

Mapping Brain Disease With Brain Frequency Using EEG Device And Characterizing

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Abstract- Autism spectrum disorder is a difficult and mixed type of disorder which is found out on the basis of the behavioral symptoms. The incidence of the autism has been increased since last few years. Identifying ASD is the most challenging and can be costly. We are developing a project which will be cheaper and efficient to find autism, brain disease and we will characterize them according to the waves identified such as alpha, beta, gamma, theta, delta, attention and meditation. We are going to use EEG device which is only the cheaper, easy to use and efficient to find and detect the brain disease and we will generate the report according to the result. We will use the brain frequency of the person with the help of the EEG device and connect it to the laptop or computer with the help of the Arduino. The Data that is been send on the laptop through EEG which will act as an input to the software which helps to identify the brain disease from which the person is suffering. The data will of the person will be collected at three different times in a day and find the probability of the three different that has been collected. At last we will determine whether the person is suffering from any brain disease or autism and a report will be generated including the detailed information about the person disease.

Keywords- Autism Detection, Brain Disease, Brain Frequency and Electroencephalogram (EEG) Device.

I. INTRODUCTION

Autism Spectrum Disorder (ASD) is a grouping of neuro developmental disabilities characterized by pervasive impairments in social communication and behavioral functioning. The estimated prevalence of ASD is 1 in 68. While researchers have extensively studied how to improve social skills, language development, and emotion recognition in young children with ASD [1]. Alzheimer's disease (AD) is a brain disease that is characterized by a progressive loss of structure or function of neurons, including death of neurons. It is the most common form of dementia; third most expensive disease and sixth leading cause of death in the United States. In particular, it affects more than 10% of Americans above the age of 65, roughly 50% of people older than 85, and it is expected that the number of AD cases will triple within the next 50 years [2].

As new medical diagnostic tools such as EEG are combined with powerful signal processors, new features are observed which make it possible to get new information from the signals measured, providing better windows to understanding brain science and functioning. The EEG signals are electric potentials induced on the electrodes by brain electromagnetic signals (BEMS). Since greater and more minute information of BEMS may be extracted from EEG signals, there is now a greater possibility of understanding, early detection and diagnosing neurological illnesses such as Alzheimer disease and autism, which are progressive. About 1 in 150 children is affected by the Autism Spectrum Disorders (ASD). Autism, Asperger's syndrome and Pervasive Developmental Disorder are collectively referred to as ASD. Moreover, the number of children affected is rapidly increasing [3].

The term Brainwave is used to refer to the electrical signals or impulses generated by the neurons while communicating with each other. The advantage with electrical impulses is that they travel in all directions (Omni-directional in nature). Hence these signals can be trapped using sophisticated electrical charge amplifiers. When the electrodes to tap these signals are situated on the scalp, this method is referred to as Electroencephalography (EEG). On the contrary, if the electrodes have been implanted invasively on top of the brain or under the skin, the invasive technique is known as Electrocorticography (ECoG) [4].

II. LITERATURE SURVEY

Autism Spectrum Disorder (ASD) is a grouping of neurodevelopmental disabilities characterized by pervasive impairments in social communication and behavioral functioning. The estimated prevalence of ASD is 1 in 68. While researchers have extensively studied how to improve social skills, language development, and emotion recognition in young children with ASD [1].

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In the year 2012 PRP Hoole, K Pirapaharan, Sofia A Basar, Roslina Ismail, DLDA Liyanage SSHMUL Senanayake and SRH Hoole developed a system which shows the difference between the working brain and relaxed brain, especially in the Alpha waves used for diagnosis [3].

Brain wave is a generic term used to refer to the electrical impulses generated by the neurons or during interaction between them. These impulses also known as Neural Oscillations can be observed by the measuring technique known as Electroencephalogram (EEG). Even though research in the field has been carried out since the 1960s, high level applications using brain waves have not emerged yet. Our objective will be to obtain EEG data for different thinking process and visual stimulus [4].

In the year 2013, Wasifa Jamal, Saptarshi Das, Koushik Maharatna, DogaKuyucu, Federico Sicca, Lucia Billeci, Fabio Apicella, and Filippo Muratori utilized the concept of stable phase synchronization topography – synchrostates – over the scalp derived from EEG recording for formulating brain connectivity network in Autism Spectrum Disorder (ASD) and typically-growing children. A synchronization index is adapted for forming the edges of the connectivity graph capturing the stability of each of the synchrostates. Such network is formed for 11 ASD and 12 control group children. Comparative analyses of these networks using graph theoretic measures show that children with autism have a different modularity of such networks from typical children [5].

