

Early Detection, Diagnosis and Treatment of Autism Using Mobile Application Platform

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Abstract: Autism Spectrum Disorder (ASD) is among the most significant developmental disorders in terms of neurodevelopment mind processing. Common symptoms that an autistic patient shows are: social development, communication problem and odd social behavior. Proposed paper presents the design and development of an application intended for the detection and diagnosis of autism in children at the early stage. The application is of tremendous help in detection, diagnosis and monitoring the health and curing of patient. This endeavor stages a resolution that empowers the operability among the doctor and the autistic child to contribute in the treatment. The solution is implemented by developing an android phone application.

The survey results showed that the software developed had a reasonable impact on a person suffering with autism. Also the viewing system was improvised with tracking.

Keywords: Autism, Learning, Schedules, Games, Monitoring, Mobile Application.

INTRODUCTION

One of the most significant mental disorders that exist these days is Autism which impairs capturing and gaining capabilities and it is difficult to interact socially. In India, 8.2% minors of age bar between 2-12 years are considered to have ASD syndromes. This neurological mental disorder results symptoms of strange restricted and insistent behaviors. It is a neuro developmental disorder of brain function and not a disease. It is commonly related with brain disability and difficulties in mind-body harmonization and focus deficiency and sometimes in physical health issues that consist of slumber and digestion. We know that symptoms of ASD develop at the young and delicate age of 2 to 3 years this is a crucial age where preventable measures can be taken to avoid further complications in the condition. However, in the future symptoms of ASD might be found via observable feelings and reading apt or during community intercommunication when encountering outsiders. During some situations, such minors might reach their progression stage conventionally after showing few indications of growth, while there are still chances of relapse. One of the biggest drawbacks for such a person is the inability to convey their needs in general with the people. In some situations, these children don't even manage to mature their real speech, due to which there is minute scope for advancement in their communication skills. Therefore diagnosis at a younger age is beneficial for treatment.

Conversing skills are missing in such children since they sense higher confident connecting and conversing with the ones closer to them as compared to outsiders. This results in complication in terms of evolving their schooling skills particularly when schooling requires interaction and friendliness among the pedagogue and the patient. Due to the necessity of one-on-one interaction, schooling poses as a major obstacle for such a person where particular approach and chores are required to be done towards building theoretical and practical skills. This work recognizes particular attributes that use the ongoing enabled technologies existing now-a-days (like android application devices and cloud computing) which can devote in the detection, curing (type of schooling) and observing (both curing assessment, advancement and both physical and mental condition) of such children. In this paper presented, we introduce a constructive layout of the entire process and show case the outright implementation of the mobile application.

The terms Autism and ASD (Autism Spectrum Disorder) can be reciprocal in the medical context, and have been used to define the most beguiling neurobehavioral syndrome, that comprises complication in conversation, communal skills, and restrain scope of activities. Also, it is considerably arduous to accurately describe autism, due to the presence of different types of ASD.

The generic oversight of ASD from scientific viewpoint houses both mediation in the house/surroundings as well as mediation referring to the autistic patient. Impeccably, after Recent Advances in Autism Spectrum Disorders - Volume I 634 diagnosis affirmation, the leading introductory path could be done by a multidisciplinary squad consisting of professionals hailing from medicine, social sciences and psychology. Moreover, before commencing any type of interference, few actions must be followed. First and foremost, the concluding test should be proved by a meticulous analysis and additionally verified by the DSM-IV norm along with credulous scientific equipment such as Autism Diagnosis Interview-Revised (ADI-R). This ADI-R is utilized as a GSI for publishing intents, but it is questionable in scientific proceeding for multiple purposes, like it can neglect similar ASD situations and additionally it requires minimum two hours to get finished. Next, the severity of the disorder can be described both from the scientific testing and by apparatus like CARS. Other crucial concern is to check whether there is any correlated psychic impairment and its degree of severity.

The second step is to get an insight of the guardian's concerns, anxiety, and degree of consciousness. Generally, after examination affirmation, the parents become tensed.

