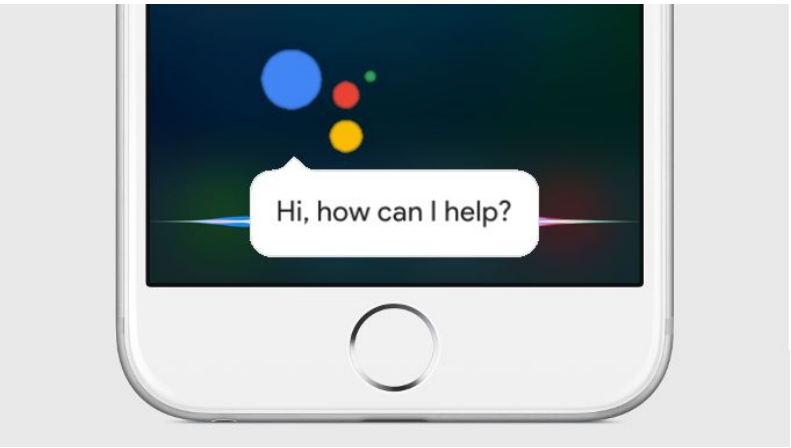
iAssistMe

TAIP MSSI 2018-2019

1. Introduction

Most of the time, visually impaired people report numerous difficulties with accessing printed text using existing technology, including problems with alignment, focus, accuracy, mobility, and efficiency. For instance, imagine you have arrived at your hotel and go for a shower. In the bathroom are four bottles, all the same size and shape, you assume they are: shampoo, conditioner, shower gel and body lotion. How do you find out which one is which? If you have eyes, and still have your glasses on, your read the small print, you then lay out the bottles so you use the right one at the right time. But what would you do if your were blind or if you could not read the small print? For a person who is blind, or has a significant vision impairment, this is a typical day-to-day problem, one of the many that limit their independence.
Technology could be the answer to many problems alike as the one described so far. For example, with the advent of live streaming on mobile phones a solution is to call a friend and ask them which bottle is which. However, the limitation of this is the availability and ultimately patience of a friend or friends. But what if this so-called friend were to be not so human anymore? That would mean Franny, your new smart and body-less friend, is always there for you to answer all types of questions you may have regarding the weather, your surroundings, general knowledge any many other things that would be easy to access if your eyesight would be available.



2. Activity in this field performed by others, methodologies used, evaluation methods, results

Smart Assistance System for the Visually Impaired, proposed in 2017 by a group of researchers from Sinhgad Institute of Technology and Science, Mumbai is a smart system consisting of two components: a wireless Camera (from smart glasses) and an Android Device. This system allows blind people or people with low vision to detect and avoid hurdles/obstacles. The project depends on the Smartphone App and its reliability. A separate database is designed, where the definition of the objects are found. In the system level, the novelty lies in the real-time application working on the Smartphone.
Main used metods are text-to-speech, object recognitionand face recognition.
Text-to-speech module comprises of image and speech processing. The main aim of this module is to acquire a 3D world real image of any text constraints area and to convert this image into text followed by providing audio output using speech processing.
Object recognition module helps visually impaired people to locate their frequently used day to day objects. The used algorithm analyses the position of the object, size, shape, etc.
Face recognition module uses face features detection algorithms, the results are then used to search for other images with matching features.
The obstacle detector/recognition application provides a high detection rate on selected surroundings. The limitation of the system are imposed by the user's hardware, for instance, a weak camera could lead to weaker results.

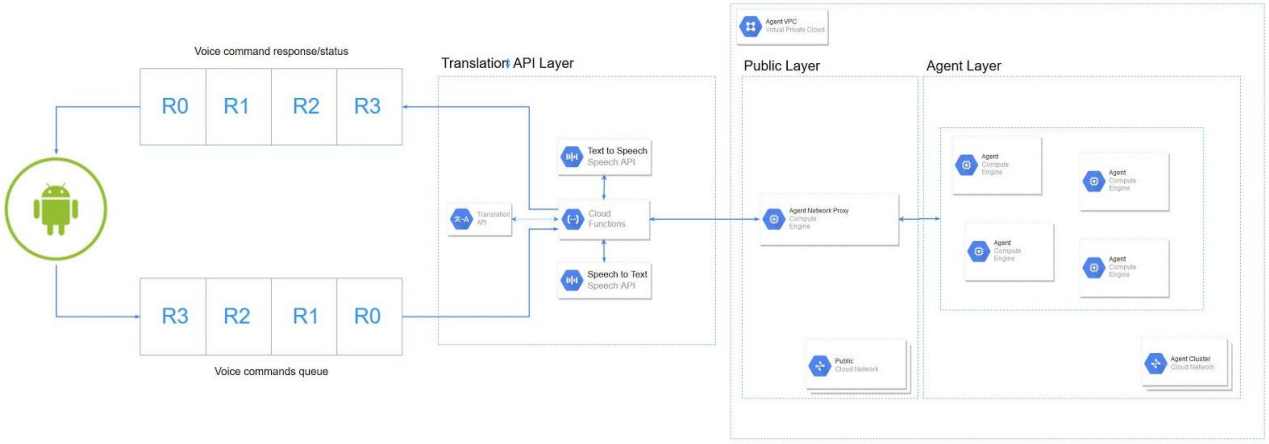
Other mentions:

