D. Accoto, L. Zollo, D. Formica, E. Guglielmelli. Design of a planar robotic machine for telerehabilitation of elderly patients. Gerontechnology 2008; 7(2):65. Early supported discharge (ESD) from hospital with continued rehabilitation at home is a well-validated regimen for post-stroke rehabilitation[1] aiming at accelerating the patient's discharge and providing an equivalent level of rehabilitation input in the patient's own home in comparison with conventional hospital care and discharge arrangements[2]. Several recent studies on ESD demonstrated a significant effect even in comparison with standard care based in a stroke unit[3]. Decreased length of in-patient rehabilitation stay, greater long-term injury survival rates, broader access to information technologies, and the growing role of the Internet create potential for new models of rehabilitation. Information-based rehabilitation technologies expand the possibilities for numerous interventions to promote independent living of impaired elderly people, such as virtual reality and robot-aided telerehabilitation[4]. Robot-aided telerehabilitation is a remote type of rehabilitation where the patient uses the robot at home while the therapist is conducting the therapy from a remote location[5]. The enabling technologies are the Internet, which provides the communication link (data and video), and a robot, which allows the user to enter motion commands and receive force feedback. Two possible configurations are feasible: (i) in a unilateral configuration only the patient needs to have a robot to enable telerehabilitation[6-8]; (ii) in a bilateral configuration both patient and therapist use robots. We present the design and development of a robot manipulator for telerehabilitation of the upper limb. The machine is conceived to optimize the dynamic behavior in the interaction with the patient by addressing requirements coming from the application areas of robot-aided rehabilitation and remote rehabilitation. In particular, the robot design tries to address the following features: (i) high back-driveability (low friction; low and isotropic apparent inertia when back-driven); (ii) a large workspace to allow administrating rehabilitative treatments (target: >500x500 mm); (iii) interaction forces up to 50 N; (iv) low cost and high robustness; (v) high portability. The robotic machine is currently being developed for upper limb motor therapy[9-11] in the unilateral configuration, taking care of in-depth studying issues related to communication on intermittent basis or in real-time (that are critical for ensuring safety in the interaction). A gradual increase of interactive control and cooperation with the therapist in remote location, up to the bilateral configuration is then envisaged. Specific application scenarios of this machine for telerehabilitation of elderly patients is presented and analyzed.

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Keywords: design, robot, rehabilitation, telerehabilitation

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