Final Year Project Showcase for Batch-2016

Department of Electronics Engineering Electronics Engineering Programme		
1	**Project Idea**	The main objective of this project is to develop an affordable speech assistant for visually impaired people based on Artificial Intelligence models. The text reading assistant contributes in the assistance of the visually impaired people making them independent of a braille reading system or a digital speech synthesizer as these facilities are not always available everywhere and for everyone. These people are prevented from living and earning normal wages. An advanced step towards convenience and portability promises an easier and furthermore much interesting life. During the project, our course of action was to apply Deep Learning models to detect text from any given document, paper, boards or natural scene. The text reading assistant has two main parts: 1. The Lectora: Non-mobile wooden platform 2. The Third Eye: wearable glasses
2	**Process**	The text reading assistant implements Artificial Intelligence based Models to convert typed or printed text into machine encoded text, it then converts the recognize text into audio output and assist the user (Visually Challenged or Blind) without any graphical interface. There are different methods and techniques involved in the whole procedure. In the text detection phase the text is detected from any given paper, boards or natural scene using Deep Learning Model called **EAST**. Then the ROIs of each text is extracted and pass it for further processing, which is the identification of bounding box and giving output if text is detected. In the second phase when an image is captured to recognize text using Optical Character Recognition (OCR) with the help of another Deep Learning Model for Text Recognition called as **Python-Tesseract.** Once the text is recognized properly it will be converted into machine encoded text and by applying Text-To-Speech (TTS) Method, which allows given text to be transcript in digital format into human voice and, can be playback using an audio output device. **The Lectora: Non-mobile wooden platform** Lectora has three modes of working: ▪ **Default mode:** Read text normally ▪ **Character mode**: Read individual character of words and numbers individually**.** ▪ **Text Translation mode**: enables the user to recognize the text from 5 languages: Chinese, Spanish, German, Urdu, Arabic and translate these to two different language as per user choice (through button) that are English and Urdu.

		The Third Eye: wearable glasses Third eye also has 3 modes of operation: ▪ **Default mode:** Read text normally ▪ **Character mode:** Read individual character of words and numbers individually. ▪ **Natural Scene Text Detection:** Detects text in the surrounding of person
3	**Outcome**	• The natural scene text detection is achieved, enabling a blind person to detect text around him very accurately and efficiently at 2ft to 3ft and less. • Appropriate ROIs are extracted of detected text and Image processing is done with much competence. • The use of optical character recognition is achieved by enabling the device to be able to read documents or typed black text on white background with much accuracy. • The device is made efficient such that it can read and recognize text as well as characters and numbers both separately. • The device offers two components: a non-mobile wooden box aka The Lectora which enables a visually impaired person to read any documents or text. It is very easy to use and gives instructions in audio output. The device notifies you when it takes a picture and then read the text. Hence making a blind person read a text without any dependency. • The Third Eye is portable and easy to carry. A belt is attached with the glasses. The Third Eye will help the blind person to detect any text around him. • The device is made efficient since it can detect and recognize 3 basic font styles with much accuracy i.e. Arial, times new roman and Calibri. • The efficiency is further increased by enabling the devise to read smaller font size. It can much accurately detect and read font size 14 and above. • Th device can detect 5 different languages from images and then translates the text into English or Urdu by selecting the mode you would like. • A systematic way of performing each task with proper procedure that