A Stereo Image Processing System for Visually Impaired, proposed by a group of researchers from the School of engineering and Information Technology, University Malaysia and the Northern Malaysia University College of Engineering in 2008. The system utilizes stereo vision, image processing methodology and a sonification procedure to support blind navigation. The developed system includes a wearable computer, stereo cameras as vision sensor and stereo earphones, all molded in a helmet.

Blind Path Obstacle Detector using Smartphone Camera and Line Laser Emitter, poposed by german researchers in 2016. The system relies on two things: mobile camera and laser. The laser and the mobile is kept at static distance. The image is captured from the camera and along with it the laser is also observed. Using the

static distance and angle between the laser point and the camera the distance is measured.

We propose a system, based on digital assistants, to help visually impaired people in their basic activities of life. The main flow of the application can be observed in the diagram below:



The interaction with the application is done through an Android device, by vocal commands, that can be send in the user's native language. The core of the application consists of an aggregation of cloud services and and apis from various platforms , that allows us to generate a user profile, in order to create a more personalised user experience.

3. Important names in the field, research teams

As visual impairment is no longer a problem we can neglect as everything around us becomes automated and digitalized, research groups and institutes have been set up to find ways to help people with such a condition become independent:

- **Oxford Smart Specs Research Group** (https://www.ndcn.ox.ac.uk/research/oxford-smart-specs-research-group)

- **National Eye Institute** (https://nei.nih.gov/)

- **International Society for Low-vision Research and Rehabilitation, Informa Healthcare**, that has published a journal that covers the entire field of research and practice in visual rehabilitation assessment (https://www.researchgate.net/journal/1388-235X_Visual_Impairment_Research)

- **American Foundation for the Blind** (https://www.afb.org/default.aspx)

- **AppleVis -** A community-powered website for individuals with blindness and low-vision users of Apple's range of Mac computers, the iPhone, iPad and iPod Touch. AppleVis is a rich resource that strives to empower the community by offering multiple pathways to access and share relevant and useful information. (http://www.applevis.com/)

- **Macfortheblind.com** - is a place specifically for individuals with blindness and visual disabilities who are either users or potential users of Macintosh computers or iOS devices, such as the iPhone, iPad or iPod.

Besides these, there are companies that provide specialty software and hardware products (such as screen readers and specialty keyboards) that provide essential computer access to individuals with significant vision disabilities and more:

- Ai Squared (https://www.zoomtext.com/)
- BAUM Retec AG (https://www.visiobraille.de/)
- Claro Software (http://www.clarosoftware.com/)
- Dolphin Oceanic Ltd. (https://yourdolphin.com/)
- Enabling Technologies, Inc. (http://www.brailler.com/)
- Freedom Scientific (http://www.freedomscientific.com/)
- gh, LLC (http://www.gh-accessibility.com/)
- GW Micro (http://www.gwmicro.com/)
- Low Vision International AB (http://www.lvi.se/)
- Meridian One Consulting Ltd. (http://speech.meridian-one.co.uk/index.html)
- Portset Systems Ltd (http://www.portset.co.uk/)
- Serotek (http://www.serotek.com/)
- TACK-TILES Braille Systems (http://www.tack-tiles.com/)
- Techno-Vision Systems Ltd. (https://www.techno-vision.co.uk/)
- Thunder (http://www.screenreader.net/)
- ViewPlus Technologies (http://www.viewplus.com/)

Big corporations are thinking on this topic as well. For example:

- **Toyota** - is working on its project Blade—a wearable mobility device for the blind and vision impaired that helps fill in the blanks left by canes, dogs and existing GPS devices;

- **Microsoft** - is working on smart headphones for visually impaired people. The headset can create a sound map of the city using beacons. On this

project, called Cities Unlocked http://www.citiesunlocked.org.uk Microsoft works closely with Guidedogs and Future Cities Catapult;

