Computer Science & ComputerEngineering

Vigilant

Detecting Falls Using Computer Vision

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Introduction

Many people with disabilities or health conditions (such as Grand Mal seizures) are at some risk to collapse suddenly. Additionally, often times slip and fall injuries can go unnoticed for a long period of time, as such, our goal is to use computer vision to recognize slip and fall. Potentially to reduce response times in key situations as well as reducing liability in slip and fall cases.

Purpose

In public spaces, whether a public park, grocery store, or mall, oftentimes an injury (such as seizure or heart attack) can go unnoticed for key minutes that are critical in making sure that treatment is delivered as soon as possible. Additionally, oftentimes these spaces are already monitored by security cameras that computer vision could use to recognize a potential injury.

Additionally often times in slip and fall cases where liability plays a role getting footage of a slip and fall can be complicated due to the amount of footage generated by an entity (i.e. Corporations or CCTV) and footage relevant to such a case may be deleted long before it is asked for, or deemed necessary in a relevant court case. If the slip and fall could be recognized, footage could be put into a longer term storage in the event it’s deemed relevant to a case.

Methods

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The backbone of the algorithm is the open source C++ computer vision library called OpenCV, which is an industry standard in computer vision. Our code is almost entirely based on this library and uses it to detect people in the video feed and to draw a bounding box around their shape. This is critical to the remainder of the program.
As far as theory goes, the project is built on object detection and classification algorithms centering on edge detection and shape recognition. In essence the library, OpenCV, detect large values in the hue gradient of each image in the video and uses those to estimate edges between objects, and then feeds the shape of those edge outlines into a trained neural network to identify human shapes. These estimated human blobs are then returned to our program for analysis of whether that shape indicates a fall or normal behavior.