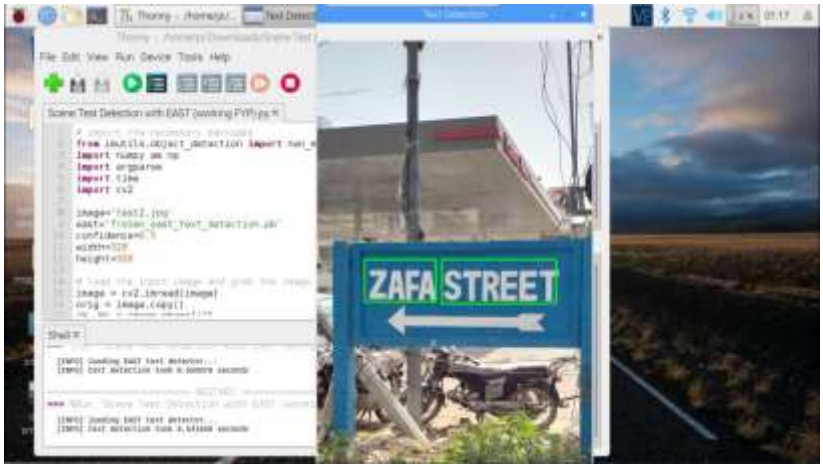
		can assist a Visually Impaired Person is achieved. The device gives option to select different modes to read text
5	**Competitive Advantage or Unique Selling Proposition** (Cost Reduction, Process improvement, Attainment of any SDG (Sustainable Development Goal), increase of market share or capturing new market or having superior performance over competitor. In summary, any striking aspect of the project which compels industry to invest in FYP or purchase it. Some detail description is required in terms of how, why when what. You can select one or more from following dropdown and delete rest of them)	
a	**Cost reduction of existing Product**	The Text Reading assistant is developed to be an affordable product, but the cost can be further reduced by replacing Raspberry Pi with a special purpose microcomputer, capable to process the deep learning models used and with a larger RAM. The mass production of the product reduces components costs as well due to wholesale prices.
b	**Process Improvement which leads to superior product or cost reduction, efficiency improvement of whole process** (e.g. What is issue is current process and what improvement you suggest)	• This device can detect natural scene text with much competence, but text recognition remains a difficult task. A profound natural scene recognition is recommended for the device which can make it more useful for visually impaired person like guiding them directions on roads etc. • The text recognition has scope to be extended. The device can be trained on more complex font styles and handwritten text. The handwritten feature can prove to be a breakthrough. The text reading assistant can be trained to read important official documents and forms like utility bills etc. • The wearable device can be made more compact and proficient in its structure as well as features by the addition of natural scene recognition the increment of distance required to be read efficiently etc. • The most important field in which this speech assistant can grow is real-time object detection and recognition. The device can be used to detect and recognize faces around the blind person. The detection and recognition of objects and views can make a blind person independent and being able to comprehend of what goes around the world around him.
c	**Attainment of any SDG** (e.g. How it is achieved and why it is necessary for the region)	This Project achieves the goal of • Good Health and Well-being • Quality Education for all • Reduced Inequality About 2 million people are blind and about 6 million people are partially blind in Pakistan. The medium for them to read and write is using a special system called Braille which is a code in which raised dots are used to represent alphabets. This code system can be used to read text by the medium of touch. Braille code has been proved a rather difficult method to

		learn as it is not one code book but of many types like Literally Braille, Nemeth Braille and Music Braille etc. According to the National Federation of the Blind statistics in 2009 showed that only 10 percent of 1.3 million of Americans with visual impairment can read braille. Braille is heavier to carry and takes up more space than the traditional alphabet, National Braille Press printed the Harry Potter series in 56 volumes! This concludes that text reading requires the use of a braille reading system or a digital speech synthesizer (if the text is available in digital format). Most of printed and published books, papers etc. are not in braille or audio versions, and digital versions are still in the minority. Thus, the development of a device that can perform the image to speech conversion, whether it's a text written on a wall, a sheet of writing paper or in another support, has a great potential and utility. This enables a blind person to perform daily tasks much easily and independently. The chances for better education and job are increased immensely.
e	**Capture new market (**e.g. Niche market or unaddressed segment**)**	The niche of our project is Health Care and Medical with application of AI. Considering the fact that About 2 million people are blind and about 6 million people are partially blind in Pakistan, we can say that this type of device will have a high demand in the market. The most important aspects of this device are that it is a new concept in this market, it is affordable and easy to use.
7	**Team Members (Names & Roll No.)**	Muhammad Wasiq Pervez (El-047) Hamna Nadeem (El-004) Hamza Aslam (El-062) Ammad Mallick (El-061)
8	**Supervisor Name**	Ms. Aqsa Khan

9	Pictures	**The Lectora: wooden non mobile platform:**     **The Third Eye: The wearable device**

OUTCOMES/ RESULTS:

