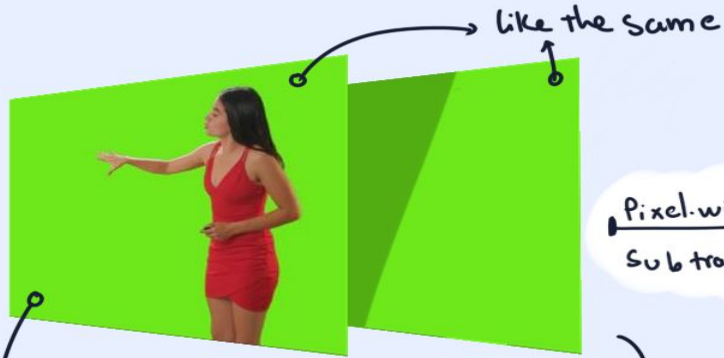


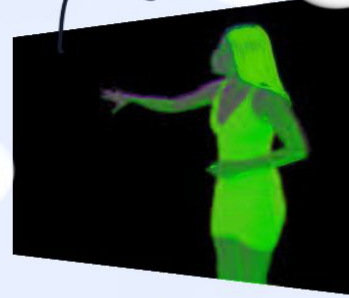
BACKGROUND SUBTRACTION & MEAN TRANSFER

BACKGROUND SUBTRACTION

Background Subtraction



Pixel-wise
Subtraction



Subtracted Img
(color)

Convert
Grayscale



Subtracted Img
(Grayscale)

Creating Mask

foreground Background

$$\text{pixel}_{ij} = \begin{bmatrix} R \\ G \\ B \end{bmatrix} - \begin{bmatrix} R \\ G \\ B \end{bmatrix} \text{pixel}_{ij}$$

$$\text{pixel}_{ij} = \begin{bmatrix} |R-R| \\ |G-G| \\ |B-B| \end{bmatrix}$$

$$\text{pixel}_{ij} = 0.3R + 0.59G + 0.11B$$

Remember!

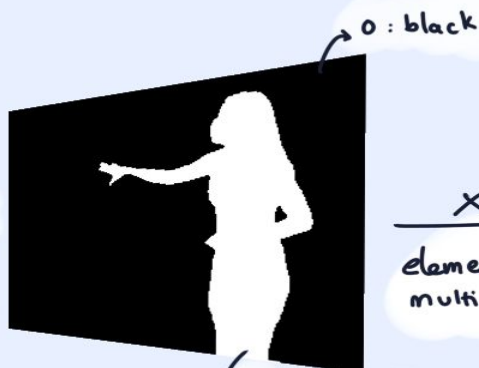
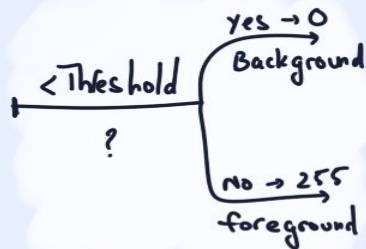
0 → black
255 → white

0 $\xrightleftharpoons[\text{Darker}]{\text{Brighter}}$ 255

Back ground Subtraction (cont.)



Subtracted Img
Grayscale, 1 channel



Mask

0 : black
255 : white

\times
element wise
multiplication



New Image, with Fake BG



$$0 \times \begin{bmatrix} R \\ G \\ B \end{bmatrix} \rightarrow \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

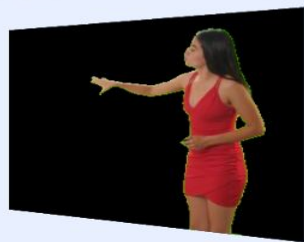
$$\frac{255}{255} \times \begin{bmatrix} R \\ G \\ B \end{bmatrix} \rightarrow \begin{bmatrix} R \\ G \\ B \end{bmatrix}$$



Segmented Img

Combining Images.

1) Comparing Pix 2 Pix

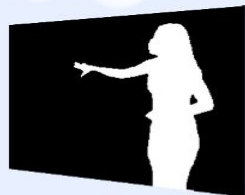


$\text{mask} == 0 \rightarrow \text{new_img} = \text{fake bg}$
 ij \rightarrow ijk ijk
 $\text{mask} != 0 \rightarrow \text{new_img} = \text{segmented}$
 ij \rightarrow ijk ijk

New img



2) Elementwise Addition + Multiplication.



