

# Organization Exercise Classes

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- Part 1 (Lecture Marc Pollefeys)
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- Part 2 (Lecture Markus Gross)
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# Part 1 Schedule

| TA Classes          | Exercise                           | Assistant      |
|---------------------|------------------------------------|----------------|
| Sept. 23 / Sept. 25 | Background Subtraction             | Christian Häne |
| Sept. 30 / Oct. 2   | Edge Detection                     | Christian Häne |
| Oct. 7 / Oct. 9     | Fourier Transform                  | Yağiz Aksoy    |
| Oct. 14 / Oct. 16   | PCA                                | Yağiz Aksoy    |
| Oct. 21 / Oct. 23   | Optical Flow                       | Andrea Cohen   |
| Oct. 28 / Oct. 30   | None (discussion of ex. Opt. Flow) | Andrea Cohen   |

# Exercise 1 – Background Subtraction



# Bluescreen / Greenscreen



<http://www.iwatchstuff.com/images/2006/01/superman-greenscreen.jpg>

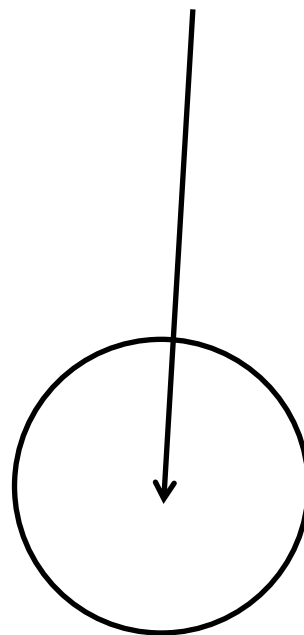


[http://www.theavclub.tv/behind\\_the\\_scenes/greenscreen/](http://www.theavclub.tv/behind_the_scenes/greenscreen/)

# Bluescreen

- Represent background with a single color value
  - Classification based on absolute distances

$$|[r, g, b] - [r_o, g_o, b_o]| < t.$$



# Bluescreen

- Represent background with a set of color values
  - Classify new RGB values based on Mahalanobis distance

$$(\mathbf{x} - \mu)^T \Sigma^{-1} (\mathbf{x} - \mu) > t$$

- Covariance Matrix

$$\Sigma_{ij} = E [(X_i - \mu_i)(X_j - \mu_j)]$$

- Estimation from n data points

$$\frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})(x_i - \bar{x})^T$$



# Bluescreen



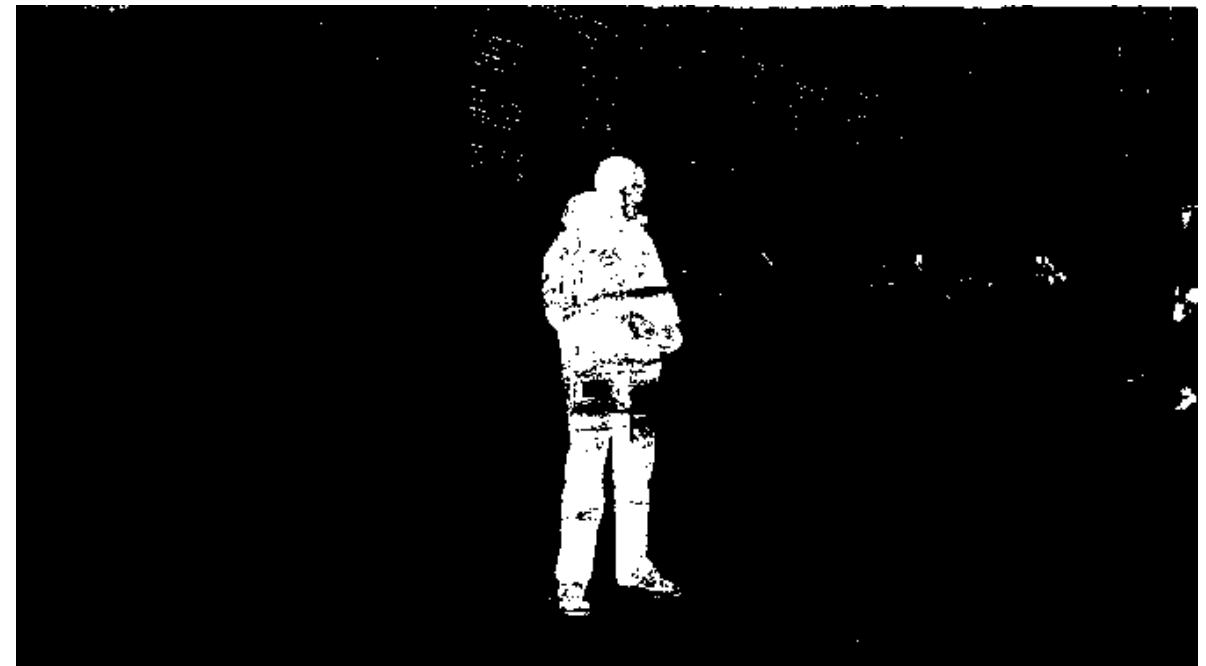
# Pixelwise Color Model

- Mean and covariance for each pixel
- One threshold for all pixels (Mahalanobis distance)





# Pixelwise Color Model



# Matlab

- Many loops and if statements can be avoided

- $A .* B$                       `reshape(A,3,3)`                      `sum(A,3)`
- `Mask = A > t`                      `A(find(A==2)) = 3`
- `A(:,)`,                      `A(:,1)`

- Accessing images from a movie

- `mov = aviread('bluescreen.avi');`
- `im = mov(frameNo).cdata`

- Exercise sheet

- Matlab help