

Use of Latest Robots for Autism Spectrum Disorder

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Abstract

One of the prominent applications of robots is in assistive therapy using humanoids. Robots are now playing a vital role in our lives as assistants, therapist, companions and much more. Autism Spectrum Disorder (ASD) affects the communication skills and social cues of a person considerably. Recently efforts have been made in the development of communicational, behavioral, motor movements, joint attention and physical behavior of the children suffering from ASD using the humanoid robots. The therapies based on interactive interventions using robots for ASD have proved to be a favorable tool for improving the behavior of children with ASD. There are different ways to identify and improve the behavior in ASD child e.g. psychologists' sessions, computer vision based bio markers like joint attention measurement and gait analysis, and robot assisted therapies using Autism Observation Scale for Infants (AOSI). In particular the area of robotics is helping a lot in the treatment of ASD as the robot acts as a mediator as well as measures the response of an autistic child.

Keywords: Autism; Joint Attention; Therapy; Bio Markers

Introduction

Socially assistive robots (SAR) are becoming a part of therapies for the treatment of Autism spectrum disorder. The SAR aims at improving the social response and communication skills of an individual suffering with social disabilities. One of the most commonly addressed disabilities by the humanoid robots is Autism Spectrum Disorder (ASD) [1]. Impairment in social interactions and communication skills caused by a complex developmental brain disorder refers to the definition of Autism Spectrum Disorder [2]. Children under ASD lack verbal, non-verbal and communication skills such as joint attention, imitation, gait, motor skills, facial expressions etc. With the advancement in recent years, robots

are now replacing human tasks with a lot of accuracy, reliability, different aesthetic and functional characteristics. Robots have now been interacting with ASD children under specially designed interactive interventions for improving the social cues and behavior of ASD child. There are several robots that have been made to develop social development skills or physical impairments. Research shows that robots helps to improve the attention span and develop the spontaneous skills of a child with ASD [3,4]. Examples of such robots are Paro [5-7], robotic doll Robot [8-11]. These robots help people with physical, emotional and behavioral disorders to improve their social interaction and cues.

Robots Utilized in ASD Interventions

Table 1: Commonly used robots in autism spectrum disorder therapies.

Robot Name	NAO	iRobi	Robotics OP2
Height (cm)	53	32	45.45
Weight (kg)	4.3	7	3.0
DOF	25		20
CPU	Intel Atom @ 1.6GHz	Celeron @733 MHz	Intel Atom N2600 @ 1.6 GHz (dual core)
CPU additional accessory		256 MB, HDD 40 GB	4 GB DDR3, 32 GB mSATA
Operation Time	90 minutes (LIPO battery)	180 minutes (LIPO battery)	30 minutes (LIPO battery)
Built in OS	NAOqi 2.0 (Linux based)		Any Linux or Windows release (32 bit only)
Compatible OS	Windows, MAC and Linux		Linux and Windows (32 bit)
Programming Languages	C++, Java, MATLAB, Urbi, C, .Net, Python		
Sensors	Two HD cameras, four microphones, sonar rangefinder, two infrared emitters and receivers, inertial board, nine tactile sensors, eight pressure sensors	Camera, Microphone, 7 Ultrasonic sensors, Inertial unit, 12 IR sensors, Floor detection sensor, 2 stereo speakers, stereo Mac, 7 inch Touch screen, 6 Tactile sensors	Serial communication, 2 USB ports, 3 axis-gyro, 3 axis-accelerometer, 2 microphones
Connectivity	Wifi, Ethernet	Wireless LAN installed for internet connection (101.11 b/g)	Ethernet, mini HDMI
Cost (US)	7996	4598	9600

There are multiple robots which have been developed and utilized in Autism Spectrum Disorder curing. Few of them are given in Table 1, which are listed along with their specifications. Among all, NAO is more famous and it's being utilized in different applications along with Autism Spectrum Disorder.

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