

Developing a robotic therapist for children

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In collaboration with other national institutions, researchers at Universidad Carlos III de Madrid (UC3M) are designing a new therapeutic tool for motor rehabilitation for children. In this project, an interactive social therapist robot, which is totally autonomous, is able to

perceive patients' reactions and determine if they are doing their exercises correctly.

This advance, which had been developed as part of the scientific project known as Therapist, proposes a therapeutic method that is enlivened by a robot that looks like a toy to avoid the kind of discouragement that often impedes youngsters' recovery. So far, more than one hundred children have evaluated the social abilities of the robot, and some children with motor difficulties have tried this therapy. Both the children and their parents, as well as the medical staff who work with them, have noted that this makes the activity more fun and attractive for the patients and that the robot is an excellent tool for improving the degree to which patients correctly follow their rehabilitation treatment, as well as improving the evaluation process, according to an article on this development that was recently published in the journal *Revista Iberoamericana de Automática e Informática Industrial*.

During this research, the humanoid robot NAO, which is 58 centimeters high and weighs just over four kilos, was converted into a kind of personal therapist. This is how it is described by the head of the project from the research group on Planning and Learning (Planificación y Aprendizaje - PLG) within UC3M's Computer Science Department, Fernando Fernández Rebollo; he explains that the idea is to create "a robot that doesn't seem like a robot, one which seems alive to the children and can socially interact with them." The second goal of the project is to collaborate with the hospitals' medical rehabilitation services in defining therapies incorporating this robot. There is no physical contact between the robot and the patient at any time, nor is there any risk to the child, the scientists assure.

Advantages of the system

"The main benefit is that the children see the robot as a friend; they like

playing with it and they become uninhibited," assures one of the researchers from the PLG group, José Carlos Pulido. That was the experience of the patients in the pediatric unit at the Hospital Universitario Virgen del Rocío, who responded affirmatively to the question, "Do you want to play with me?" The robotic therapist used this invitation to start the sessions. After asking the questions, the robot indicates the rehabilitation exercises (a sequence of postures that the child must imitate), carrying them out itself thanks to its articulated body. When a child doesn't carry out the positions correctly, the robot indicates this visually, by the color of its eyes and, using its voice and body movements, shows the patient how to do the exercise correctly.

The work done by UC3M is focused on planning tasks and automated learning, something that "gives the robot the ability to decide which actions it wants to carry out at any given moment," explains Fernández Rebollo, as well as "adapt to the characteristics of the patient and the rehabilitation session that is underway." He also points out that this "control architecture", called Robocog, can be applied to other robotic therapists such as Ursus, which the Universidad de Extremadura is currently working on as part of this consortium. In addition, these robotic physical therapists will be fine-tuning their performance thanks to the algorithms that Universidad de Málaga is working on and which, as José Carlos González, one of the other PLG researchers at UC3M who is working on this project, notes, will allow the [robot](#) to recognize the child's gestures using a camera; it will be able to recognize when the child is smiling, getting angry or having difficulty with an exercise.

This robotic therapist will become a reality and could, within a few years, even enliven rehabilitation processes for [children](#) with pathologies like cerebral palsy. For now, the researchers point out that there is still work to be done defining the metrics for accurately evaluating the degree of success of the new [rehabilitation](#) therapy and determining the degree of interaction with the patient that this robotic physical therapist

might reach; its contribution to the evaluation and monitoring of the therapies must also be determined.

More information: L.V. Calderita, P. Bustos, C. Suárez Mejías, F. Fernández, R. Viciano, A. Bandera. Asistente Robótico Socialmente Interactivo para Terapias de Rehabilitación Motriz con Pacientes de Pediatría en Revista Iberoamericana de Automática e Informática Industrial 12 (2015) 99–110.

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