Alma Mater Studiorum University of Bologna

Artificial Intelligence - Computer vision

Intrusion detection project

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Introduction

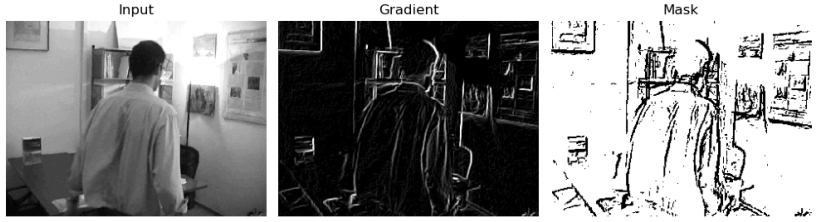
Problem

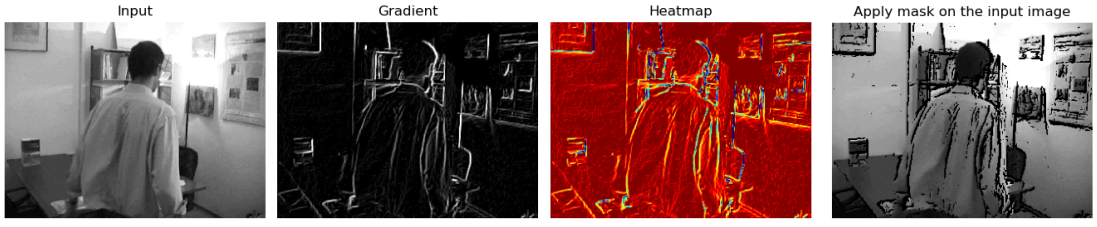
Build an intrusion detection system using a static background as a reference

Introduction

What is a pipeline?

A sequence of transformations and operations






```
pipeline.add_operation("Input",
    lambda frame: frame)
pipeline.add_operation("Gradient",
    lambda frame: get_grad(frame))
pipeline.add_operation("Heatmap",
    lambda frame: cv2.
    applyColorMap(frame, cv2.
    COLORMAP_JET))
```

```
pipeline.add_operation("Input",
    lambda frame: frame)
pipeline.add_operation("Gradient",
    lambda frame: get_grad(frame))
pipeline.add_operation("Mask",
    lambda frame: frame < 30)
def showonlymask(mask):
    import numpy as np
    input = pipeline.input.copy()
    out = np.empty_like(input)
    out[mask] = input[mask]
    return out

pipeline.add_operation("Apply␣mask␣
    on␣the␣input␣image",
    showonlymask)
```

