CamVisors: Cost-Effective Real-Time Object Detection Using Contrastive Captioners for the Blind

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Smart technology can be used not only to expand human capabilities but also to compensate for lost human functions. Making these technological advances accessible for everyone is a noble course but far from reality. The World Health Organization estimated in 2021 that over 80% of the world's 300 million visually impaired and 40 million blind individuals live in developing countries within sub-Saharan Africa. The current technology is too expensive and inaccessible for most visually impaired, especially in less-developed countries. Offering low-cost options remain a significant technical challenge. This project aims to develop a cost-effective solution by building a pair of artificial eyes for the visually impaired, creating a walking path to avoid detected obstacles and recognize objects and text. Using TensorFlow to detect objects and obstacles, OpenCV to obtain live video input, Kivy to create an application that could be exported to all operating systems, and Python to tie everything together, a program was created that connected a wearable camera system to the majority types of smartphones and microcontrollers. Preliminary testing of this program in public environments, such as in school, on a walk in the park, and navigating streets supports the approach. This project's results supported its hypothesis by creating software that can run on technology at 5% of the cost of existing technologies while being compatible with white canes. This technology has the potential to drastically improve the lives of millions of visually impaired or blind people in both developed and developing countries.

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