Not usually they browse the internet in order to gain knowledge related to autism. Also, some material coming from the web could be incorrect, during this instance, it is extremely necessary to determine which of these counter-measures are updated on the basis of evidence. The next step should be the unrestricting of natural variables that should be attended, starting from the surroundings such as clan and home. Community and academy needs to be assessed in order to facilitate choosing a particular type of treatment on an individual basis and to determine possible stressors.

The final step consists of recognition of the victims conduct requiring cure. After the foundation symptoms are determined in each situation, the unique qualified specialties and individuals that are to be included are determined. In general, the group includes a doctor specialized in ASD victims as well as a speech correction therapist and other professionals with backgrounds from education and/or health department with understanding of minors with this disorder.

LITERATURE SURVEY

Below is the literature survey on the papers about detection, diagnosis and clinical treatment alternatives for autism in children.

Machine Learning for Early Detection of Autism Using a Parental Questionnaire

This paper concentrates on the detection of autism in children in the first few years of their life using machine learning algorithm. They used Machine Learning to combine and compile clinical data gained from thousands of minors at risk from ASD to build an easy to apply, fast, and economic autism testing tool that performs way better than most commonly used regulated equipment.

The autism machine learning based testers were trained using knowledge combined from different clinical repositories of ADOS and ADI-R mark-sheets of nearly 7 thousand children between 17 to 84 months of birth, supplemented by information gained from the guardians of minors answering evaluation questions on Cognoa's website. Both testers were applied using Cognoa's Application in a medical test to a fragment of 162 in jeopardy minors.

The parental questionnaire tester aims on observable patterns generally present in a typical autism testing instrument, the Autism Diagnostic Interview Revised (ADI-

R). This clinical questionnaire consists of a guardian interview of 93 questions with multiple-parts and multiple choices which are conveyed by an experienced individual in a clinical surrounding.

Deep Learning Based Recognition of Meltdown in Autistic Kids

This paper basically concentrates on the detection of meltdown in such children. Minors with autism generally suffer abrupt meltdowns which not only makes the situation difficult for the guardian but also make the kids hurt themselves physically. Researchers have found that minors with this disorder exhibit particular type of actions using which we can predict meltdowns in the children.

They first went forward with the process of gathering raw images and videos that encompasses the desired movements. The knowledge was attained from dependable internet sources and multiple databases, which is succeeded by the information cleaning operation that crucially involved filtering the database from dreadful pictures and frames thereby attaining a more feasible set of pictures for training which is further processed by annotating and cropping using different picture editing and refining tools.

Nearly 2100 data pictures were assembled for different types of behaviors, and 92% accuracy for classification was attained for training alone. Training time taken in class was approximately around 10-15 minutes.

Analysis of Quantitative Autistic Traits While Teaching Social Skills to ASD Children Using Multimedia Tool

This paper gives quantitative analysis of autistic traits and evaluates technology based learning for upcoming emotional skills in such minors.

It mainly examines the social capabilities in schooling situations and try to strengthen observable achievements in cognitive and social communications. It was observed that such minors after random tests became more trivial and less impulsive and restless. The increase in attitude steadiness was also noticed

.Multimedia incursion is found to be highly prosperous in curing problems like autism. In the survey it came to appearance that In India, 8.2% minors of age group of 4-14 years were anticipated to have autism.

This mental disorder gives signs of repetitive and unusual restricted behaviors. Other symptoms observed were concentration issues and maintain eye contact and focus in particular activity in addition to reading, writing and emotional imbalance.

In India the early signs of ASD are usually ignored and hard to accept by the family due to various reasons like social acceptance of the problem, short of finances and lack of knowledge. The delay in detection and diagnosis of the problem leads to overlying of numerous medical situations along with autism which poses an obstacle for primary instructors and guardian to lastly get a way to coach such minors and regulate their attitude. Due to fast pace changing lifestyle time has become a restriction and limiting social interactions. There are so many family issues in considerations that can be the reason why the parents neglect to give valuable time to tutor diverse customs and cultures that are present in the society to their children. Other than the family issues of these minors, few problems are still a matter of concern like providing autistic children with routine activities to immerse and regulate their nature.

