehabilitation Robot Follower

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***Abstract*—Patients that suffer Chronic Obstructive Pulmonary Disease (COPD) underwent a procedure called Pulmonary Rehabilitation that helps them to improve disease prognosis. During Pulmonary Rehabilitation procedures patients require external oxygen assistance. The oxygen tank cannot be carried by the patient and some external assistance is required. In this work a basic robot follower is proposed to carry the oxygen tank based on a differential tethered scheme. Two algorithms are proposed in a very basic configuration. BLABLABLABLABLABLA**

This work is inspired in () but with a different setting in mind, particularly for Pulmonary Rehabilitation procedures.

First describe the problem. Cite the japanese work and the work similar to what we were doing that is in the book.

Describe the robot. How it works, the hardware software, python based the devices and tools used and other architectural elements. Add a graph of how it works.

Describe the PVC manufacturing process that Esteban created. The materials and the name of the CNC that they are using to manufacture everything. Add the components.

Describe the active spring using scrapped DVD motors.

Control strategies: describe both of them.

Results: show the results of the control strategy using Webots and also the same strategy with the real robot.

Discuss: Describe how everything worked. Which one is the better and describe how they worked.

***Index Terms*—robotics, tethered, COPD**

I. Introduction

CHRONIC Obstructive Pulmonary Disease (COPD) is an umbrella term that describe several pulmonary affections characterized by a eskeletomuscular atrophy. In order to carve these after effects a treatment called Pulmonary Rehabilitation is regularly performed on patients. During these treatments patients underwent walking procedures and physical exercises under the supervision of physical therapist. These patients are characterized by a severe low saturation illness and they require effective oxygen supply, particularly when performing physical activity. Hence, patients require to carry with them an oxygen tank to assist in the oxygenotherapy. However, their own condition prevent them with the ability to precisely carry the often bulky external tank. This situation pertain as a realistic solution to provide two physical therapist, with one of them carrying the oxygen tank, or to devise a customization to wheelchairs to allow them to carry the oxygen tank. This ended up sometimes being a cumbersome situation for the physical therapist because he had to push and maneuver the chain with the oxygent tank, and at the same time take care of the patient.

These scenario may be aggravated by the fact that the Rehabilitation Gym may be sometimes crowded with different patients, physiologist, physical therapists.

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Robotics applications can offer a solution in this scenario.

COPD treatment for patients has been tackled from many perspectives. An extensive body of research deals with COPD patients from the point of view of telemedicine applications to track biological signals for patients in home care scenarios.

Tethered robots, on the other hand, have been extensively research in robotics communities. They offered a very simple solution to some common navigation problems, and they can be very effective on robot-to robot interaction or while interacting with humans in Human Robot Interfaces, collaborative robotics [1], [2].

Differential tethered robots are so widespread. The work presented by [3] offers an excellent scheme though aimed to a different purpose.

REFERENCE TO RAS MAgazine and ONU . [4]

This work follows the line of [5]

II. Materials and Methods

In order to prioritize several iterations that could be verified by key stakeholders, we developed a simple robotic prototype constructed on Internet of Robotic Things [6]. This discipline is part of what is being called 4th industrial revolution and is reshaping many aspects of global manufacturing, including robotic and healthcare.

A. Solution Design

The medical community is frequently skeptical to technological solutions for medical personel (REF). At the same time, development process as design thinking and other similar tendencies prioritize rapid development, prototyping that can bring quickly feedback from real users about the drawbacks and improving opportunities. In this context, it is important to perform rapid prototyping.

B. Hardware

C. Software Components

D. Control Strategy

In order to verify the feasibility of the system, two simple control strategies are devised. The first one is called ...

III. Experimental Protocol

This section describes the experimental protocol used to evaluate the performance of the proposed solution.

Several metrics are proposed to evaluate the performance. They are.

First the simulatiom is sdescribed and later the evaluation on the prototyped rrobotic platform is described.

A. Simulation

B. Real world

To verify the validity of the proposed framework and method,

The experimental protocol used to

The recorded dataset was sampled at 256 Hz and it consisted of a scalp multichannel EEG signal for electrode channels Fz, Cz, Pz, Oz, P3, P4, PO7 and PO8, identified according to the 10-20 International System, for each one of the 8 subjects. The recording device was a research-oriented digital EEG device (g.Mobilab, g.Tec, Austria) and the data acquisition and stimuli delivery were handled by the BCI2000 open source software [7].

In order to assess

IV. Results

The purpose of this section is to evaluate the feasibility of both control strategies, their engineering issues.

