

Handwritten Text to Speech

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GitLab:

<https://cci-git.uncc.edu/itcs-4152-5152/fall-2021/project-13-text-to-speech-for-the-visually-impaired/-/tree/main>

Research

Business/Customers

- **What problem will your Computer Vision solution solve, and for whom?**
 - Our solution will assist the day to day life of the visually impaired and allow them to be more independent by comfortably navigating their environments. Our product will be mostly focused on translating handwritten text to speech.
- **How big is the potential market?**
 - The American Foundation for the Blind notes that as of 2018 roughly 13% of adult Americans (32.2 million) are blind or have difficulty seeing. The NCBI also notes that data conducted in 2015 determined that 89% of those who are visually impaired live in low-middle income communities.
 - Our product will be specifically targeting these lower-income communities, including those without access to expensive OCR software. However, it will still be available to higher income communities and our potential market will include all 32+ million visually impaired individuals.
- **Would your business have any competitors? Who are they? How are they doing?**
 - Adobe (Acrobat Pro DC)
 - Kofax (OmniPage Ultimate)
 - Abbyy (FineReader)
 - These are the top 3 companies producing OCR software. They are dominating the business market, but they don't really target personal or individual markets. All of their OCR software is corporate focused and only works with scanning already printed documents into a PDF.

- **How are potential customers dealing with these issues now?**
 - The software available currently is directed more towards businesses and higher income communities. Because low income individuals do not have access to products like these or they are unable to afford them, they are not able to live the same quality of life compared to those who do.
 - Regardless of income, all visually impaired people have extremely limited access to softwares that can translate handwritten text into audio. They are limited to products that only translate typed or scanned documents.
- **Are your customers individuals or businesses?**
 - Our main focus will be around the individuals, and more specifically the low income individuals who cannot afford the expensive software or monthly subscriptions.

Academic Literature Review

- **What academic work is relevant to your project topic? Pick 3 papers, ask us for help if you need it.**
 - Design of An Electronic Narrator on Assistant Robot for Blind People (Authors: Rizqi Andry Ardiansyah, S Suhag, M Guo, P Plapper)
 - https://uncc.primo.exlibrisgroup.com/permalink/01UNCC_INST/1rqh8fi/cdi_doaj_primary_oai_doaj_org_article_41a6dde6e04b472788f6f3b7083f1550
 - Text recognition in multimedia documents: a study of two neural-based OCRs using and avoiding character segmentation (Authors: Khaoula Elagouni, Christophe Garcia, Franck Mamalet, Pascale Sébillot)
 - https://uncc.primo.exlibrisgroup.com/permalink/01UNCC_INST/1rqh8fi/cdi_crossref_primary_10_1007_s10032_013_0202_7
 - Camera Reading for Blind People (Authors: Roberto Neato, Nuno Fonseca)
 - https://uncc.primo.exlibrisgroup.com/permalink/01UNCC_INST/1rqh8fi/cdi_crossref_primary_10_1016_j_protcy_2014_10_135
- **What makes these papers important/relevant?**
 - The research papers gathered here implements OCR or Optical Character Recognition techniques to identify text from a document. These techniques are still in use today for a variety of purposes. Understanding OCR techniques to identify specific characters will help us identify the text of a hand-written document.

- **What are their results and how did they achieve these results**
 - The researchers took various pictures of text. They then utilized OCR techniques to analyze the characters within the images. These characters were used in one of the papers we have listed to be sent to a text-to-speech algorithm.
- **What's different/unique about these approaches**
 - These approaches are not necessarily different since they all utilize OCR techniques to extract the text from images. The one notable difference between the three papers is that our final listed article noted how they utilized a text-to-speech algorithm that takes in the OCR data that we gathered previously. It is important to note that none of these approaches analyze hand-written text, unlike the approach we plan to create.

Open Source

- **What open source code is available that are relevant to your topic?**
 - Tesseract OCR (<https://github.com/tesseract-ocr/tesseract>)
 - Ocropy (<https://github.com/ocropus/ocropy>)
 - Ocular (<https://github.com/tberg12/ocular>)
 - SwiftOCR (<https://github.com/NMAC427/SwiftOCR>)
- **How active are the communities around this code?**
 - Tesseract OCR - Most recent commit was 10/5/2021
 - Ocropy - Most recent commit was 12/3/2020
 - Ocular - Most recent commit was 7/17/2017
 - SwiftOCR- Most recent commit was 12/13/2020
- **What data is available for testing and/or training algorithms?**
 - Data for our project is readily available, but we will have to provide it. The main focus of our project is converting hand-written english text into an audio sample of the given text. To train our models, all we need to do is get a variety of hand-writing from different people so that we can have a diverse test group based on different styles of writing.

Industry Solutions

- **What companies are solving similar problems to yours?**
 - National Federation of the Blind (KNFB Reader) - \$100 on app store
 - Evernote (Read hand-written notes) - Free version, subscription version
 - Natural Reader Software (text to speech Word files, webpages, PDFs, emails) - Free versions, paid versions (up to \$200)

- MWS Reader 5 (OCR, converts text to MP3 so you can save and download text as audio files) - Free version, paid version
- **Are there available talks, documentation, or other resources from their engineering teams?**
 - Not publicly, these softwares do not have any documentation available. The only other resources available to the public are video tutorials on how to use the softwares.