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The development of new technologies enables changes in all spheres of social activity. Particularly vulnerable social categories are people suffering from autistic spectrum disorders, as well as people with other forms of disability. The aim of the workshop is to share knowledge about the different technologies that should facilitate the easier inclusion of these people in society. Special attention is devoted to technologies that enable the diagnosis of autistic spectrum disorders and appropriate therapy from the earliest years of life. Particularly important roles are referred to robotics and information technology. Very common side effects of autistic spectrum disorders are motoric dysfunctions, where advanced robotic systems can play a very important role in successful rehabilitation. The half-day workshop will bring together top experts - trainers from the field of robotics, information technology, human-robot interaction, rehabilitation and other related areas.

Agenda of the Workshop:

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:55</td>
<td>Opening and welcome address</td>
</tr>
<tr>
<td>09:00</td>
<td>Maja Cepanec, Zdenko Kovačić</td>
</tr>
<tr>
<td>09:05</td>
<td>Keynote talk: NAO and Autism: an update on SoftBank Robotics's projects</td>
</tr>
<tr>
<td>09:40</td>
<td>DE-ENIGMA – Robot-based emotion-recognition and emotion-expression</td>
</tr>
<tr>
<td>10:00</td>
<td>CareTOY - Rehabilitation at Home based on Mechatronic Toys</td>
</tr>
<tr>
<td>10:20</td>
<td>ADORE – Autism Diagnostic Observation with Robot Evaluator</td>
</tr>
<tr>
<td>10:45</td>
<td>Coffee break</td>
</tr>
<tr>
<td>11:00</td>
<td>QTrobot, programmable by everyone</td>
</tr>
<tr>
<td>11:20</td>
<td>Digital stimulating environment for children with multiple impairments</td>
</tr>
<tr>
<td>11:40</td>
<td>Assistive technology for environmental control, education, and communication</td>
</tr>
<tr>
<td>12:00</td>
<td>Voice Conversion and Expressive Speech as Assistive Technologies</td>
</tr>
<tr>
<td>12:20</td>
<td>Children with ASD and Robots - What's the Connection?</td>
</tr>
<tr>
<td>12:40</td>
<td>Robot-assisted Autism Spectrum Disorder Diagnostics using Partially</td>
</tr>
<tr>
<td>13:00</td>
<td>Lunch break</td>
</tr>
</tbody>
</table>

The 26th Mediterranean Conference on Control and Automation
Venue: Hotel Kolovare, Zadar, Croatia
Date: Tuesday June 19, 2018.
Meeting Room 1

Workshop
Assistive Technologies for People with ASD and other Disabilities
Organized by: Zdenko Kovačić (University of Zagreb Faculty of Electrical Engineering and Computing) and Maja Cepanec (University of Zagreb Faculty of Education and Rehabilitation Sciences)
Sponsored by Croatian Science Foundation through the project

http://www.med-control.org/med2018/
Abstracts:

NAO and Autism: an update on SoftBank Robotics’s projects

In this talk, we’ll give you an overview of our company’s recent developments in the uses of our robot related to autism. Including the EC funded DREAM Project on Robot-enhanced Therapy for Autism, the new version of the AskNAO solution, and other related projects.

DE-ENIGMA – Robot-based emotion-recognition and emotion-expression teaching programme to school-aged autistic children

There are over 5 million people with autism in the European Union. If you include their families, this number increases to over 20 million. It affects the way a person communicates, understands and relates to others. People with autism often have difficulty using and understanding verbal and non-verbal language. This often makes it difficult to understand others and interact with them. Getting the right support and therapies makes a substantial difference to people with autism. On the other hand, people with autism often have intact and sometimes even superior cognitive abilities to comprehend predictable systems, such as robots. Children with autism perceive a humanoid robot as being less complicated, less threatening, and more comfortable to communicate with than humans. Research has demonstrated that the best treatments are early and specialized. Behavior-based therapy is an approach that helps people with autism to develop skills to cope with the individual challenges they face. The DE-ENIGMA project is developing artificial intelligence for a commercial robot (Robokind’s Zeno). The robot will be used for an emotion-recognition and emotion-expression teaching programme to school-aged autistic children. This approach combines the most common interests of children of school age: technology, cartoon characters (that Zeno resembles) and socializing with peers. During the project, Zeno will go through several design phases, getting “smarter” every day. The programme is to promote the acquisition of new emotions and facial expressions in order to adaptively and autonomously present emotion activities, and engage in feedback, support, and play. Preliminary results