There are multiple schooling structures present to tutor these ASD minors, very prominent and effective approach of schooling is RPM (Rapid Promotion Methodology) by Soma. Multimedia is the mixture of collection and easily accessible contents such as audio, message, text, images, video, interactive materials and animation.

Multimedia is different from media which uses only a typical system like texts or traditional types of clip arts and symbols or hand-crafted items.

Multimedia can be implemented and used according to the requirements and needs of the user similarly it can be viewed, retrieved and recorded using electronic devices and computers, knowledge and information can be stored on real time electronic devices as well. It was observed that autistic children have better response to pictures and image recognition. One hour bilateral discussion was conducted with the support of special tutors and advisors, assessments were focused depending on the age group and minor's interest.

As a disruption from supplementary tasks, the minor was given an opportunity to indulge with a desktop, mobile with the sequences of freely available applications, host stories and movies for infants, and sounds to sooth and regulate their restlessness.

It was observed that all the minors were able to indulge with the devices and tried to explore and learn the latest touch screen interface.

After noticing minors on allocated guidelines for evaluation, irregular appropriation was finished and guardians/tutors were briefed by records mustered via regular meetings and through telephonic discussions.

AutiAid: A Learning Mobile Application for Autistic Children

This paper offers a constructive solution that enables the inter-operability between an ASD minor under parental monitor system and doctor associated to commit on the early diagnosis, detection, curing and monitoring the person suffering from autism. The path of overcoming it is carried out by developing and designing an android application for mobile and testing it with a group of people suffering from Autism syndromes.

The outcomes indicate that the designed software system made a positive impact and remedy contribution to a person suffering from autism. We know that symptoms of ASD develop at the young and delicate age of 2 to 3 years this is a crucial age where preventable measures can be taken to avoid further complications in the condition. However, in the future symptoms of ASD might be found via observable feelings and reading apt or during community intercommunication when encountering outsiders. During some situations, such minors might reach their progression stage conventionally after showing few indications of growth, while there are still chances of relapse.

Conversing skills are missing in such children since they sense higher confident connecting and conversing with the ones closer to them as compared to outsiders. This results in complication in terms of evolving their schooling skills particularly when schooling requires interaction and friendliness among the pedagogue and the patient. This task determines unique features that uses the latest existential technology that exist which can devote in the curing (type of schooling) and observing (curing process) of the ASD minor. In this paper, a component and architecture design of the overall system. DISSERO application was popularized to improve social and mental skills, this demonstrates how the teaching process may be designed and created along with enough thought towards the media needs. This paper contains following sections presenting related work, the functional requirements, the implementations and system design, the preliminary outcomes attained from this effort, from which conclusions were drawn using which various inferences were made.

PROPOSED SYSTEM

The architectural design as shown in fig 1, proposes a systematic organization to detect the early signs of ASD in children. Clinically to detect the presence of autism disorder in children two broad spectrums are defined and suitable scale is decided accordingly. CARS (Childhood autism rating scale) are conducted for children of age above 3 years and M-CHAT (Modified checklist for autism tolerance) is conducted for children of age below 3 years. Level of ASD is recognized by DSM-V where the **DSM-V** is the standard reference that healthcare providers use to diagnose mental and behavioral conditions, including **autism**.

Levels of ASD recognized by DSMV are, Level 1: Requiring support (Mild) Poor social skills, difficulty in initiating interactions, attempts to make friends are odd and unsuccessful. Level 2: Requiring substantial support (Moderate) Markedly odd, restricted repetitive behaviors, noticeable difficulties changing activities or focus. Level 3: Requiring Very Substantial Support (Severe) Very limited speech, odd, repetitive behavior; many express their basic needs only. It is also important to keep in consideration that the IQ level of the patient can vary depending on the level of severity.

Based on the aforementioned symptoms the proposed functional system is divided into four main subsystems – Account system, Schedule system, Monitoring system and Progress section. The Account section enables the users to register as-well as sign-in. The users recognized here are the caretaker (or guardian), associated doctors and the patient (child). The account system manages the various accounts present in it and is responsible for assigning the doctor to each autistic patient on the basis of his condition and the treatment suitable for him.