III. PROPOSED SYSTEM

First of all, the patient has to wear the EEG device to get his/her brain frequency. The EEG Device is connected directly to the laptop with the help of the Bluetooth. So, after connecting the EEG device with the respective laptop. This would be the main hardware connection of the EEG Device with the laptop to get the brain frequency of the person. After the connection of the EEG device with the computer or laptop when the actual brain frequency are read and stored as a JSON file and that JSON file is read and the data is wrote in the excel file. The data will be coming as a whole row which contains frequency of attention, meditation, delta, theta, low alpha, high alpha, low beta, high beta, low gamma and high gamma. This data will be the input of the software than starts

the work of the Software system that is been developed to determine whether the person is autistic or not.

The Software system consist of the User Login, New User Registration, Starting the Test of the Patient which is divided into three parts as Test 1, Test 2 and Test 3 and finally the generation of the Report of the Test which will determine whether the person is suffering from autism or not with the help of probability of the above three tests that has been done of the patient at three different time slots and not at a time. This is the main advantage of the system.

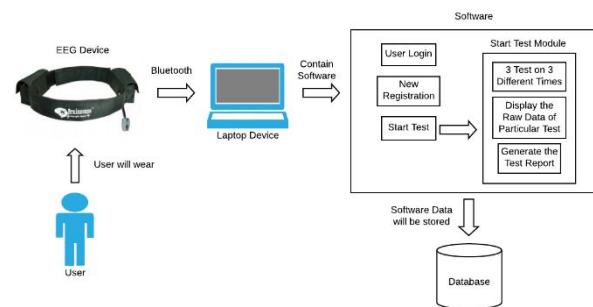


Fig. System Architecture Diagram

The above figure shows the whole System Architecture that has been explained before.

Now lets see how the Software System will work.

Firstly the User/Patient will Select the New Registration Option and fill the all his personal details that has been asked and it will be saved to the database. After Registering the User can login to the software with the help of the username and password that User/Patient has set in the Registration Form.

After Registration and Login to the Software than the User/Patient can start the test. When he/she clicks on Start Test option there comes three different time slots in which he/she has to test because if we would do this all three test at a time than we cannot find the proper result because the Patient can be in one situation, one concentration level and focus so we has to take three different time slots to get the proper results. So when the User/Patient selects the time and start the test at the time his/her brain frequencies are been captured for 2 to 3 minutes and than after 2 or 3 minutes it gets stopped and the data that has been collected will get processed. This process will take place 3 times in different time periods and in each time period a final wave will come among the five waves namely alpha, beta, gama, delta, theta and each wave consist of various problem and disesase which can be easily identified by this system. Then afterwards when the User click

on the generate the report than the system will generate the report by calculating the probability of all the three test which will consist of the whole information about the diseases that the person is facing.

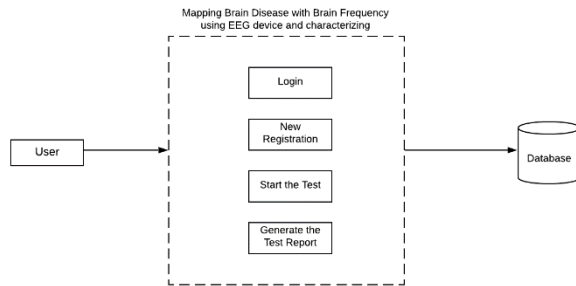


Fig. Block Diagram

The above figure shows the block diagram of the software system that is been developed.

IV. RESULT

The Result of the Project will be a detailed information about the person. The result of the project will in the form of a detailed report containing the information about the brain or other diseases related to the brain he is suffering from. This all data will be stored into a database which in future can be used by anyone to validate other things related to a person or the diseases to study in more detail or for the research purpose.

V. CONCLUSION

The outcome of the project will be a detailed information about the brain disease that the person is suffering. This project will help us to identify the brain disease easily and very early because this project will generate the report on the probability of the 3 tests only and it does not require any detail information by the person. The project just takes the User/Patient brain frequency and convert it appropriate waves which helps to determine the disease from which the User/Patient is suffering. Each wave consists of various diseases so it would be easy for the User/Patient to know from which brain disease he/she is suffering. The project will generate the report by calculating the probability of all the three test which will consist of the whole information about the diseases that the person is facing

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