

Chapter 6

An Intelligent Ecosystem to Support the Development of Communication Skills in Children with Autism: An Experience Based on Ontologies, Multi-Sensory Stimulation Rooms, and Robotic Assistants

Vladimir Robles-Bykbaev

Universidad Politécnica Salesiana, Ecuador

Martín López-Nores

University of Vigo, Spain

Jorge Andrés Galán-Mena

Universidad Politécnica Salesiana, Ecuador

Verónica Cevallos León Wong

Universidad Politécnica Salesiana, Ecuador

Diego Quisi-Peralta

Universidad Politécnica Salesiana, Ecuador

Diego Lima-Juma

Universidad Politécnica Salesiana, Ecuador

Carlos Andrés Arévalo Fernández

Universidad Politécnica Salesiana, Ecuador

José Pazos-Arias

University of Vigo, Spain

ABSTRACT

The term Autism Spectrum Disorders (ASDs) covers conditions such as autism, childhood disintegrative disorder and Asperger syndrome. In this line, the World Health Organization (WHO) points that core symptoms of ASD are: a mixture of impaired capacity for reciprocal socio-communicative interaction and a restricted, stereotyped repetitive repertoire of interests and activities. Therefore, it is fundamental for a person with ASD to develop skills to communicate with his/her peers, share ideas, and express feelings. On those grounds, this chapter presents an intelligent ecosystem to support the development

DOI: 10.4018/978-1-5225-2492-2.ch006

of social communication skills in children with ASD. The ecosystem uses a knowledge model that relies on ontologies, and defines the main elements that will be used for psychological intervention process. The different activities that will be carried out during the therapeutic intervention can be done using a robotic assistant or a Multi-Sensory Stimulation Room. This proposal has been tested with 47 children of regular schools, 9 specialists on ASD, and 36 children with ASD.

INTRODUCTION

World Health Organization (2016) data show that 1 in 160 children present an Autism Spectrum Disorder, and some other resources (CDC, 2016) point about 1 in 68. Far from being a disease, this condition obeys to a developmental disorder, which implicates impairments in social interaction, social communication disabilities, repetitive behavior and restricted interests (American Psychiatric Association, 2014). New conceptualizations of autism are presented within the latest version of the Diagnostic Statistic Manual (American Psychiatric Association, 2014) to adjust the diagnosis to the particular characteristics of individuals. In this line, a person with Autism is diagnosticated considering the main traits of the spectrum, but also describing his/her performance in different areas such as cognition, language and the seriousness level of the main symptoms.

Children with ASD present difficulties to adjust their behavior to social situations, which frequently leads them to remain excluded from their peer group. In serious cases of autism, children may show impairments to even recognize simple conventional behavior such as associating objects with specific places or different types of behavior needed to execute simple tasks, such as using silverware correctly. Visual tools have shown to effectively enhance the development of communication and social skills, by helping the child with ASD to understand and integrate conventional information and develop social skills that may allow them to be more tolerated and accepted within the peer group.

Deficits in conventional language and communication are associated with poor social skills in this population; this demands a progressive intervention in which the child can be introduced to basic social patterns and eventually enhance his/her relationship with other significant human being. These interventions are aimed to get the child to be better tolerated and accepted by his/her peer group, by helping him/her to integrate social skills through stories presented in a visual manner.

In addition, children with ASD usually present a preference to interact with objects rather than with humans, which may cause withdraws during the therapeutic work. In this scenario, it is needed the assistance of mediators, which nowadays can be represented by robotic devices. The implementation of artifacts of this kind would reduce the anxiety that children with ASD commonly present towards the interaction with adults or peers, allowing the interventions to be more progressive and respectful with the child's particular characteristics and needs.

Neurobehavioral models of autism consider it as a “disorder of complex information processing system” in which skilled motor, complex memory and language, and reasoning domains present impairments, while, in contrast, attention, simple memory and language, and visual–spatial domains show a high level of performance (Minshew and Goldstein, 1998). Considering the fact that visual-spatial domains are a strength in these individuals, most of interventions proposed to enhance their life quality are based on visual supports, addressed to attract the child's attention, anticipate facts and reduce the associated

23 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/an-intelligent-ecosystem-to-support-the-development-of-communication-skills-in-children-with-autism/179035

Related Content

Context-Awareness in Ambient Intelligence

Declan Traynor, Ermai Xie and Kevin Curran (2010). *International Journal of Ambient Computing and Intelligence* (pp. 13-23).

www.irma-international.org/article/context-awareness-ambient-intelligence/40347

Investigation of Aviation Sector in Industry 5.0

G. Prasad (2024). *AI and Blockchain Optimization Techniques in Aerospace Engineering* (pp. 135-148).

www.irma-international.org/chapter/investigation-of-aviation-sector-in-industry-50/341330

Selection of Wavelet Features for Biomedical Signals Using SVM Learning

Girisha Garg and Vijander Singh (2016). *Intelligent Techniques for Data Analysis in Diverse Settings* (pp. 299-308).

www.irma-international.org/chapter/selection-of-wavelet-features-for-biomedical-signals-using-svm-learning/150299

Rule Base Simplification and Constrained Learning for Interpretability in TSK Neuro-Fuzzy Modelling

Sharifa Rajab (2020). *International Journal of Fuzzy System Applications* (pp. 31-58).

www.irma-international.org/article/rule-base-simplification-and-constrained-learning-for-interpretability-in-tsk-neuro-fuzzy-modelling/250819

Heterogeneous Influence Maximization Through Community Detection in Social Networks

Jaya Krishna Raguru and Devi Prasad Sharma (2021). *International Journal of Ambient Computing and Intelligence* (pp. 118-131).

www.irma-international.org/article/heterogeneous-influence-maximization-through-community-detection-in-social-networks/289629