Smart Glasses for eye impaired people using AI

Oprea Olivia Maria-Magdalena

1. Definitions

What is "computer vision"?

A computer vision system is an application of artificial intelligence (AI) that provides computers and systems with the ability to gather meaningful information from digital images, videos, and other visual inputs - and to act on that information or to make recommendations based on that information. AI enables computers to make predictions based on image training data.

As a result of computer vision, machines are trained to perform these functions, but they do so in a much shorter amount of time with cameras, data and algorithms rather than with retinas and optic nerves.

2. Introduction and project presentation

What is the problem and the importance of it?

A major problem of today is the spiralling number of people in need of eye care. Unless eye health services improve, the number of people who are blind could triple to 600 million by 2050.
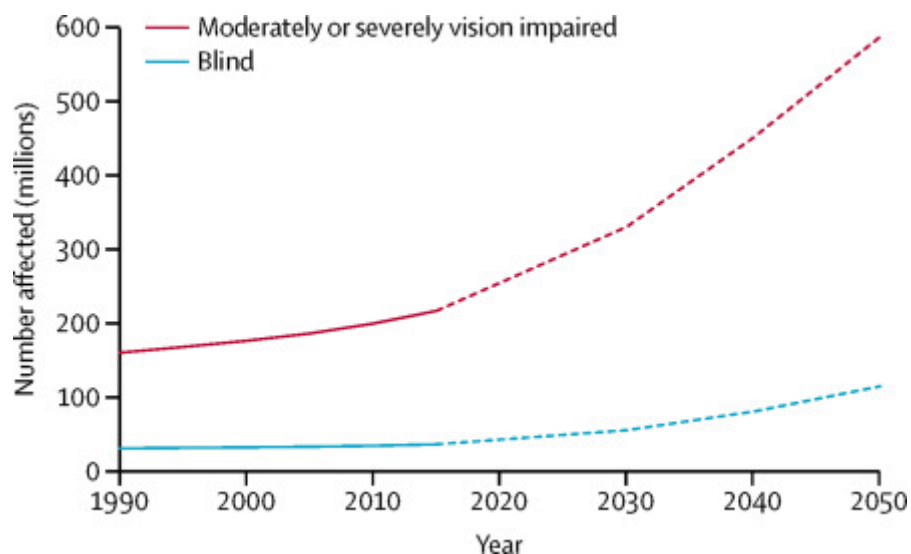
A recent cause that can increase the number of eye impaired people is because people must spend most of their time behind a screen, in order to keep their job. This is a result of the digitalization and automatization in all fields.

As a solution to this problem and eye related diseases in general (mild, moderate, severe and blindness), I designed a pair of smart glasses which use AI augmentation to guide people in need.

Implementation of smart glasses and potential problems

The smart glasses will be able to detect and recognize surrounding objects and people. In addition to people detection, it will perceive their emotions. Individuals that suffer from eye problems have difficulties in understanding others feelings and often experience powerlessness.

Smart glasses can contextualise a document, making it less confusing for the user to read a food menu, newspaper, road sign or a poster.

These glasses require two important components: software and hardware. For this specific application, the physical implementation is going to be the most difficult challenge. The glasses must be small, light, easy to handle and also with a natural design. Eye impaired people are more inclined to social judgement and unwanted attention from strangers. As a result, I believe that the smart glasses must resemble normal looking glasses. In addition, a big implementation challenge is scaling a powerful and complex structure that can be used for many hours with ease.

In order to create this project, the hardware part will contain: frame glasses with an integrated camera to capture images and transmit the information to the processor. This needs to successfully process the received information, make a prediction and send the result in an audio format through an earphone.

The software part will be implemented using an algorithm based on a neural network trained to detect objects, people and their emotions. For this, I would require a large database containing pretrained and preprocessed information. The images taken by the camera will be transmitted through a Bluetooth module to a smartphone application. After receiving the data, the photos will be processed (there could be applied multiple filters for noise and blurring reduction) and introduced into the machine learning algorithm. The predictions will be read by artificial human voice and played in the earphone.

Despite all these challenges, the project still needs to be affordable for all the people in need, in order to be successful.

Future directions

Looking into the future development of the technology and artificial intelligence, we will be able to transmit the predictions directly to the brain using stimulation. Other functionalities that can be introduced would be:

- Accurate text reading (translation of digital and handwritten texts from various sources)
- Language Capabilities (available in all languages, not only the most spoken ones)
- Offline Usage (remove the need to stay connected to internet or a smartphone)

3. Bibliography

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