Direction detection through the use of optical flow

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Abstract

This report shows the modifications made to the scripts lk _track.py and opt _flow.py in order to know the address to which an object moves. Additionally, some results obtained are shown.

1. Introduction

Optical flow is the analysis of patterns in objects, surfaces or edges that they move in a visual scene caused by relative movement, it can be of the observer or the scene. The concept of optical flow was proposed by the American psychologist James J. Gibson in the 1940s to describe the visual stimulus provided to animals that move around the world, allowing them to analyze the action of the animal within the environment. In this way, the optical flow is also applied in image processing, navigation control, motion detection, object segmentation, contact time information, luminance, motion compensated coding and stereo disparity measurement. [1]

2. Methodology

For this practice, was modify the scripts lk_track.py and opt_flow.py available on `https://github.com/affromero/IBIO4680/tree/master/13-OpticalFlow/scripts` for two different applications. The first application is to detect if the objects move to the right or left, in this case the lk _track.py script was modified, by means of this code points of interest of the objects present in the video are picked, with these points analyzed. the positions in x since they made lateral movements, what was done was to take the difference between points of the previous frame and a new one, all were added and if this was greater than a threshold, the object moved to the left, if it was smaller At another threshold it moved to the right and if it was in the middle of these the object did not move. The threshold was defined experimentally by different tests.

Figure 1: Warning when the object moves to the right

Figure 2: Warning when the object moves to the left

The second application was to determine if a person moved in favor of the hands of the clock or against, for this the code opt _flow.py was modified, by means of this code the flow was determined in each one of the axes (x, y), through the application of the rotational gradient, a threshold was determined where the change of direction was presented, being less than said threshold the person moved in favor of the hands of the clock, if it was greater had the opposite movement.

Figure 3: Warning when the object doesn't move

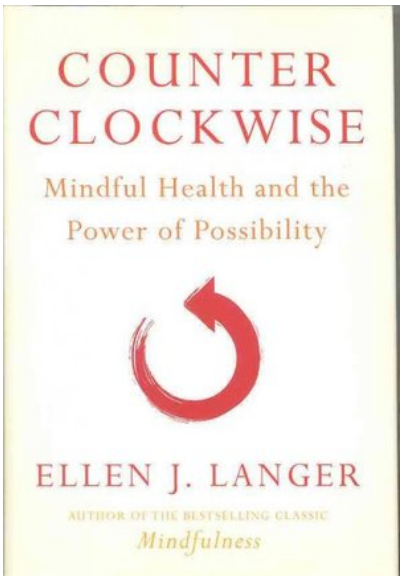

Figure 4: Warning when person moves counterclockwise

Figure 5: Warning when person moves counterclockwise

3. Results

The results obtained can be seen in the following YouTube link `https://www.youtube.com/watch?v=m3gIdNFnZs0&feature=youtu.be`

4. Discussion

It was achieved the objective that was to determine changes of direction in an object or the direction of movement of the person, the high advantage of these algorithms is its operation in real time. In the case of determining the directions of movement, it can be seen that the changes are not efficient given that approximate thresholds were taken and those that worked best. Additionally, in the case of determining the direction of rotation of a person, a greater deficiency is found since it depended on the speed of movement of the subject.

References

[1] A. Burton and J. Radford. *Thinking in perspective*. Methuen, 1978.