- **Google** – has developed an app, *Lookout*, that offers users auditory clues to objects, text and people around them. The app is designed to be used with a device worn in a shirt pocket or hanging on a lanyard around a user's neck, with its camera pointing away from the body; https://www.google.com/accessibility/blog/post/announce-lookout.html

4. Related articles and books

- **Smart Assistance for Blind People using Raspberry Pi**, Dr. B. Muthusenthil, Joshuva J, Kishore S, Narendiran K, International Journal of Advance Research, Ideas and Innovations in Technology, ISSN: 2454-132X. [Online]: https://www.ijariit.com/manuscripts/v4i2/V4I2-1339.pdf

- **Blind Reader: An intelligent assistant for blind**, Shahed Anzarus Sabab, Md. Hamjajul Ashmafee, Electronic ISBN: 978-1-5090-4090-2. [Online]: https://ieeexplore.ieee.org/document/7860200

- **Developing Apps for Visually Impaired People: Lessons Learned from Practice**, Eduardo Ghidini ; Wagner D. L. Almeida ; Isabel H. Manssour ; Milene S. Silveira, Print ISSN: 1530-1605. [Online]: https://ieeexplore.ieee.org/document/7427893

- **Smart Assistance System for the Visually Impaired**, Prof. Priya U. Thakare, Kote Shubham, Pawale Ankit, Rajguru Ajinkya, Shelke Om, International Journal of Scientific and Research Publications, Volume 7, Issue 12, December 2017, ISSN 2250-3153. [Online]: http://www.ijsrp.org/research-paper-1217/ijsrp-p7254.pdf

- **Sensor-Based Assistive Devices for Visually-Impaired People: Current Status, Challenges, and Future Directions,** Wafa Elmannai, Khaled Elleithy. [Online]: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5375851/

- **Simple Smartphone-Based Guiding System for Visually Impaired People**, Bor-Shing Lin, Cheng-Che Lee, Pei-Ying Chiang. [Online]: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5492085/

- **Smart Assistance for Blind People with Audio Guidance by using Face Recognition Methods**, Sangram Madyapgol, Prof. Bharati Patil, International

Journal of Current Engineering and Scientific Research (IJCESR), ISSN (PRINT): 2393-8374.
[Online]: http://troindia.in/journal/ijcesr/vol3iss8/68-70.pdf

- **A multifunctional reading assistant for the visually impaired**, Céline Mancas-Thillou, Silvio Ferreira, Jonathan Demeyer, Christophe Minetti, Bernard Gosselin, Journal on Image and Video Processing archive, Volume 2007 Issue 3, November 2007, Article No. 5. [Online]: https://dl.acm.org/citation.cfm?id=1340513

- **Mobile assistive technologies for the visually impaired,** Lilit Hakobyan Jo Lumsden, Dympna O'Sullivan, Hannah Bartlett, Survey of Ophthalmology, Volume 58, Issue 6, November–December 2013, Pages 513-528. [Online]: https://www.sciencedirect.com/science/article/pii/S0039625712002512

5. Relevant links. Resources and tools available

- **Aira provides a remote personal assistant for blind people**, Peter Abrahams.
[Online]:https://www.bloorresearch.com/2017/07/aira-provides-a-remote-personal-assistant-for-blind-people/

- **Digital Voice Assistants Changing Lives of Blind People**. [Online]: https://www.medgadget.com/2018/04/digital-voice-assistants-changing-lives-of-blind-people.html

- **Sherpa, the first smart assistant for visually impaired people ! By Handisco**. [Online]: https://www.youtube.com/watch?v=zEffqHJpA1Y

- **Smart Speakers: How They Can Help People with Vision Loss**. [Online]: https://www.visionaware.org/blog/visionaware-blog/smart-speakers-how-they-can-help-people-with-vision-loss/12

- **Android Documentation**. [Online]: https://developers.google.com/android/

- **Google APIs for Android**. [Online]: https://developer.android.com/reference/

- **Cloud Text-to-Speech API**. [Online]: https://cloud.google.com/text-to-speech/docs/reference/rest/?hl=ro

- **Cloud Text-to-Speech API Basics**. [Online]: https://cloud.google.com/text-to-speech/docs/basics

- **Cloud Speech-to-Text**. [Online]: https://cloud.google.com/speech-to-text/

- **Cloud Translation API**. [Online]: https://cloud.google.com/translate/

- **RabbitMQ is the most widely deployed open source message broker**. [Online]: https://www.rabbitmq.com/

- **KUBERNETES ENGINE. Reliable, efficient, and secured way to run Kubernetes clusters**, [Online]: https://cloud.google.com/kubernetes-engine/

- **Nginx powers Load Balancers, Microservices and API Gateways**. [Online]: https://www.nginx.com/