From Fig 2, the schedule system is composed of three things: History/op card, Learning and Daily schedules.

The history section consists of the patient's past medical record inferences and treatment undertaken and further diagnosis and treatment tracks of the future. The Medical Schedule is responsible for allocating the doctor to see the ASD minor at a specific time of the week. The learning schedule is also responsible for allocating a time for the ASD minor to take learning assignments under parental guidance.

The schedule system also enables the doctor to monitor the progress of the child and accordingly modify the curriculum/course of activities performed by the autistic child. The doctor can also design his own course of activities and create a schedule for the patient accordingly.

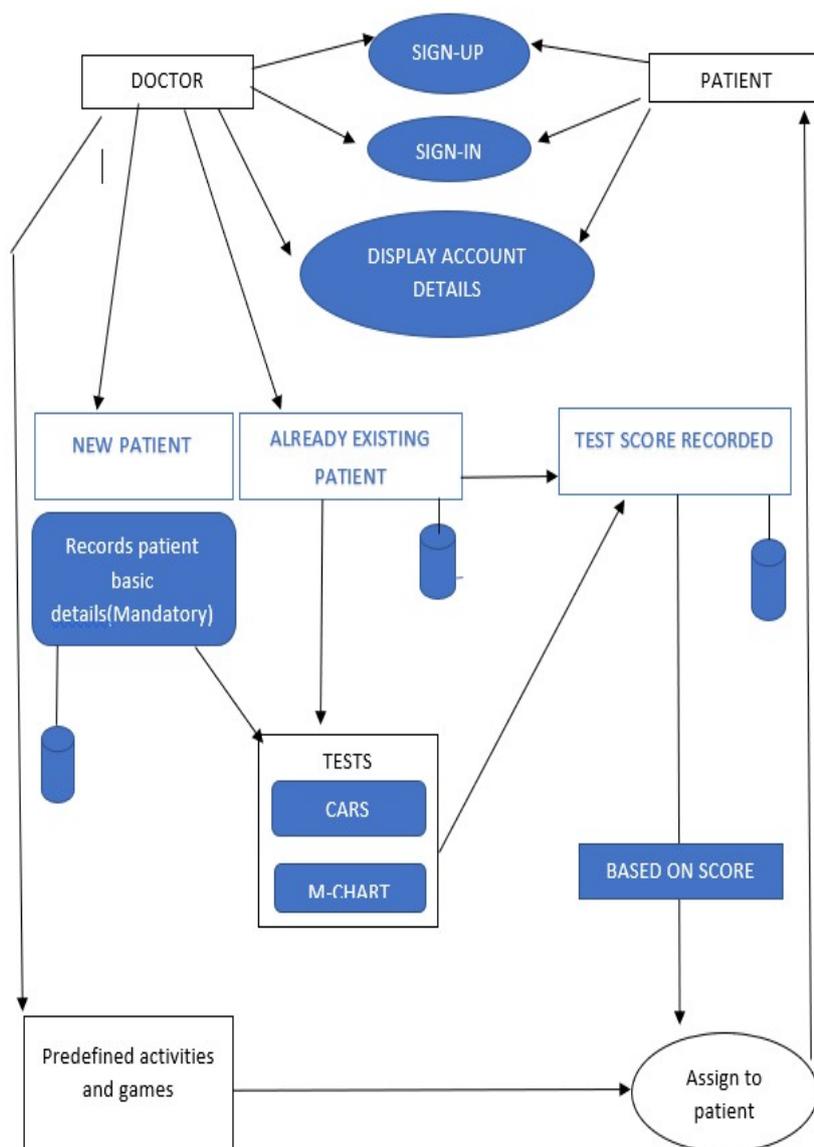


Figure 1: Architecture Diagram Schedule and Monitoring System

The autistic minor can remember and understand pictures better than letters thus using it towards developing and constructing a daily routine for the minor can prove beneficial in the learning process. Manipulating these skills, guides minors to better memorizing and understanding of the letters. From the above scenario, we propose that a mobile android application should be developed where in a catalogue of letters which together form words are provided along with corresponding pictures for relational understanding between the pictures and their meaning. It is essential to provide these minors with new pictures to increase their learning spectrum therefore it is necessary to continue the updation of the pictures present in the application. The doctor can view the results of the patients' exercises and create and assign new exercises to him. Both the parents and the doctor can communicate with one another using the application and then decide the best course of actions for the autistic patient.