In its first 18 months, DE-ENIGMA has seen numerous empirical evidences of impact that the teaching program had on children who participated in sessions with Zeno. Almost all of the children showed improvement of socio-emotional skills and their use in context. This includes:

- positive emotions caused by the pleasant environment and the type of program, improved the ability to learn academic skills
- improving social interaction, developing relationships with people through Zeno
- recognition of own emotions, use in the context, generalization of the learned content
- developing empathy, ability and desire to help others
- improving social interaction, skill of sharing with others
- improvement of social interaction, control and subtle display of emotions
- developing empathy and an adequate response to the emotions of other people
- improving social skills and rules by implicit learning
- alleviating of sensory issues by adjusting content to the child’s interest
- understanding of own needs, desires and emotions
- understanding the needs, desires and emotions of other people
- improving communication and vocabulary (in verbal children)

CareTOY – Rehabilitation at Home based on Mechatronic Toys

The project CareTOY’s intention in the first year of life with a portable, low cost, smart system using telemonitoring therapy. The CareToy system is composed of different modules: a) an instrumented baby gym with mechatronic hazardous toys that encode the information of the gym on the card can be measured and stimulated, b) a vision module, for measuring and promoting infants’ attention and gaze movements and c) a sensorized mat and Inertial Measurement Units (IMU) for measuring and providing postural control. A fourth telehabilitation module allows for remote communication with the rehabilitation staff for monitoring and the rehabilitation task definition. CareToy was validated by a RCT on 60 preterm infants with different brain lesions.

ADORE – Autism Diagnostic Observation with Robot Evaluator

Notwithstanding intensive research and many advances, diagnosing autism spectrum disorders remains a slow and tedious process. Due to the absence of any physiological tests, the outcome depends solely on the expertise of the clinician, which takes years to acquire. The goal of our ADORE project funded by the European Research Council (HRZ2) is to develop a robotic assistant, which will facilitate the diagnostic process and make it more reliable. For this purpose, four tasks from the ADOS-2 protocol were selected.

QTRobot, programmable by everyone

Social robots are effective tools to make healthcare and education more accessible and affordable. Therefore, we developed our robot in a non-verbal form – the QTrobot. QTrobot is a speech synthesis robot that can talk, express emotions and cooperate with other objects. Information from QTrobot is encoded in the observation probabilities of task models. Expert knowledge is encoded in the observation probabilities of task models. ASD experts are surveyed and their knowledge is shared with the robot to process the observations of child’s behavior, infer information about the child’s mental state, and be used for robot’s decisions. The purpose of the current study was to examine the differences in interactions of children with ASD in relation to the demonstration of the task (robot-human) and to give a detailed description of the imitation skills. The results will be elaborated in the presentation.

Children with ASD and Robots - What’s the Connection?

Various technological devices have long been an essential part of diagnostics and rehabilitation of many disorders. In the field of autism spectrum disorder (ASD) research, enhancement of diagnostics process and therapy of individuals with ASD, scientists have become rather interested in potential of socially-assistant robots. So far, in the field of human-robot interaction, researchers have explored various applications of robots in autism, e.g. language acquisition, attention and gaze, social interaction and socializing with robots. Researchers have so far been successful in eliciting desirable social behaviors in children with ASD, as joint attention or sharing of the enjoyment. The purpose of the current study was to examine the differences in interactions of children with ASD in relation to the demonstration of the task (robot-human) and to give a detailed description of the imitation skills. The results will be elaborated in the presentation.

Robot-assisted Autism Spectrum Disorder Diagnostics using Partially Observable Markov Decision Processes (POMDP)

In this talk the focus will be on methodological aspects of diagnostics. The method being presented is a hierarchical POMDP framework that enables a humanoid robot to process the observations of child’s behavior, infer information about the unsolvable state of the child and autonomously makes decisions by selecting actions and tasks within the robot-assisted ASD diagnostic protocol. Each task of the protocol is modeled using a Mixed Observability Markov Decision Process model as a template. In order to formulate observation probabilities of task models, ASD experts are surveyed and their knowledge is encoded in the observation probabilities of task models. Expert knowledge also allowed for implementation of child behavioral models which are used to validate developed models. The core of a POMDP is a so-called a Markov Decision Process whose actions are tasks of the protocol. The interface between task and protocol models is formulated using regions of belief space of the task as observations for the protocol model. Following the successful validation through simulations with child behavioral models, task and protocol models are validated through experimental sessions with seven typically developing children and eight children with ASD. Results obtained through experiments show the feasibility of the presented method for differentiating different types of children, since the belief of the robot over the states of the child was comparable to assessment of autism experts.