myEyeAssistant: Using Computer Vision to Create a Smart Camera Based Navigation System

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In 2010, the World Health Organization estimated that over 285 million people are considered to be visually impaired. Current techniques that attempt to help these people navigate require either highly advanced technology or are too bulky; general navigation technologies such as GPS are just unfeasible in this situation. Using Objective-C/C++ with the OpenCV framework, an application, myEyeAssistant, was developed to enable portable electronic devices to detect and verbally warn users of approaching objects. A unique Area Detection Method with a logistics curve model was created to track the distance of approaching objects. To name the objects, a cloud database of pre-computed images, populated through crowd sourcing, was created. Using another application, Database Creator, one can create a database of local surroundings and upload the images based on GPS location. myEyeAssistant can then download that specific database for that location, allowing for a relatively small, efficient, and location specific database, which increases the accuracy and speed of detection and reduces memory used. To name objects a combination of Histogram matching and Speed Up Robust Features (SURF) with Fast Approximate Nearest Neighbor Search (FLANN) was used, in which the Histogram matching is used to quickly filter database objects and the SURF with FLANN is used to match and name objects. My experiments showed that the Database Creator was able to effectively upload images to a location-specific public database, and myEyeAssistant was able to correctly download the correct databases, which lead to fairly accurate object detection and analysis. This new technique is very applicable and can be used on cars as a warning and detection system and in medicine to analyze anomalies on the body.

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