<u>Natural Scene EAST Text Detection:</u>



The above figures show bounding box with natural scene detection with average time 8

seconds using EAST in raspberry pi

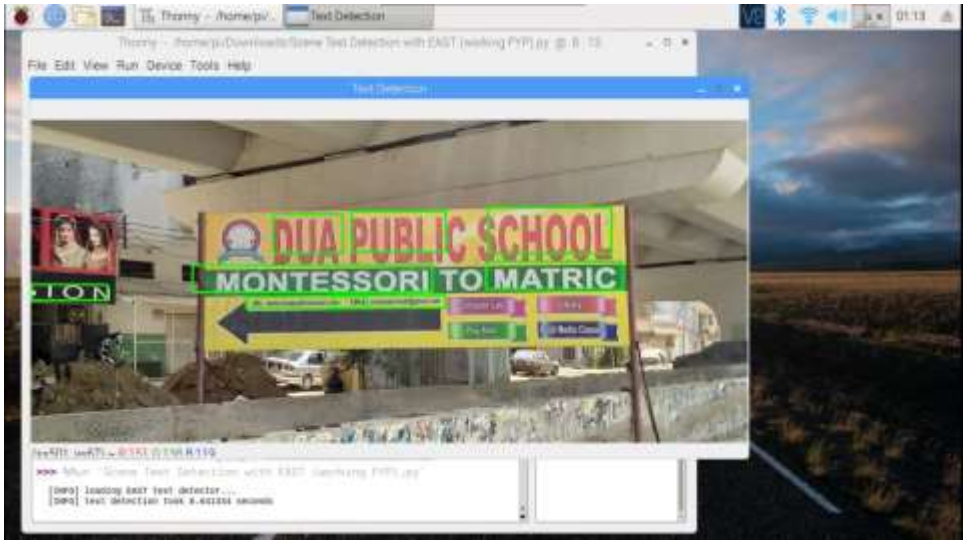
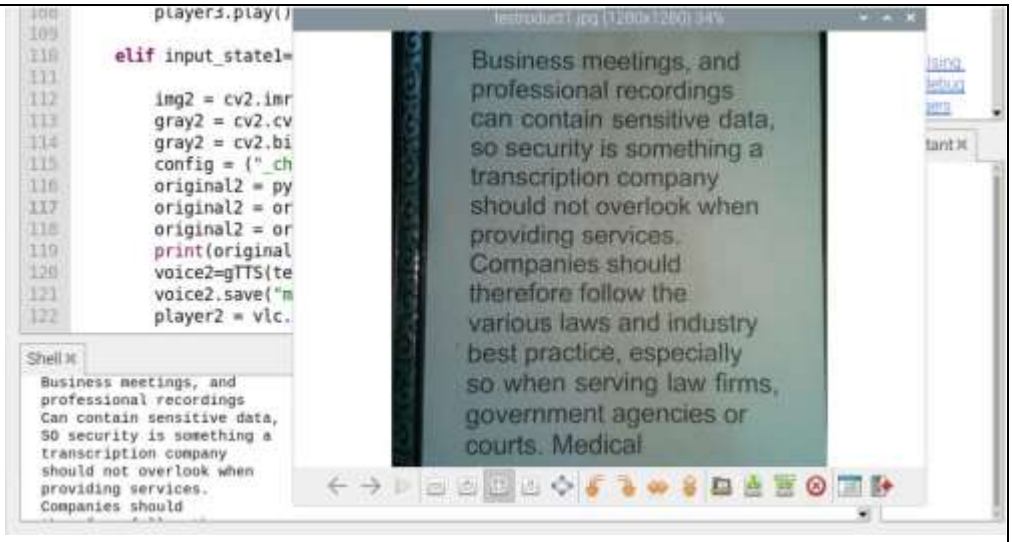
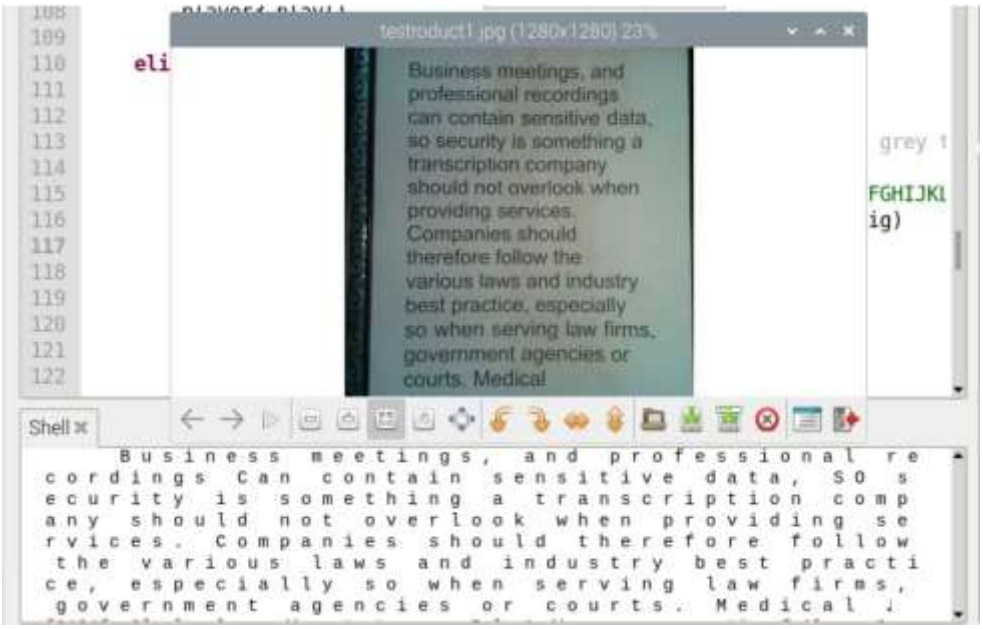


