Robot-Assisted Rehabilitation for Children with Autism Spectrum Disorders

Sahadev Roy
Department of ECE, NIT Arunachal Pradesh, Yupia, India
sahadevroy@nitap.ac.in

Abstract
This research is the exploration of the social effects of human-robot interaction (HRI) on children with Autism Spectrum Disorders (ASD), inhabitants that has deficiencies in different types of social behavior. Different studies show that electronics gadgets and assistive robots have been shown to be a catalyst for improved social interaction in children with ASD. The paper also includes the summary work in later section, and a brief idea of robot prototype and previous implementation of software and interactive games that was used in our field experiment. Future studies will include more rigorous statistical testing and include larger sample sizes to further validate the intervention methodology described in this document.

Keywords: Autism Spectrum Disorders, Robot, Social Interaction, Speech, Therapeutic Robot

1. Introduction
In this modern era the research has done on significant level on assistive robot. In this research paper we are going to talk how the Robotics can impact on human health system especially the Autism Spectrum Disorders. we know the modern robotics can do those things which cannot possible for humans [1], like in some critical operations can be done by using smart robots, here specifically we are going to talk about the ASD in young children and, how we can reduce the effect of ASD in young children [2]. By using assistive robots we can make a good impact on ASD this disorder in mainly found in young children having the symptom of less social interactions and poor communication skills [3]. Many of study is telling us effective outcomes in ASD such as, increased his speech [4], increase in social interaction [5], joint and directed attention. this study has the main purpose is to develop the low-cost toy like robot prototype with safety features such as snap of head [6] and snap of arms [7], a camera for face and detection [8] and session recordings [9] to independent games [10] and a teleported mode. Our work with children with ASD leads to an approach that utilizes feasibility studies to determine if a robot can behave appropriately in experimental settings, and behavior studies that facilitate improved social interaction for users with ASD. An experiment design that meets these criteria, described in the following sections.

2. Methodology
We have developed a new robot and tested on the eight study participant and three control diagnoses with ASD. The study group obtained pre and post interventions with measures with Vine land adaptive behavior scale II [11], mean length spontaneous utterance determination, motor imitation scale, unstructured imitation assessment and expressive vocabulary test [12] and participated twenty to thirty minutes intervention to see the effectiveness of new robot assisted intervention we check the improvement in speech, social and communication skills [13] and we compared the improvement with, and without robot-assisted interventions and verify the results with the robot assisted ASD intervention with clinical method. Research studies shows that by using augmented intervention with widely accessible socially assistive robot, an improvement can be obtained in social interaction and communication skills.

In this study we used both soft toy and robot toy (Fig 1), what we will find that may be used for other robots and or in other context our three primary objective that are first one is effectiveness of new robot assisted intervention to increasing the speech [14] and the increase in communication as well as increased in social skills, second one is we will compare the above result and when we are not using the robot assisted intervention and ,third one is we will find what type of robot behavior will augment the goal of clinical trials.

The robot prototype and, along with a set of interactive games, was introduced in our earlier research in this field study, we employ previously developed interactive imitation games and introduce a new set of different games motivated by observations made during preliminary testing. A summary of the robot’s hardware, software implementation and interaction designs show a good result.

Motivation for robot design there are three major objectives which motivate us, the first one is related to its fundamental structure that should be simple and it should take minimum range of motion to perform imitation actions and Servo Motor has to generator minimum noise .the second point is Robot should be robust so that when child manipulate robot it should not damage .to this end we in integrated snap of arms and head on the robot, and provided the base for stability of robot. Our third motto is outward appearance of robot should be very fancy so that it will attract the child.

3. Results and Observation
This study proves the inability to improve communication and social interaction can be achieved with advanced intervention. The most common and least outreach tool Robotics (SAR) research increases productivity and define new methods with the help of robots. This leads to certain long-term autonomous behavior, Application of multilevel SAR [15] [16] in clinical intervention. The results also show that using social media is recommended. Foundation-based models can build a wide variety of social relationships. As robots integrate with clinical methods, Education is still a largely theoretical prerequisite. What robot behavior is worth automating is a challenge. Design and pilot field studies to achieve this have been conducted. Three main objectives: (1) Quantitative evaluation: New types of robot-assisted interventions are on the rise, Spontaneous speaking, and general communication and social networks, Skills of autistic children, (2) Comparison: Improved care-acquired skills and social skills. Robotic support helps increase. It can be achieved without the intervention of a robot. (3) Clear, well-defined robot behavior can improve the following goals: Clinical interventions that ultimately promote robotic automation in this field.

The experiment shows that increases in speech and socialization result from a new paradigm of robot-assisted intervention with a small group of children with ASD. Some difficulty occurs in the control group communication domain posttest and the socialization domain pretest, indicating that intergroup results should be viewed with caution. Finally, to assess the sustainability of the improvements resulting from the robot-assisted intervention, a future study will reevaluate study participants after an interval to test retention of increased proficiency in speech and socialization. Result shows that social games based paradise can produce social exchange which is obtained by robot to child and child to other interaction. In the present circumstances integration of robot into clinical trial is still on primary stage so we cannot fully predict the behavior but the sustained child to robot interaction leading to improved therapeutic outcomes.

4. Conclusions
The experiment shows that interactive robot

assisted intervention is quite useful to tackle the ASD. Especially our new technique which has resulted in increased of speech, increase of communication and social skills. Different feature of interactive game which includes first one is child initiated verbal prompt, which had deliver in form of oral question and second one is contingent robot reaction and third one is a motor imitation and fourth one is some general rule for, which we got during child to robot or robot to child interactions. RFID can be included in robots forehead and hands and to each accessory to allow the robot its head and respond appropriately. This same modality can be implemented for initiating each coordinated movement with music. For instance, placing an RFID-tagged card with a picture of a bus in the robot’s hand might trigger the launch of the “Wheels on the Bus” activity.

Verbal prompt and include a verbal response and finally, after several practice trials with the robot, that child will get motivation to play with human.

Acknowledgement
This project supported by TEQIP III under seed grant.

References


