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SURVEY ON LEARNING ASSISTANCE SYSTEM FOR AUTISTIC CHILD

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Abstract - *Autism or Autism Spectrum Disorder (ASD) characterizes a vast range of developmental disabilities associated with social interaction, communication and behavior. Though basic education is a must for everyone, but teaching autism community through traditional approach is still quite complex. This project is aims in teaching Malayalam to autism students according to their disease condition. Here the affected area of the children is detected and according to that the learning is undertaken. The main areas covering over here is data mining, neuroimaging, deep learning.*

Key Words: **Autism Spectrum Disorder, AAC, CALL**

1. INTRODUCTION

Autism Spectrum Disorder (ASD) is a neurodevelopmental disability with atypical traits in behavioral and physiological responses. Autism is a group of complex disorders of brain development. The autism students need special training to make them familiar to words, letters and objects. To improve autism patients reading and understanding skills, a new system is developed which trained them on understanding words, letters (Malayalam) and objects. Even today, there is no system for training in our mother tongue Malayalam. The assessment was based on the voice recorded and it was analyzed using MFCC algorithm. But the developed system's output was not accurate.

Thus by using deep learning algorithms the output is being modified. The learning tool is being modified by analyzing the level by which the student had learnt the letters. If he learnt properly, then he will be promoted to study words and then sentences. After learning an exam will be conducted and the result is provided to the trainer. While learning, the sound of student is being recorded. Thus by using that sound (recorded), the disease prediction is being performed. It is mainly classified into 4

1) Nasal problems

2) Tongue problems

3) Auditory problems

4) Brain defects by using ABIDE dataset

2. LITERATURE SURVEY

2.1 What is autism and importance of treating them differently?

If you've met one person with autism, you've met one person with autism: - DR. STEPHEN SHORE. Autism spectrum disorder (ASD) is a complex developmental disability, typically appearing during childhood and affecting a person's ability to communicate and interact with others. The word 'spectrum' describes the range of difficulties that people on the autism spectrum may experience and the degree to which they may be affected. The main areas of difficulty are in social communication, social interaction and restricted or repetitive behaviors and interests. People on the autism spectrum may also have:

1) Unusual sensory interests such as sniffing objects or staring intently at moving objects

2) Sensory sensitivities including avoiding everyday sounds and textures such as hair dryers, vacuum cleaners and sand

3) Intellectual impairment or learning difficulties

2.2 Design of an Autonomous Social Orienting Training System (ASOTS) for Young Children with Autism

Social communication is among the core areas of impairment for children with Autism Spectrum Disorders (ASD). The training of social orientation is important for improving social communication of children with ASD. In recent years, technology-assisted ASD intervention had gained momentum due to its potential advantages in terms of precision, sustainability, flexibility and cost. In this paper, a closed-loop autonomous computer system, named ASOTS, for training social orientation skills to young children with ASD is proposed. This system is designed to detect and track a child's attention in response to social orientation bids and help the child towards appropriate social orientation when needed. Response to name, an important social orientation skill, was used to demonstrate the functionality of the proposed system. Ten toddlers with ASD participated in a pilot user study to show whether the system could be used on young children who have been diagnosed with ASD. Another pilot user study with 10 TD infants tested whether this system has a potential to be applied for early detection for infants who were younger than the age when ASD

diagnoses can be done. This was done intentionally to separately demonstrate utility and functionality for the clinical population of interest and to demonstrate functionality beyond current clinical identification capacity (i.e., infants). The results showed that the proposed system and the protocol were well tolerated by both groups, successfully captured young children's attention, and elicited the desired behavior.