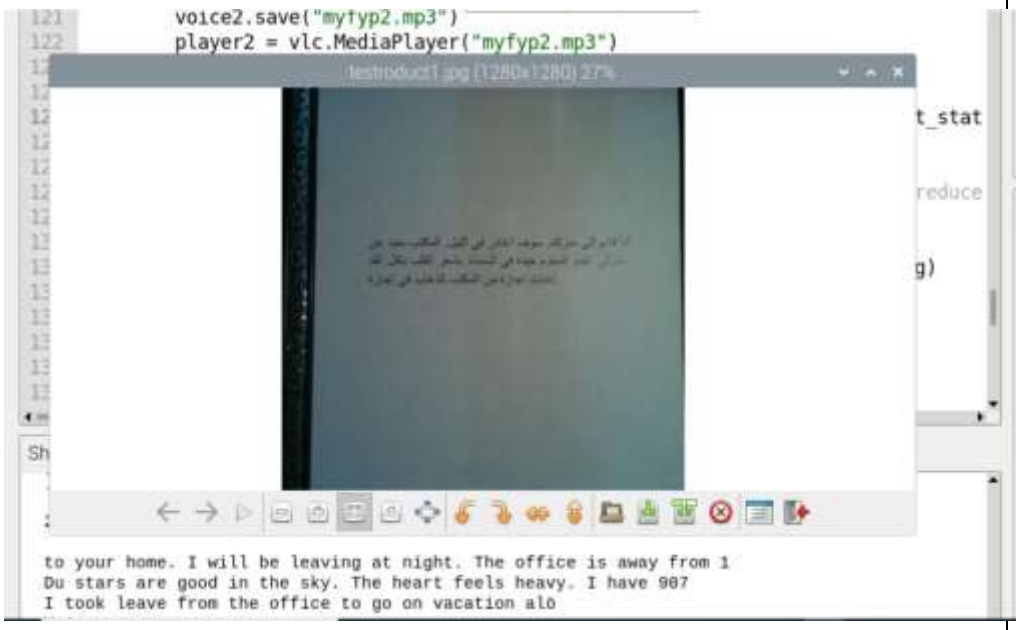
Fig 1,2,3: Natural Scene Detection

Text recognition in Default reading mode:



Text recognition in Character reading mode:



		Text recognition in Translation reading mode: 
10	**Video**	Please follow the link below for the project video: https://drive.google.com/file/d/1KgZvooeHZcV9iwXSOwYa_hgK0j9eXfIn/view?usp=sharing