Brain Computer Interface for Neurodegenerative Person Using Electroencephalogram

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ABSTRACT Brain–computer interface (BCI) connects the outside world, in real time and in a natural way, like biological communication system. It facilitates the communication link from the brain to the external world by converting brain thoughts in to control commands to control the external devices, such as wheelchair, keyboard mouse, and other home appliances. Measuring the electrical brain activity by placing electrodes over scalp is called electroencephalogram (EEG). By combining these two techniques, we are able to create EEG-based BCI. In this paper, we use band power and radial basis function to analyze the signal for four mentally composed tasks to design four states BCI for a neurodegenerative person using EEG. Online study was conducted to analyze the performance of the wheelchair for a neurodegenerative person. The result shows that an overall average classification accuracy of 92.50% and individual tasks with an average classification of 95%, 87.50%, 92.50%, and 95.00% were achieved for the four tasks. The result proves that control commands generated from the EEG signal have the bcapacity to control the intelligent systems.

INDEX TERMS Brain computer interface, band power, radial basis function, FRDM-KL25Z.

I. INTRODUCTION

In India total population was crossed over 121 Crore. Among that total population 2.68 Crore (2.21%) individuals were disabled. From the total disabledpercentage 56% (1.5 Cr) were males and 44% (1.18 Cr) were females. In the total disabled population Amongst 1.86 Crore (69%) and 81Crore (31%) of persons were resided in the rural and urban areas. Disable persons were varied due to various age groups and disease. The total number of handicapped persons is highest in the age group between 10-19 years (46.2 lakhs). 17% of the disabled population is in the age group 10-19 years and 16% of them are in the age group 20-29 years. Elderly above 60% immobilize constituted 21% of the total incapacitate at all India level [1], [2] which was shown in Table.1.

Different types of disability shown in Table.2. Interprets that 20%, 19%, 19% and 10% of individuals affected by the movement, Vision, Hearing and multiple disabilities. From the Table.2 We analyzed that most of the disabled individuals were affected by movement. So there is a need of

assistive device for the individuals with motor impairment. Brain Computer Interface is one of technique to overcome such problem with help of mental thoughts [1], [2].

People with disabilities due to spinal cord injuries, cerebral palsy, locked in Syndrome or Amyotrophic Lateral Sclerosis, Multiple Sclerosis are unable to use the biological channels for communication. These disorders affect the muscles and cause weakness or reduced the motor neurons in both upper and lower limps and stop the message communication from brain to muscles. Finally the individual person loses the voluntary movement and controls.

Humanoid robots are playing important role in our daily life. By converting motor imagery thoughts to neural activity to control the external devices called BCI. In the earlier days assistive robots are widely used in industry, nowadays need of assistive device are gradually increased and there is lot of demand for such product. So the researcher's turn their attention towards EEG based BCI. BCI receives electrical signals and converts it into control commands like