

Humanoid Social Robots in Rehabilitation

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Abstract

To increase the interest of a child in motor training we have tried to use a humanoid social robot that acts like a coach to encourage the patient. The humanoid robot "KineTron" was assembled from commercially available Bioloid Premium robotic kit. Nine movement scenarios of robot behaviour combined with voice and music were developed.

Evaluation of the Rehabilitation Robot was carried out on a group of six children with Cerebral Palsy. All children and parents liked the sessions with the Rehabilitation Robot. This pilot study suggests that there are potential benefits in using humanoid robots in motor training of patients with cerebral palsy.



Description of Rehabilitation Robot

The humanoid robot "KineTron" is 40 cm high and weights 1.7 kg. His movements are performed by 18 servomotors (6 in each leg and 3 in each hand) operated by microcontroller.

Nine movement scenarios of robot behavior have been developed - three for the beginning of the session, three to encourage patients in the middle of training and three for the final part of the session. Each movement scenario is combined with voice and music. During the training session, a therapist activates one of the scenarios by pressing a button on the remote.

Movement scenarios description

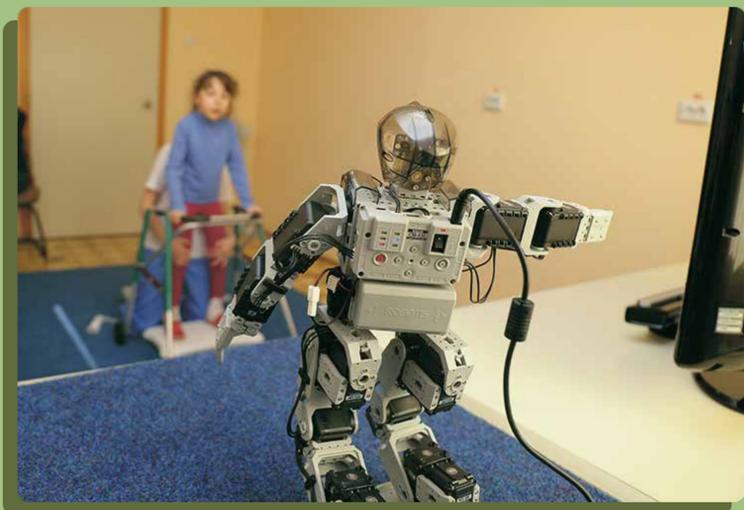
Music starts, Robot stands up, goes out to the patient, waves his hand and says: "Hello, I am a Rehabilitation Robot KineTron, and what's your name?" After the child's reply, he says "Nice to meet you" and bows. He suggests training together, points with his hand to the screen, says that he would be watching carefully and squats down.

Evaluation of Rehabilitation Robot

Evaluation of the Rehabilitation Robot was carried out on a group of six children with Cerebral Palsy, aged between 4-9 years, undergoing in the International Clinic of Rehabilitation a two-week course of intensive neurophysiological rehabilitation according to the Kozyavkin Method. This rehabilitation system incorporates different treatment modalities one of which is special computer games, developed by our IT team.

Rehabilitation Robot was used during 5 to 7 treatment sessions of Computer Stepping Games with duration about 20 min. During the sessions, therapists several times executed certain robot behavior scenarios depending on the performance of the child by pressing a button on remote.

After the treatment course patients and parents were asked in an interview about their opinion about the Robot. All children liked the sessions with the Rehabilitation Robot. The children wanted him to be present during their other sessions. The parents made useful suggestions including the following: making him different clothes, expanding the movement scenarios and making separate programs for boys and girls.



Rehabilitation Robot KineTron during training session



Humanoid Robots in Motor Rehabilitation
YouTube video <http://youtu.be/M84NAZ4aJFs>



Stepping Games for Virtual Rehabilitation
YouTube video <http://youtu.be/IDLtu575Ugw>

Conclusion

The pilot study suggests that there are potential benefits in using humanoid robots in motor training of patients with cerebral palsy. It appears to be motivating for the child and encourages active participation in rehabilitation activities.

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