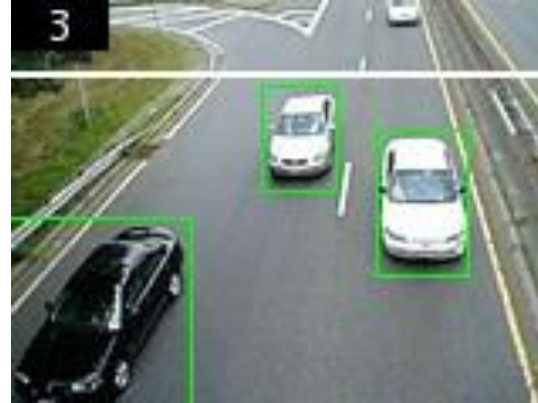


VIDEO PROCESSING

(Course # 0512.4263)



Laboratory Manual

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Lab 1 - Introduction

Goal: to provide an introduction to video processing using Matlab's Image Processing Toolbox and Computer Vision System Toolbox. In this lab we'll learn to read and write video files and to segment video frames using edge detection, morphological operators and connected-component analysis.

Note: Don't change the code of the existing Matlab demo programs. Copy the Matlab demo program to your directory, save it with a different name and work with the "local" copied file.

1. Detecting a Cell Using Image Segmentation

Use the command **doc** in Matlab command window. Then select:

Image Processing Toolbox→**Examples**→**Image Segmentation**→**Detecting a Cell Using Image Segmentation**

Then press the button **Open this Example** (in the top-right corner). Then copy the contents of the file **ipexcell.m** to the file in your local directory.

1. Describe the algorithm used for cell detection.
2. What is edge detection?
3. Explain the command `[~, threshold] = edge(I, 'sobel');`
What is the meaning of "~"?
4. Explain the use of the **FudgeFactor**.
5. What is morphological processing?
6. Explain the command `BWsdil = imdilate(BWs, [se90 se0]);`
What is the type of "[se90 se0]" and how the function **imdilate** uses "[se90 se0]"?

2. Cell counting

Use the command **doc** in Matlab command window. Then select:

Computer Vision System Toolbox→**Examples**

Then find the section **Analysis** and choose **Cell Counting**.

Then press the button **Open this Example** (in the top-right corner). Then copy the contents of the file **videocellcounting.m** to the file in your local directory.

1. Describe the algorithm used for cell counting.
2. Explain the use of the command **step**. (Pay attention to the fact that this function is used several times with different arguments.)
3. Explain the command **isDone**.
4. Explain the command **release**.
5. In the command

```
hdilate1 = vision.MorphologicalDilate('NeighborhoodSource', 'Property','Neighborhood',  
strel('square',7));
```

what is the use of the arguments “'NeighborhoodSource', 'Property'”? Can we discard these arguments from the command `vision.MorphologicalDilate`?

6. In contrast to the `hinserttext1=...`, in `hinserttext2=...` the argument 'FontSize' is not used. What is the value of 'FontSize' in this case?
7. What is *connected-component analysis*?
8. What command from the file `videocellcounting.m` uses connected-component analysis?
9. Explain the use of the commands:

```
y1 = 2*image - step(hdilate1, image);
```

```
y1(y1<0) = 0;
```

```
y1(y1>1) = 1;
```

```
y2 = step(hdilate2, y1) - y1;
```

Note: If it's possible, don't write video files in the lab, just display them (in order to save memory). At the end of work please delete large files.

Note: don't forget to use the command `release` in your code.

3. Detecting Cars in a Video of Traffic

Use the command `doc` in Matlab command window. Then select:

Image Processing Toolbox→**Examples**→**Image Segmentation**→**Detecting Cars in a Video of Traffic**

Then press the button **Open this Example** (in the top-right corner). Then copy the contents of the file `ipextraffic.m` to the file in your local directory.

1. Describe the algorithm used for cars detecting.
2. Why dark cars are not tracked?
3. Explain the command `imextendedmax`.
4. Explain the command `imopen`.
5. Explain the purpose of the command `fliplr` in the command `c = floor(fliplr(c));`
6. How can we make the following code

```
taggedCars(row,col,1,k) = 255;
```

```
taggedCars(row,col,2,k) = 0;
```

```
taggedCars(row,col,3,k) = 0;
```

more compact?