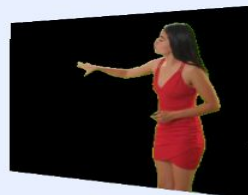
\times
 Elementwise
 Multiplication



\Rightarrow



+

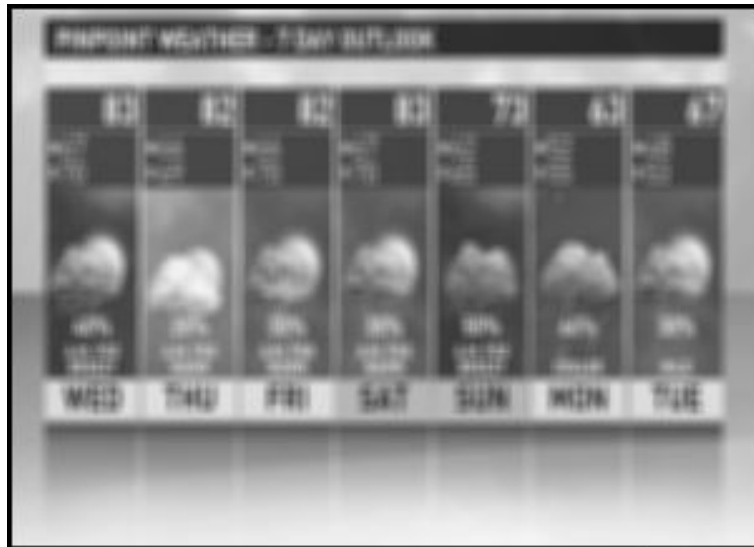


Elementwise Addition

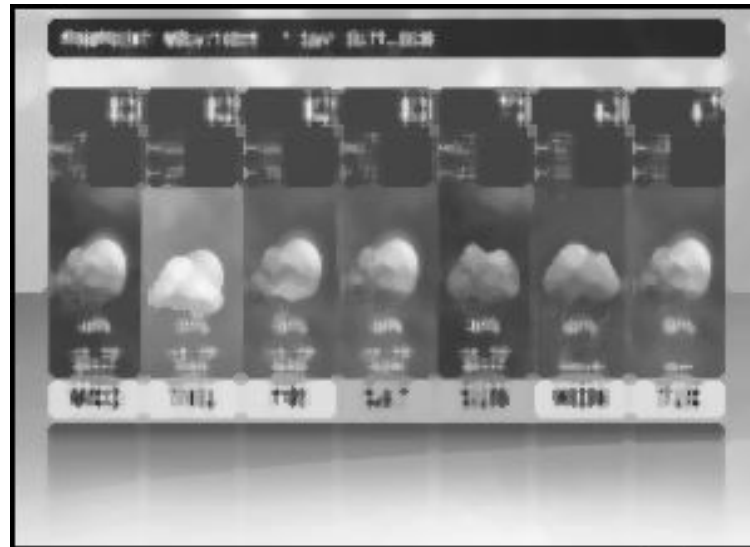
mask
 $\xrightarrow{\text{Mask Inversion}}$
 $255 - \text{mask}$
 ij

mask'
 $\frac{\text{mask}'}{255} \times \text{fake background}$

MEAN AND MEDIAN TRANSFER



Mean Trans



Median Trans

Mean transfer



input Img

$$\begin{bmatrix} R \\ G \\ B \end{bmatrix}$$

=

pixel_{ij}

Convert
to Gray scale



gray scale Img

$$\text{pixel}_{ij} = 0.3R + 0.59G + 0.11B$$

w x w window's
mean calculating



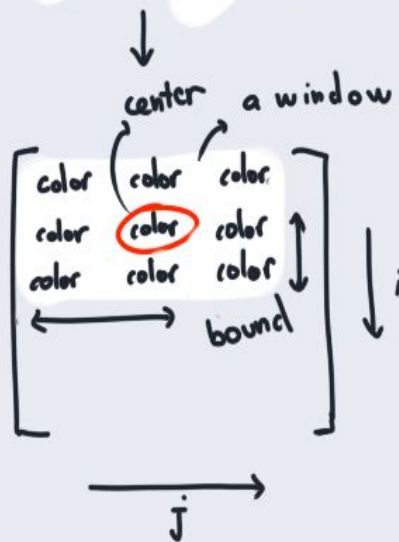
output Img

$$\text{pixel}_{ij} = \text{mean}(\text{window}_{ij})$$

Mean Transfer (cont.)



Calculating Mean
for each window



let $i := \text{bound}$; let $j := \text{bound} \rightarrow j := W - \text{bound}$

$i := H - \text{bound}$

$$\begin{matrix} W \\ m \\ n \end{matrix} = \begin{matrix} I \\ i+m \\ j+n \end{matrix}$$



$-\text{bound}$



$$\begin{matrix} W \\ m \\ n \end{matrix} = \begin{matrix} I \\ i+m-\text{bound} \\ j+n-\text{bound} \end{matrix}$$

END OF SLIDE!