

The Potential of Humanoid Robots for Children with Autism Spectrum Disorders: a Preliminary Study

Linus Aidokas

Vilnius University, Institute of Data Science and Technologies, Artificial Intelligence lab



Introduction

Autism spectrum disorder (ASD) is a developmental disorder characterised by impaired social communication, restricted interests, lack of emotional control and repetitive behaviours. Autistic people are impaired in their abilities for social interaction, social communication and imagination. People with autism spectrum disorders have problems with interpersonal relationships and difficulties building relationships with their environment. Humanoid robotics in combination with developmental therapy can help people build interpersonal and environmental relationships.

Challenges for autistic people

- Challenges can be very dynamic;
- Autistic people can have a strict routine and lead a completely normal life;
- After the typical routine is disrupted, they may begin to show strange or unusual signs;
- Contrary to popular belief, it is not a disease, we do not get sick from it;
- It is not a special need but individual needs;
- Difficult emotional control and cognition;

Autism explained

Autism is a genetically determined neurological variant in humans. The complex, interrelated features that distinguish autistic neurology from non-autistic neurology are not yet clear, but current evidence suggests that the central distinguishing feature is that autistic brains are characterized by a particularly high degree of synaptic connectivity and responsiveness. As a result, the subjective experience of those affected is more intense and chaotic than that of non-autistic people: the autistic mind absorbs more information at both the sensorimotor and cognitive levels, and the impact of individual pieces of information is stronger and less predictable.

Autism is a developmental phenomenon, meaning it begins in utero and has a pervasive impact on development, on multiple levels, throughout the lifespan. Autism results in a distinct, atypical way of thinking, moving, interacting, and controlling sensory and cognitive processing. An often-used analogy is that autistic people have a different neurological “operating system” than non-autistic people.

Cooperating together with:

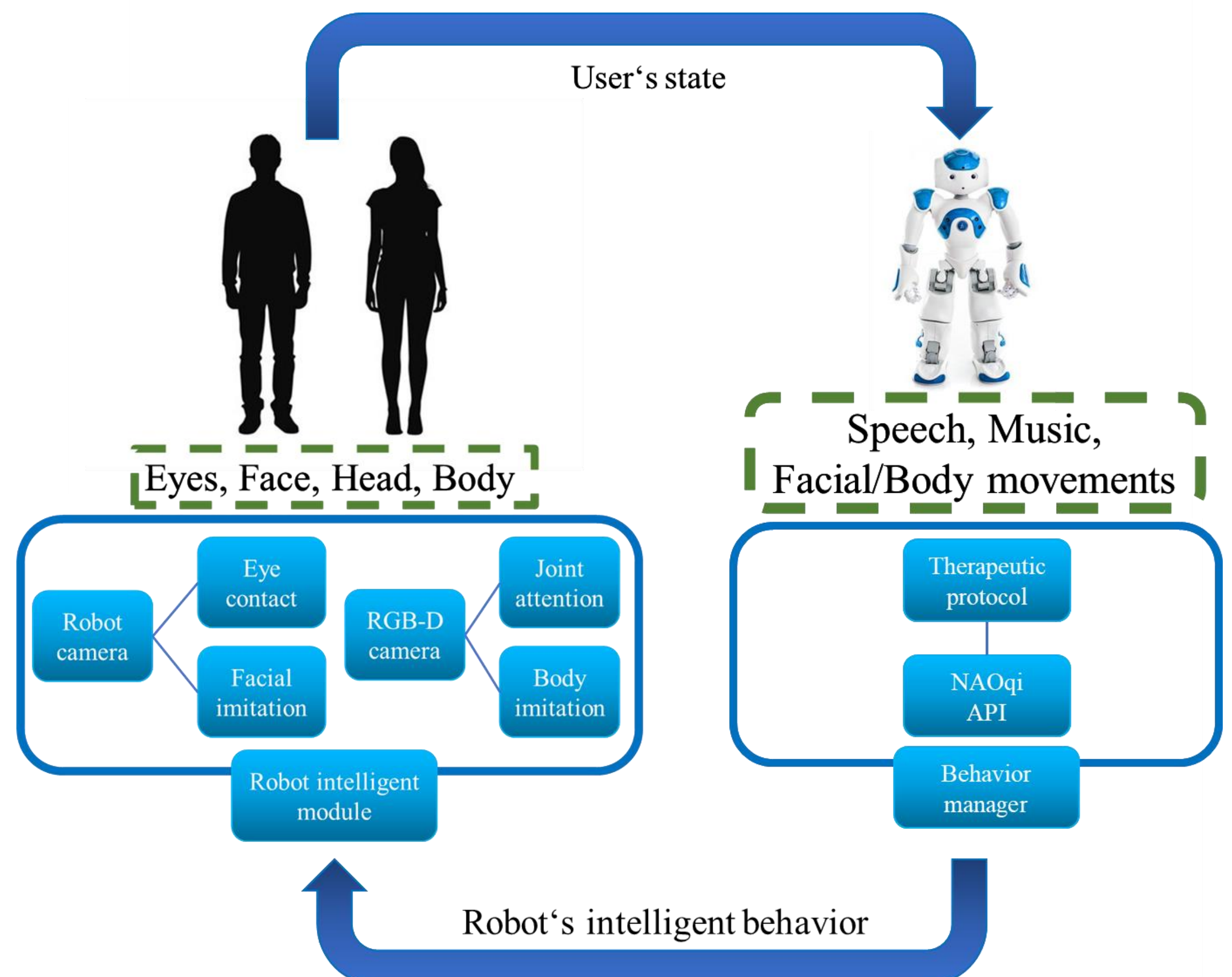


Consulting with:



Examples of possible therapeutic interventions

- The person imitates the movements of a robot;
- The child answers a question;
- The child needs the guidance of a robot to show therapy steps;
- The child must dance with the robot;
- The therapy module needs a robot to move;
- The robot must show the child an angry or happy face;
- The child looks at the robot;
- The robot must point to the object in the environment;
- The robot must start predefined therapy routines;
- The child has completed the current therapy routines and needs a new one;
- The robot must ask for a specific object out of multiple choices



Conclusions

- The robots could work together with the therapists' requirements in a robot-mediated telerehabilitation facility. However, the software still needs to be developed to improve control over the robot.
- It is important to develop the interface of the software and its content to be user-friendly for people without a technical background, which could expand the user base of the software.
- The social skills and emotional development seen in children with ASD when engaging with robots allow us to accept the crucial role that robots play in autism therapy.
- The process of working with autistic children can be very challenging and for this reason it is very important to have a flexible view of the desired outcome. The unpredictable and sometimes chaotic behaviors and mood swings that are characteristic of autistic children, along with the fact that we do not really understand what is interesting to them and what might cause anxiety or discomfort, can be a real obstacle when working with fixed goals.