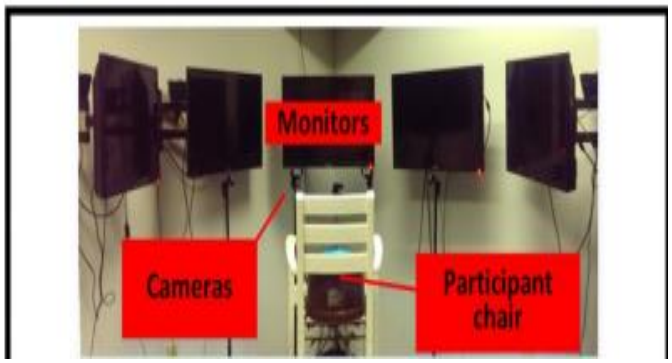

Fig-1 Experimental System Setup

2.3 Learning tool (using arduino and sensors)

A cost effective, portable, and user-friendly interactive learning tool for autistic children so that they can acquire it easily through an entertaining and interactive method by themselves. The basis of this learning tool is mainly a keypad which is interfaced with a PC/laptop. The input is given to the interaction surface through keypad and the output is generated on the display of the laptop/PC. The JAVA software helps to integrate the usability features of the learning tool. The sensors are used to implement 26 English alphabets.

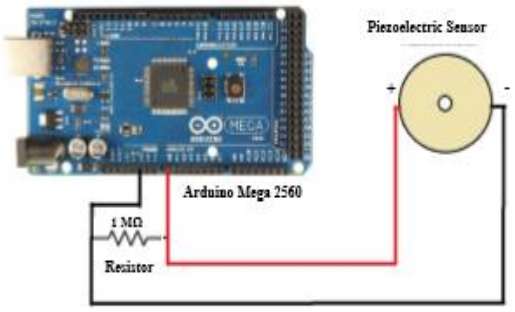

Fig-2 Arduino connection setup for learning tool

Fig-3 GUI of learning tool

But this learning tool has disadvantages like. 1) This is developed only for English alphabets 2) The learning tool is not too easy to handle 3) Huge circuitry at the center of the tool and it is based on wired connection functionality creates problems in handling

Fig-4 Learning tool using arduino and sensors

2.4. Integration of Assistive and Wearable Technology

In this system there is the use of Augmentative and Alternative Communication (AAC) solutions as part of assistive and wearable technologies for children with ASD. To Improve Communication, Social Interaction and Health Monitoring for Children with Autism Spectrum Disorder are needed. For that here wearable technology devices are used to understand their reaction to something. There is a secured cloud for data processing and storage.

Here data transfer is done via Wi-Fi. There are different kinds of data access like low level, high level etc. The data is obtained from wearable devices which are being used by autistic students. The wearable devices contain sensors to monitor the patient's activities. The data is being transferred by using communication apps and given to a database server which is being connected to a mobile device. The mobile device is receiving information from medical professionals, teachers, family, friends, speech therapist etc.

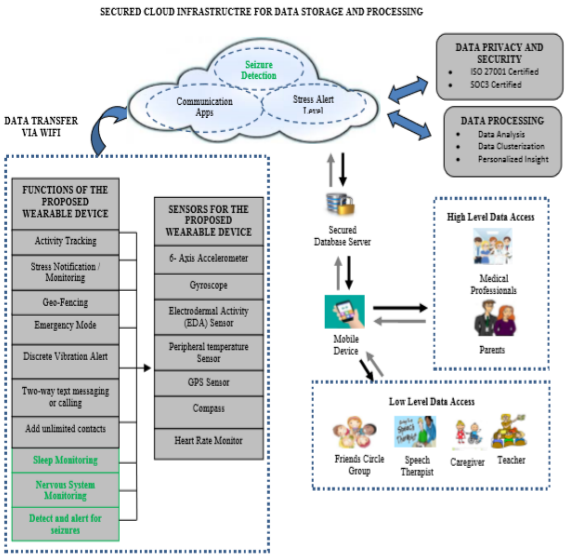

Fig-5: Secured cloud infrastructure

The main disadvantages of this system are as follows: 1) Privacy and security problems 2) Requires wearable technologies which may not be affordable to everyone 3) Create discomfort in patients while wearing the wearable technologies Does not include learning system 4) Only include the health monitoring system

2.5 User Interface (UI) Design of Scheduling Activity Apps for Autistic Children

The interface design for Special Needs Children (SNC) autism of perception mid-high function which obtained from user persona and user needs. SNC tends to have no concept to manage time; it makes them difficult to understand what activities they need to do in their daily life. The result is expected to help SNC and parents in learning to perform regular daily events and other activities provided by parents.