RESULT DISCUSSION

The Application once developed would enable the parents/guardian to detect autism of their child at home following which they would go to a doctor who would further perform a test for the detection of the level of autism in the child on the basis of his age. After this the doctor would assign certain predefined activities present in the application on the basis of the result of the test to improve the level of autism in the child.

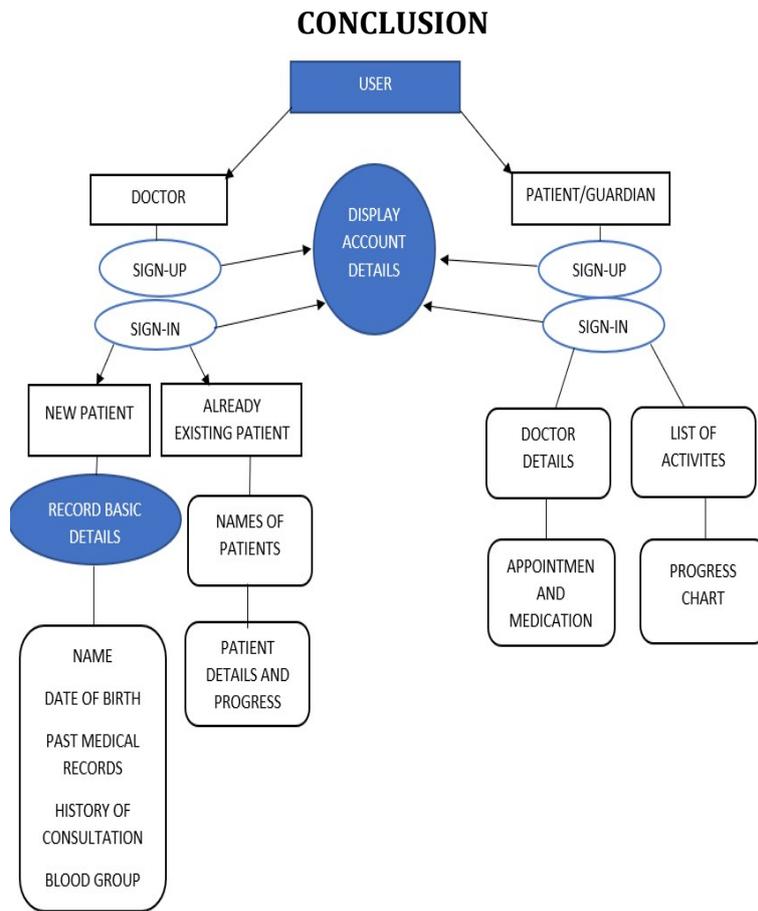


Figure 2: Structure Diagram

IMPLEMENTATION

The mobile application is developed using android studio. Various android APIs such as text-to-speech, speech recognition and correction, augmented reality, shape detection, color detection etc are used to create activities for treatment of autism in children. Tests i.e. CARS and MCHAT are performed by the doctor on the patient on the basis of age of the patient depending on which he assigns the activities to the patients to improve the level of autism in them.

After performing literature survey for the papers based on the early detection, diagnosis and treatment of autism using mobile application we realized that present method are not very efficient in providing proper detection, diagnosis and treatment of autism to a patient. The proposed system will provide a common platform i.e. mobile application for the early detection of autism done by the parents at home followed by an appointment with the doctor wherein the doctor can examine the past records of the patient as well as the score of the test conducted by the parents at home and assign a proper curriculum of activities for each patient individually. The doctor can then view the progress of the child and alter the curriculum accordingly for improving the condition of the child. The application will act as a medium of communication between the parents and the doctor wherein they can discuss the progress of the child and together decide the future course of action for the patient. The proposed system bridges the gap between the primitively practiced clinical systems and the modern approach.

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