

Arabic Optical Character Recognition and Assistive Technology

Mada Center

Abstract -

As Optical Character Recognition (OCR) technology has gone through substantial improvements over the past decades, the Assistive Technology (AT) industry has utilized it as a crucial tool to serve as a foundation for developing breakthroughs in innovative AT solutions. AT for individuals with various kinds of disabilities has been developed through the use of OCR. These solutions have enabled Persons with Disabilities (PWDs) to be active members of society in several domains such as education, employment, and community.

Introduction

The advent of OCR based AT has had a transforming effect on PWDs in terms of areas like increased educational productivity and enhanced independence in performing daily tasks, leading to an improved quality of life. The ability of OCR technology to offer efficient and accurate conversion of paper and image documents to editable digitized formats has greatly influenced the potential of providing information in accessible formats suitable for use by PWDs. Several types of innovative AT solutions based on OCR technologies are available in the market today, some of which are as follows:

- **Technologies that help to overcome Learning Difficulties:** Individuals with learning difficulties like dyslexia, and Attention Deficit Hyperactivity Disorder (ADHD) often find it challenging to read printed materials as it becomes problematic to distinguish between characters and keep track of the flow of reading. Various AT solutions support the creation of digital documents from scanned documents and images through the use of OCR technology. These digitized documents can be processed automatically and converted into accessible materials tailored fit for the needs of the student with learning disabilities. Once converted to digital format, specialized AT (e.g., TextHelp, Clicker, Kurzweil, etc.) can support features like text-to-speech and text-tracking tools that help users visually track the words being read out to them by the software. The software features can also include additional useful options like creating a user-configurable library, dictionary, highlighting, adjustable word and sentence tracking colors, and customizable backgrounds.
- **Technologies that enable Individuals with Visual Impairment to read independently:** Individuals with visual impairments like low vision or blindness can often encounter challenges to read printed materials. AT solutions can automate the process of converting printed materials to accessible format using specialized software or hardware solutions. The first step in the conversion process relies on using OCR technologies to identify the characters in the reading

materials and convert the content into a digital format. Once converted, the digitized document can be used by AT solutions (e.g., Duxbury, EZ converter, etc.) to create reading materials in an accessible format like large print, text-to-speech, and braille. Without accurate OCR technology, the translation of scanned documents into digital format would be unreliable and thus, hinder the ability for those with visual impairments to read independently.

- **Wearable technologies that enable Individuals with Visual Impairment to identify key objects and improve their ability for independent living:** In recent years the concept of integrating accessibility features into smart glasses to improve the lives of individuals with visual impairment has been explored. The inclusion of a camera and computing chip in smart glasses allows them to be an ideal platform for learning OCR based AT solutions. Smart glass technologies like Envision, NuEyes, and OrCam have integrated OCR based features that enable the identification of print-based information like product expiry dates, restaurant menus, and printed bills. These glasses are also equipped with audio output which allows text-to-speech feedback of OCR identified information.
- **Technologies that enable Individuals with Physical Disabilities to access print materials:** Accessing conventional reading materials like books and newspapers can be challenging for Individuals with Physical Disabilities as it requires sufficient dexterity to perform tasks like flipping the document pages. In such cases, the preferred access method is to have the reading materials available in an electronic format (e.g., HTML, PDF, etc.). OCR based AT solutions like OpenBook allow the creation of documents in an electronic format from scanned printed documents and graphics-image based text.

The development of OCR technologies in other languages like Arabic has progressed considerably over the past decade. This has allowed the AT industry to create innovative OCR based solutions localized in the Arabic language as the improved OCR accuracy meant a more reliable outcome from the AT solution. Currently, there are a handful of OCR based solutions commercially available in the Arabic language, some of which have around 96% or more accuracy. Examples of OCR solutions that support the Arabic language include:

- **Sakhr OCR**

Sakhr OCR solution is capable of identifying complex fonts (including cursive writing), diacritics, position-dependent character shapes, overlapping, and non-standard fonts in the Arabic language. Sakhr OCR converts scans of both Arabic and Arabic-script based languages and can recognize Arabic text with an output accuracy of up to 99%.

- **ABBYY FineReader**

ABBYY FineReader is an OCR solution that includes features like digital conversion of Arabic scanned documents through applying intelligent document layouts, image enhancement, barcode recognition, and command line integration. ABBYY FineReader can directly convert the contents of printed documents into editable Microsoft Word, Excel, or PDF format.

- **ReadIRIS**

ReadIRIS offers an accurate Arabic OCR recognition rate through its OCR software. The OCR engine supports the recovery of text from printed materials to various file format (e.g., Word, Excel, PowerPoint, or PDF). ReadIRIS supports the digitization of Arabic paper documents and thus, paves the way for AT solutions to create Arabic content in an accessible format.

Mada Center has continuously been invested in supporting the development of AT based on Arabic OCR technologies. This continues to be achieved primarily by supporting innovators and entrepreneurs through the Mada Innovation Program. A major contribution of Mada Center towards its commitment of supporting the evolution of Arabic OCR is the development of the “**Arabic Money Reader App**”, which recognizes Qatari Riyal currency notes using the mobile phone camera. Mada Center has also been committed to supporting the digitization of Arabic language reading materials in accessible format available worldwide. This objective is achieved by collaborating with international partners like **Bookshare**, which hosts one of the largest platforms of accessible reading materials for individuals with print disabilities.