Deep Learning Real-Time Object Detection Through Convolutional Neural Networks Using OpenCV and Optical Flow Algorithms for the Visually-Impaired

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The objective of our BerriVest device is to accurately do object detection by alerting the user of frontal obstacles and uneven surfaces and image processing, by specifically naming the obstacle(s) in an arbitrary environment, through the use of ultrasonic range sensors, a NoIR camera, and artificial intelligence. We programmed on Raspberry Pi 2 using Python 3 and OpenCV libraries. With one of the pre-trained models we used, the ImageNet model, we had each of the 15 test subjects conduct three trials for each of the nine obstacle detections for a bicycle, chair, car, person, dining table, sofa, TV monitor, stop sign, and fire hydrant. Then, after adding the GoogleNet model in parallel with the ImageNet model, we had our test subjects walk around arbitrary environments, such as their living room, kitchen, garage, and outside in the neighborhood. Results depicted that for 11 out of the 15 subjects, there was a high percentage of the actual object accuracy, which proves the consistency of the BerriVest in detecting various obstacles, now that it has been trained with a much larger database. With the GoogleNet model, the BerriVest can now detect objects under thousands of more detailed classifications due to its large database. We concluded that implementing supervised learning on Caffe yielded accurate and faster image processing -- reducing the lag time -- and object detection that enhanced our final product.