Department of Electrical Engineering

Presents

**CamCare**



*An image processing design to help the elderly feel safe at home.*

**Senior Design Final Report**

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**Chapter 3: Testing and Implementation**

**Preamble**

Our capstone project consists of designing a system that detects when an elderly person falls. The major problem when accidents amongst elderly happen is that help doesn’t reach them fast enough. Our project uses image processing to detect when a fall has happened and then automatically send a SMS to a relative or guardian of the elderly.

**Chapter 1: Image Processing**

*Introduction*

There are many ways in which people fall so in order to make our software as accurate as possible we had to devise a system that will work for all occasions. One possible method would have been to stage as many falls as possible gather the data and have them stored in memory. This however didn’t prove to be very productive as there are many different methods in which a person can fall. Also it isn’t very efficient, as the motion would have to be compared with all the data stored in memory, which wastes time and could slow down the system considerably. Another issue that we had to consider was differentiating a person falling from someone voluntarily bending. These issues create choices for as to what constitutes a fall and what doesn’t so creating a reasonable threshold is vital. The major problem for us is not to produce false positives but false negatives. Essentially it is better to get a false alarm rather than no alarm when a fall does occur; for this reason we opted for a more universal approach and decided to analyze speed and direction instead.

*Platform*

In order to make the image processing as versatile as possible we had to choose a platform that is well developed. We decided to go with Open Computer Vision (OpenCV). OpenCV was developed at first by Intel but later was released to the public as an open source project. We chose OpenCV because it’s open source, very well documented, supported by all 3 major OSs (Mac OS X, Windows, Linux), and can be implemented using both C/C++ and Python.

*Working Principles*

As we mentioned before we decided to measure speed and direction in order to achieve our goal of detecting an accident from a voluntary motion. Since we know the frames per second (FPS) we can calculate the relative speed of a moving object by calculating the distance of the object traveled in the image and dividing the result by the FPS. Also we can analyze the motion of an object and tell the angle of direction relative to the horizontal. After finding the speed and direction of motion we created a threshold level that tells us what is a fall what isn’t. This, of course, can be changed easily to allow for a precise calibration of the individual that is being analyzed.

In order to analyze the image we got rid of the background, so that we can view only the moving objects. However, since people could have pets and analyzing their motion as well could provide errors, we implemented a people detection algorithm that makes it possible to analyze only the motion of humans.

*Coding*

**Chapter 2: SMS Alerts**

*Introduction*

After a fall has been detected, the next step is to alert the caregiver. This will be done by sending an automatic SMS once the fall has been properly detected. The caregiver will then decide what the proper action to take is. In order to achieve this, the program first needs to make sure that a fall has occurred. When a positive fall has been detected the program generates an XML file. This XML file contains the information whether a fall occurred or not.

*Platform*

Google-voice among many other things allows us to send SMS. We first had to create a Google-voice account for this to work. The program has to check constantly if there is a file in a previously specified location on the computer. As described before, the file will be an XML. The loop will constantly be checking until it finds the file. Then it proceeds to parse the file with the information that it contains. Next, after reading and printing the contents of the file, the program will connect to Google Voice which provides us the origin number at the moment of creating the account.

*Working Principles*

*Coding*