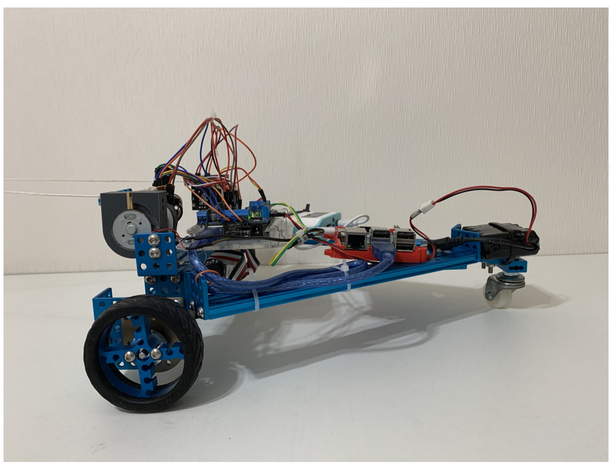

Fig. 1: This robot prototype.

V. Discussion

A. Clinical Assessment

B. Conclusion and Future Work

The goal of this work is to verify if a tethered robot to implement a following scheme on a patient during a pulmonary rehabilitation procedure is too simplistic to be a factual implementation.

VI. Acknowledgments

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Conflict of Interest Statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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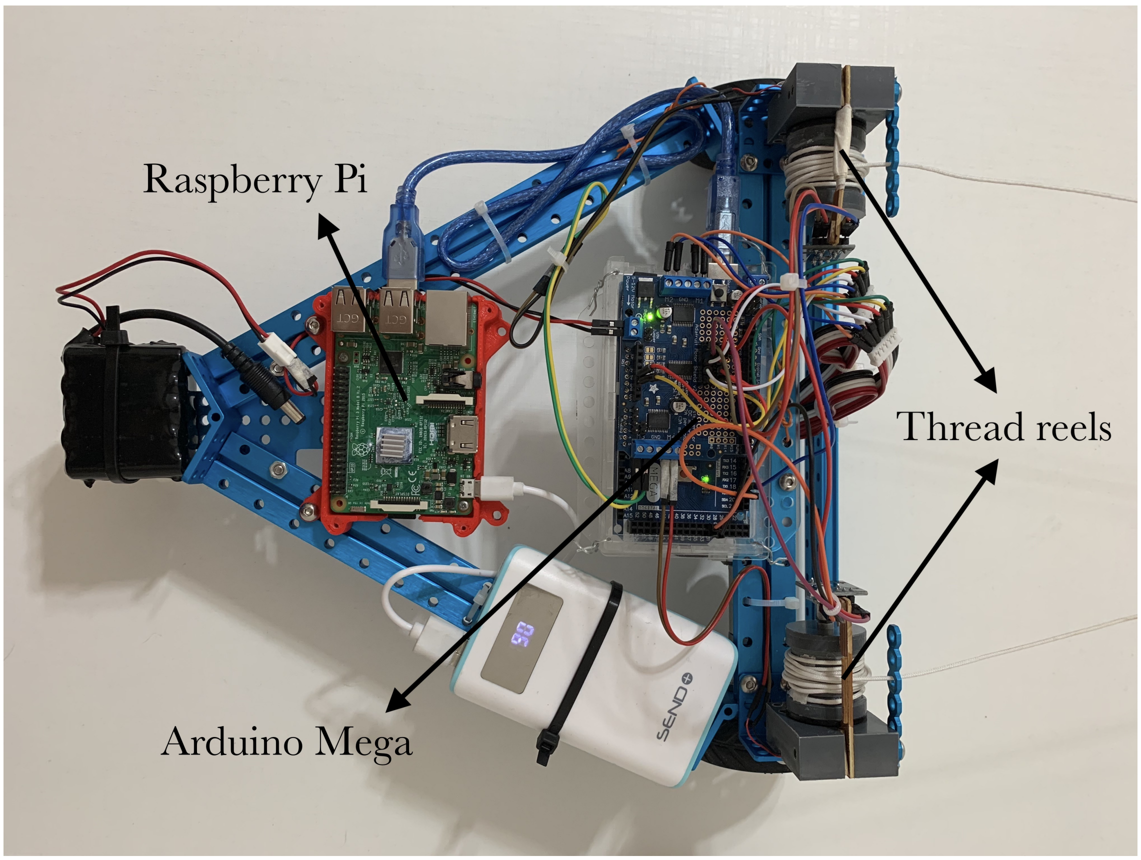

(a) Case I

Fig. 2: Ten sample P300 template patches for subjects 8 (A) and 3 (B) of the ALS Dataset. Downward deflection is positive polarity. The P300 signature waveform is more clearly and consistent characterized for subject 8, whereas for subject 3 the characteristic patterns is more difficult to spot.