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Research Article

Robotic rehabilitation solution

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Abstract:

We present an intelligent user interface that allows people to perform robotic rehabilitation solution for exercises by themselves under the limited supervision of a therapist. Every year, many people suffer injuries that require rehabilitation. This entails considerable time overheads since it requires people to perform specified exercises under the direct supervision of a therapist. In this way, it is alluring that patients keep performing practices outside the facility (for example at home, along these lines without direct oversight), to supplement in-center non-intrusive treatment. Nonetheless, to accomplish mechanical recovery task roughly, patients need proper input, as differently gave by a physiotherapist, to ensure that these constrained management practices are accurately executed.

Different approaches address this problem, providing feedback mechanisms to assist rehabilitation.

Robot is "a re-programmable, worldwide controller intended to move material, parts, instruments or concentrated gadgets by means of variable modified movements for the accomplishment of a spread of undertakings." Although this definition was intended for industrial robots, it identifies the key features of programmability, flexibility, and movement.

Rehabilitation is "the restoration of an individual to an optimal level of physical, mental, and affair and well-being." Rehabilitation robots include diverse mechatronic devices starting from artificial limbs to robots for supporting the rehabilitation therapy or for providing personal benefit in hospital and residential set ups. Rehabilitation has been revolutionized with the use of robots in many parts of the world and much research is being done on in this field. In India's there is many hospitals and clinics are using robotic devices were installed .These devices are-- the Erigo, (For Early rehab), Lokomat (For Physiological gait training), Armeo (For Hand rehabilitation) etc. there are many devices. These devices are designed and manufactured by Hocoma.

They will approach to provide real-time, active feedback, using multiple projection surfaces to provide effective visualizations by a physical therapist, with performance improvements between consecutive executions, a desirable goal to successful rehabilitation.

There are two main types of rehabilitation robots. The first type is an assistive robot that substitutes for lost limb movements. An example is that the Manus ARM (assistive robotic controller), which may be a wheelchair-mounted robotic arm that is consist of employing a chin switch or other data input device. That mechanism is named telemanipulation and is analogous to an astronaut's controlling a spacecraft's robot arm from inside the spacecraft's cockpit. Powered wheelchairs are one more example of teleoperated, assistive robots.

The second sort of rehabilitation robot may be a therapy robot, which is usually called a rehabilitator. Research in neuroscience has shown that the brain and medulla spinalis retain an interesting ability to adapt, even after injury, through the utilization of practiced movements. Therapy robots are machines or tools for rehabilitation therapists that grant patients to perform practice movements aided by the robot. The first robot utilized in that way, MIT-Manus, helped stroke patients to succeed in across a tabletop if they were unable to perform the task by themselves. Patients who received extra therapy from the robot improved the speed of their arm movement recovery. Another therapy robot, the Lokomat, supports the load of an individual and moves the legs during a walking pattern over a moving treadmill, with the goal of retraining the person to walk after spinal cord injury or stroke.

Rehabilitation robotics may be a relatively young and rapidly growing field, with increasing penetration into the clinical environment. In the late 1980s and early 90s a few pioneering technological developments were launched, triggered by discoveries on training-induced recovery of sensorimotor function in animal models with damage to the central nervous system. The goal was to enhance the effects of functional training by providing increased therapy intensity and adaptive support in a controlled way.

The idea of using machines for rehabilitation dates back much earlier. In a 1910 patent, Theodor Büdingen proposed a 'development fix mechanical assembly', a machine driven by an electrical engine to direct and empower venturing developments in patients with heart condition. In the 1930s, Richard Scherb developed the 'meridian', a cable-driven apparatus to maneuver joints for orthopedic therapy. This human-powered mechanotherapy machine already supported multiple interaction modes, starting from passive to active-assisted and active-resisted movements. A first robotic rehabilitation system was based on the concept of continuous passive motion (CPM), a stiff interaction mode in which the robot moves the joints along a predefined trajectory, independent of the contribution of the patient.

The first powered exoskeletons for therapeutic applications in SCI patients were introduced in the 1970s. These systems used pneumatic, hydraulic, or electromagnetic (via cams and Bowden cables) activators for position servo control. They included advanced features, such as actuated ankle flexion/extension, and hip adduction/abduction for increased stability or the ability of a therapist to control the motion of the exoskeleton worn by the patient through his/her own movement (in an identical , connected exoskeleton). The first system for robot-assisted therapy of stroke survivors was based on a stiff industrial manipulator and did not physically interact with patients, but rather moved a pad that patients had to touch to different locations.

A new era of neurorehabilitation robotics began in 1989 with the development of the MIT-MANUS, which was first tested clinically in 1994. Identified with modern controllers, this planar manipulandum presents intrinsically low mechanical yield impedance (a recurrence subordinate protection from movement saw at the interface between the human client and in this manner the automated framework) and gives hold of the upper appendage against gravity, along these lines permitting to adjust backing to the seriousness of the shortfalls. A few years later, force-controlled devices for bimanual, cooperative grasping and lifting were introduced. This new generation of devices, using torque-controlled direct drive actuation, allowed for more advanced interaction control, ranging from passive movements for the most severely impaired patients, to active-assisted and active-resisted movements in moderately impaired patients. Furthermore, assistance could be automatically adapted to the patient's performance. Around the same time, the reflection Motion Enabler (MIME) was introduced, which supported paretic limb movements with a stiff industrial robot, controlled by the non-paretic limb by means of a motion digitizer (mirror-image therapy mode).