

Intruder Detection

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a. Abstract

The assignment was to build an intruder detection system. The high quality frames on which the intruder had been detected were provided at "https://www.cs.rit.edu/usr/local/pub/tbk/SEQ_201_STILL_FRAMES_for_INTRUDER_IN_BACK_YARD/". The intruder is to be segmented from the background using the watershed algorithm. The goal of the assignment was to learn how the watershed algorithm works.

b. Overview

Takes path to image directory as input after running the program. The program builds a background model to detect changes in the images and find the foreground objects. The intruder is a foreground object. After finding the intruder's location, the watershed algorithm is applied to segment the intruder and the background.

i.Approach Used

I used the MOG2 background subtractor to get the foreground object and segmented the intruder using the watershed algorithm.

I have kept the history parameter as only 20 because of the brightness changes going from light to dark as the day passes in the frames. Also, the segmentation for frame x is occurring simultaneously, as frame x+10 is being used to build the background model further. I have used a similar process as in my previous assignment to detect foreground object(intruder). Using the foreground mask obtained by applying MOG2 as markers, I have applied the watershed algorithm to segment the intruder from the background.

ii.Experiment

First I tried to use the watershed program provided with the assignment specification, but it needed user input to segment the intruder.

Then I tried to calculate the foreground using frame differences, but there was too much difference, caused by brightness changes and shadows, which made it difficult to segment only the intruder.

Finally, I used the MOG2 background subtractor to get the foreground object and segmented the intruder using the watershed algorithm.

iii.Result



iv. Analysis

The Watershed algorithm did not segment the intruder completely for some frames, especially for the ones where the intruder overlaps with the tree or stones.

v. Discussion

It was difficult to find the proper steps to use the foreground mask as marker for the watershed algorithm.

Also, there are some images that have noise due to fogging and snowfall, which lead to incorrect intruder detection.

d. Conclusions

An intruder detection system can be built by using MOG2 background subtractor to get the foreground object and segmented the intruder using the watershed algorithm.

e. Credits:

I tried to follow the following tutorial on the following website to apply watershed algorithm: "https://opencv-python-tutorials.readthedocs.io/en/latest/py_tutorials/py_imgproc/py_watershed/py_watershed.html"

I followed to following post to remove too small or too large masks from the markers: "<https://stackoverflow.com/questions/42798659/how-to-remove-small-connected-objects-using-opencv>"