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# DIGITAL DEVICES ACCESSIBILITY FOR DISABLED PEOPLE

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Nowadays people with disabilities meet barriers of all types. However, technology is helping to lower many of these barriers. By using computing technology for tasks such as reading and writing documents, communicating with others, and searching for information on the Internet, students and employees with disabilities are capable of handling a wider range of activities independently. Still, people with disabilities face a variety of barriers to computer use.

According to the World Health Organization (WHO), approximately 15% of the world's population lives with some form of disability. Persons with disabilities can equally participate in society and make substantial contributions to the economy if the appropriate Internet tools are available.

Moreover Information and Communication Technologies (ICT) can be a powerful tool in supporting education and inclusion for persons with disabilities. Technological development can enable people with disabilities to improve their quality of life. The successful application of such technologies can allow people to use all existing digital devices.

Over 100 Governments have signed and ratified the UN Convention on the Rights of Persons with Disabilities. Obligations include implementing measures to design, develop, produce and distribute accessible ICT at an early stage, so these become accessible at minimum cost for persons with disabilities.

W3C's Web Content Accessibility Guidelines (WCAG) are increasingly mandated by governments and used by industry to make websites more accessible for people with disabilities.

More governments are starting to incorporate accessibility criteria in their public procurement policies.

Popular companies now have progressive attitudes to accessibility. Firstly, the Governments incorporates accessibility criteria in its public procurement policy (through what are called Section 508 guidelines) thus stimulating industry to supply more accessible products to its agencies. Secondly, litigation under discrimination and telecommunications legislation has focused companies' attention on the possible consequences if accessibility needs are not appropriately addressed.

There are new potential technical solutions that can benefit both persons with disabilities and the general community. Products like speech recognition (originally designed for people with limited hand movements) and the scanner (designed as part of a document reading device coupled with speech synthesis for blind people) are now mass market products.

There are internationally recognized accessibility guidelines developed by W3C on web content, authoring tools and user agents. These guidelines, especially the Web Content Accessibility Guidelines (WCAG), are used by many governments to build accessible websites. Version 2 of WCAG stipulates that websites are to 'perceivable', 'operable', 'understandable' and 'robust'. The guidelines detail how this is done under three levels of success criteria.

Cloud computing has massive potential to deliver affordable and accessible services to persons with disabilities.

Internet technologies have the potential to give persons with disabilities the means to live on a more equitable basis within the global community in a manner that previously was not possible.

The Internet Society's motto is "The Internet is for Everyone," reflecting the belief that access to the Internet is a fundamental public policy issue. Apart from access to infrastructure and equipment, accessibility depends on making physical devices and online services useful to everyone, including persons with disabilities.

These are positive developments; but there needs to be ongoing vigilance. Without ongoing efforts to raise awareness, new types of products may create new barriers.

Examples of what is being done across sectors and what the Internet community can do to increase and enhance the use of the Internet by persons with disabilities were offered.

Regardless of the challenges they may face, persons with disabilities can contribute to society like any other member of the community when barriers are removed. Increasing accessibility to the Internet can help to make that happen. Governments, industry and other key stakeholders need to make accessibility a priority in their ongoing work, individually and collaboratively. Internet community should

work together to make change for both social and economic benefit. If we are to be successful we must commit to move forwards and make a difference, together.

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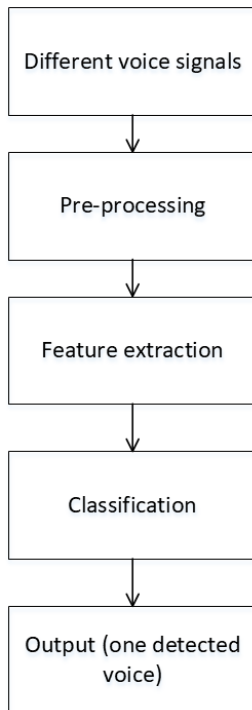# SPEECH RECOGNITION USING MACHINE LEARNING

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At the moment recognition of a person's emotional state is an actual topic and can be applied in many sectors such as medicine, psychology, marketing, security. Analysis of the speech signal and the image of the person performing the responsible activity (astronaut, pilot, operator of the nuclear power plant, air traffic controller, etc.) is used to exclude the possibility of error. Moreover, the approaches developed here can be applied in different areas, for example, alcohol intoxication, fatigue, depression, etc.

Neural Networks are a class of models within the general machine learning literature. Neural networks are a specific set of algorithms that have revolutionized machine learning.

The first step in speech recognition is obvious: we need to feed sound waves into a computer. Speech recognition mainly is done in two stages - training and testing.

In this process, the voice of different persons is recorded by a microphone in such an environment where there is no noise. These speech signals are pre-processed by using suitable techniques like filtering, entropy based on endpoint detection and Mel Frequency Cestrum Coefficient, etc. This type of technique makes the speech signal smoother and helps us in extracting only the required signal that is free of noise.

Classification of the speech signal is a very important phenomenon in the speech recognition process. In this project, the neural network is used for classification.

This figure shows the general procedure of the speech recognition process. A typical speech sentence consists of two main parts; speech information carried out by one part and silent and noise carried out by the other part. At the input side, different voice signals are applied. Before applying these signals to the neural network, pre-processing of the signals is done by using filtering. Entropy is based on endpoint detection and MFCC. The next step is to extract the features of the voice signals by the special kind of neural network. A tested signal is detected as the output.



*Picture 1 - Block diagram of speech recognition process*
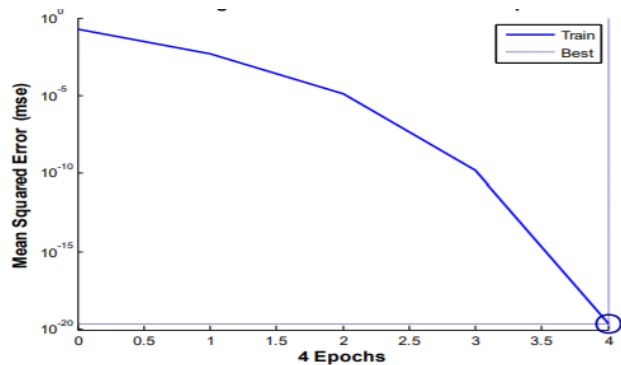


*Picture 2 - Best training performance obtained*

In our work to implement the project, MATLAB neural network toolbox has been used to create, train, and simulate the network. From 128 samples 70 samples are used for training while the other 58 are used for testing the network. The trained network can also be tested with real time input by a microphone of good quality. Setup of MFCC. They took speech data from a database isolated alphabet. They set the output nodes to nine in order to recognize the nine letters of E-set.

The best result is obtained at epoch 4 in this work. 100% accuracy is not achieved in any case. The best training performance rate is 2.2596-20 at approach