Fig- 6: Scheduling activity app

2.6 E-Learning Tool for Japanese language learning through English, Hindi and Tamil

The use of computers has revolutionized the learning and teaching process. In case of learning languages its contribution is very important due to the availability of various multimedia tools. Computer assisted language learning (CALL) is a well-established area of research. This has led to a shift of focus from the teacher to the learner by giving the learner a greater level of autonomy. CALL focuses on the receptive skills of reading and listening which are very necessary for learning a language. In this paper the features and advantages of CALL is analyzed. A lot of people do not take up learning languages like Japanese inspite of their interest in that language only due to its entirely different pictographic writing system that is not easy to master. Classroom and textbook teaching alone would not suffice for learning the essential basics of Japanese language. Therefore in this paper e-learning tool that can be used to learn and teach basics of Japanese language in a more interactive manner is presented.

Fig- 7: Startup page with Multilanguage support

2.6 Deep Belief Networks in Malayalam language

The goal of this work is to validate the impact of natural elicitation of emotions by the speakers during the development of speech emotion databases for Malayalam language. The work also proposes a Gaussian Mixture Model-Deep Belief Networks (GMM-DBN) based speech emotion recognition system. To test the effect of emotion elicitation by the speakers, two independent datasets with emotionally biased and emotionally neutral utterances are recorded in three emotions (Angry, Happy and Sad) in Malayalam language. The speech utterances of both datasets are recorded in two sessions. To develop GMM-DBN systems, the GMM models for each emotion is independently developed using Mel Frequency Cepstral Coefficients (MFCC) features and the distribution of these features for each utterance with respect to each emotion model is derived in terms of histograms with mean vectors as the frequency bins. The mean of these histograms obtained in such a manner from each emotion model is used as a feature to train the DBN. The performance of the proposed GMM-DBN system is evaluated on the developed emotionally biased and emotionally neutral

datasets for Malayalam language. Based on the comparison of the emotion recognition rates obtained, a higher emotion recognition rate is observed for utterances in emotionally biased dataset which implies that the use of emotionally biased prompts during recording identify emotions more effectively. Also, the dependency of the language for the contextual prompts is observed.

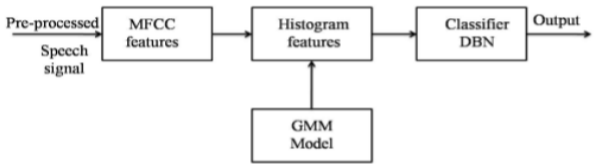

Fig- 8: Block Diagram for deep belief networks

2.7 Construction of website-based platform on assessment of children with autism

National Disability and Rehabilitation Office organized the experts in children with autism education to make Development Assessment of Children with Autism Evaluation Form (Trial) in March 2009. The college website provides a network platform for the implementation of the development of children which analyzes and converts the evaluation results so that the majority of children with autism rehabilitation professionals can free from cumber some manual operation. The experts concerned can also use the platform to guide the rehabilitation of children with autism.

The development and implementation of Development Assessment of Children with Autism Evaluation Form (Trial) is aimed at having a systematic, scientific and comprehensive assessment for children with autism. What's more, individual teaching and rehabilitation training plan is made according to the characteristic of every autistic child. These plans are adjusted according to the dynamic assessment of the training effect in order to ensure the scientificity and effectiveness of the rehabilitation training for autistic and other pervasive developmental disorder children. This system is designed and developed with ASP.NET whose ADO.NET can provide data access interface to the data. It provides the possibility to develop the application with a powerful Web data access. This system uses SQL Server 2005 as the back-end database which has a powerful data managing and solving capacity with a higher security performance. Each database can hold 200 thousands data table which is only limited by the space provided by the server hard disk. The SQL Server 2005 is chosen also because it provides remote access. The system uses B/S (Browser/Server) mode, which has a simplified client and many advantages such as easy to maintain and upgrade, lower network loads and remote login.

3. CONCLUSION

Autism is a group of complex disorders of brain development. The autism students need special training to make them familiar to regional language. To improve their reading and understanding skills, the LASAC is developed. By overcoming various disadvantages of traditional approach, the latest technologies like deep learning, neuro imaging is executed in the project. By this project, the life of the differently abled autism patients will be improved to an extent

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