Preprocessing

Gaussian blur

INPUT_NO_BLUR

INPUT_BLUR

DIFF_NO_BLUR

DIFF_BLUR

OUTPUT_NO_BLUR

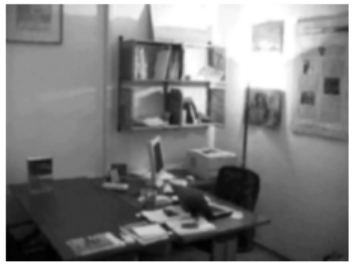
OUTPUT_BLUR

Preprocessing

Median filter

Input

Background



Current frame

Difference

MEDIAN FILTER 3

OPENING 3

MEDIAN FILTER 9

OPENING 9

Output

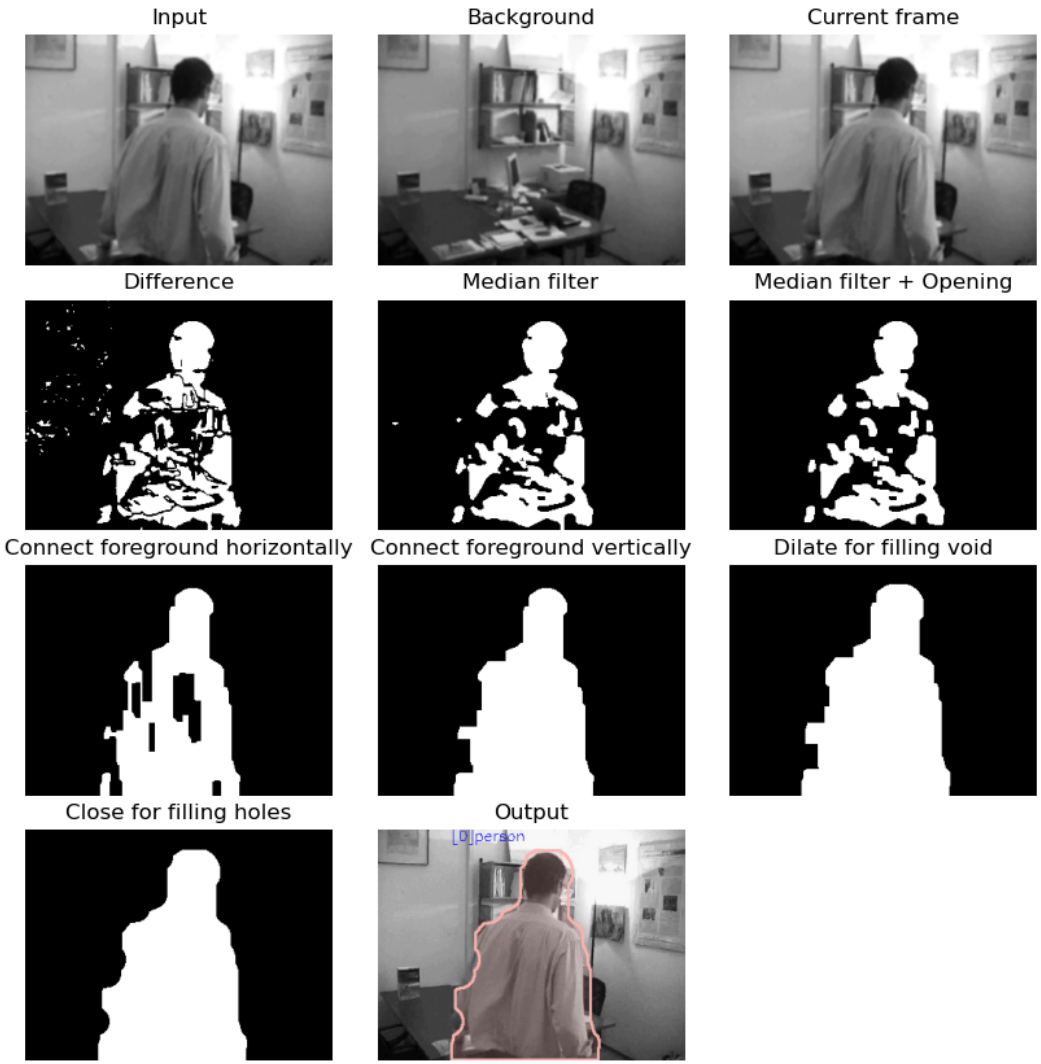
Detector

Background subtractor

- Use a **static** background
- Use the interpolation of the **first** 100 frames
- Use an **adaptive** background that computes the weighted sum of the current frame and the previous one

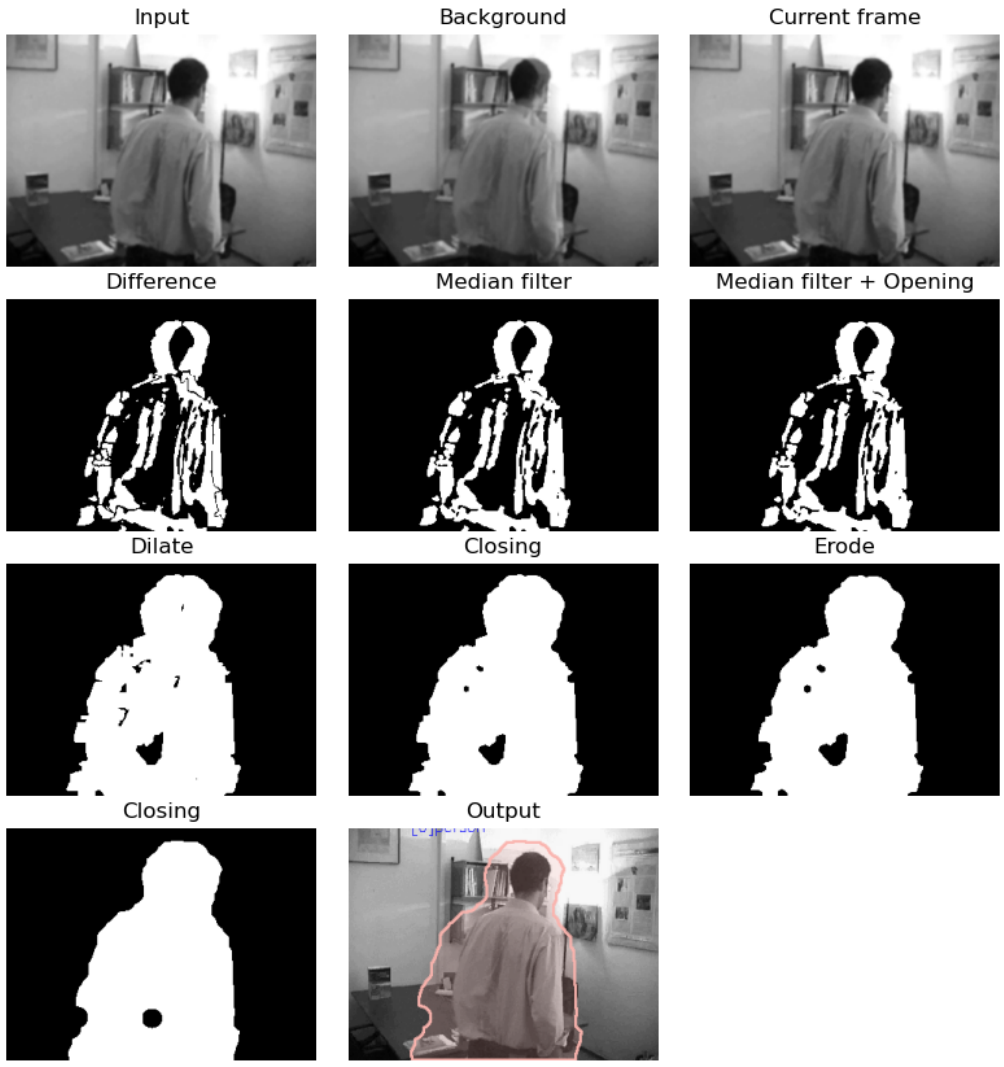
Detector

Pipeline - static, first



Detector

Pipeline - adaptive



Detector

Filtering and handling false positive

index	area	perimeter	ratio	circularity	rectangularity	mean	std	label
0	1243.0	146.76	0.80	0.93	1545.35	-	0.203	other
1	855.0	113.45	1.06	1.06	803.18	0.013	0.020	other false positive
2	15028.5	587.80	0.47	0.93	31897.22	-	0.177	person

Conclusion

Output of the frame 481

static

first

adaptive