Background Subtraction using Local SVD Binary Pattern

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***Abstract*—Background subtraction is a technique widely used to detect moving objects from static cameras. In the field of video surveillance, it is essential since it allows rapid discrimination when an event has arisen and studies of mobility of objects on the scene. In the last few years, many methods with different strengths and requirements have been proposed. For instance, background subtraction using local SVD binary pattern was a proposed method combining different techniques.**

In this paper we study, replicate and implement the paper before mentioned.

***Keywords*-camera calibration,**

I. Introduction

Background subtraction is a fundamental stage of a large number of applications in which it is necessary to detect movement, identify and / or follow objects in sequences of dynamic images. Among these applications, video surveillance can be named, such as the detection and capture of movement flow, pose estimation, man-computer interaction or video coding based on content, among others. The process of subtraction is also called foreground extraction or foreground extraction, and consists of a series of methods that allow distinguishing between background or static zones (background), and dynamic zones that correspond to the foreground.

In order to extract the background, a representation of the scene is maintained through the digital modeling of the background. This representation must contain the necessary information for each moment to determine, for each new entry image, which areas of the same correspond effectively with the background. Since the background is not invariant in time, it is necessary to perform a dynamic modeling of the background to adapt it to the variations that may occur in it. The first time, any significant change in a region of the image with respect to the background model will be considered foreground. In general, each element of the model is updated for each certain time interval, as long as it has lost significance.

II. Prerequisites to run available source code

The source code was implemented on ***python***, therefore we need the python compiler installed on our computer. Initially, we installed the the prerequisites on Ubuntu 16.04, but we can not run the code because there was a problem of compatibility between the *numpy* and *maxflow* libraries. Then we install Anaconda2 version 4.4.0 on windows 7 and also install *maxflow* library manually. Finally we run the source code with the following script:

```
python local_svd_2016
-g  highway\groundtruth
-f  highway\input
-k  1700
```

Where *-g* is the Directory with ground-truth frames, *-f* is the directory with input frames and *-k* calculates answer for K-th frame and output.

III. Match between code and paper

The algorithm proposed by the paper can be summarized by the algorithm 1 in the page 90 of the paper [1]. Then in the source code we find the function to extract the LSBP(Local SVD Binary Pattern) using the function SVD (Singular value decomposition) and the conditions to compute the background. Figure III shows the relationship between the algorithm of the paper with the parts of the source code.

IV. Results

We use the CDnet 2012 dataset[1] to test the source code. From them we take the five datasets that are showed on the paper (*copyMachine*, *highway*, *overpass*, *PETS2006* and *sofa*). Then the results of our experiments is showed on Figure 2.

[1]http://jacarini.dinf.usherbrooke.ca/dataset2012/

Fig. 1. Match between source code and paper algorithm.

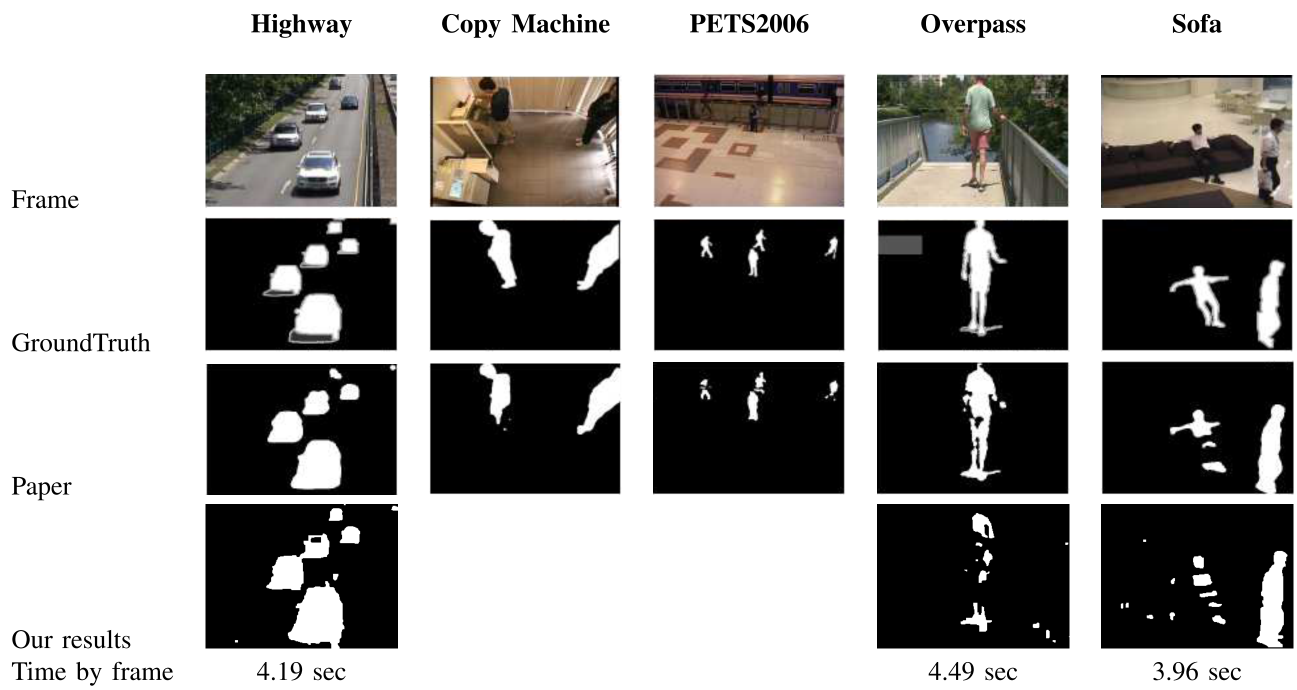

Fig. 2. Comparison between original frames, GroundTruth, results of paper and our results.

We can not compute the results of the *copyMachine* and *PETS2006* datasets because our RAM was insufficient (16 Gb). Additionally the resolution of each frame from the different datasets is different; *copyMachine* and *PETS2006* are of $720x480$ and the others are of $320x240$, therefore the compute task in the two firsts are more heavy because compute the *LSBP* is for each pixel.

REFERENCES

[1] L. Guo, D. Xu, and Z. Qiang. Background subtraction using local svd binary pattern. In *2016 IEEE Conference on Computer Vision and Pattern Recognition Workshops (CVPRW)*, pages 1159–1167, June 2016.