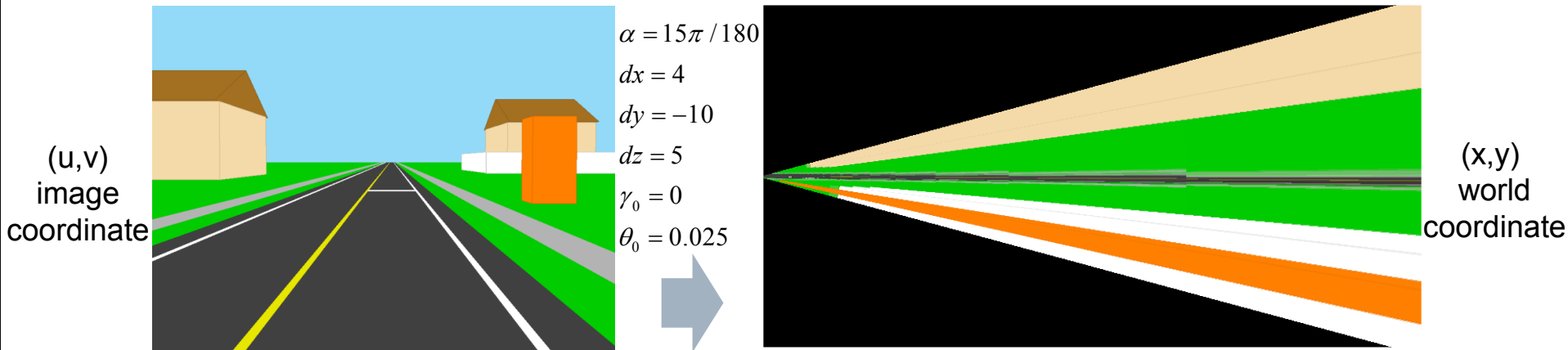


# HW3

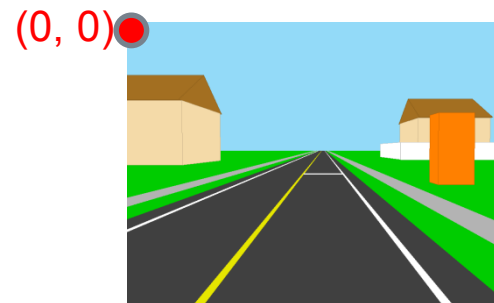
- Transfer the road image to bird's eye view by inverse perspective mapping



- Refer to "BertozziAndBroggi\_IPM.pdf"

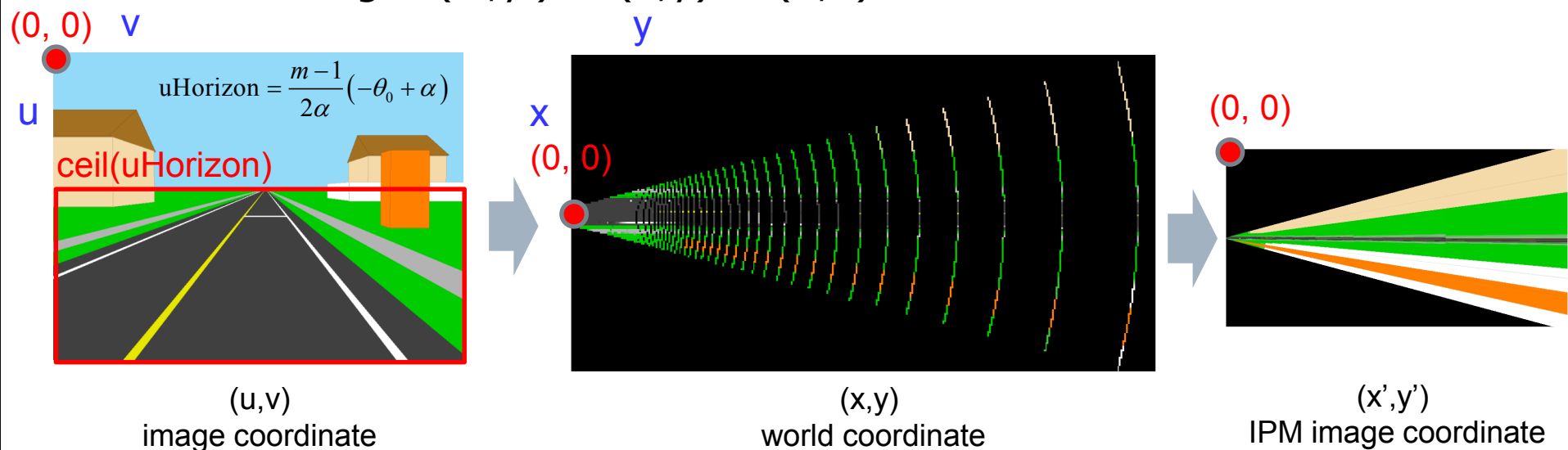
- Hint

- Image origin at left-top



# HW3

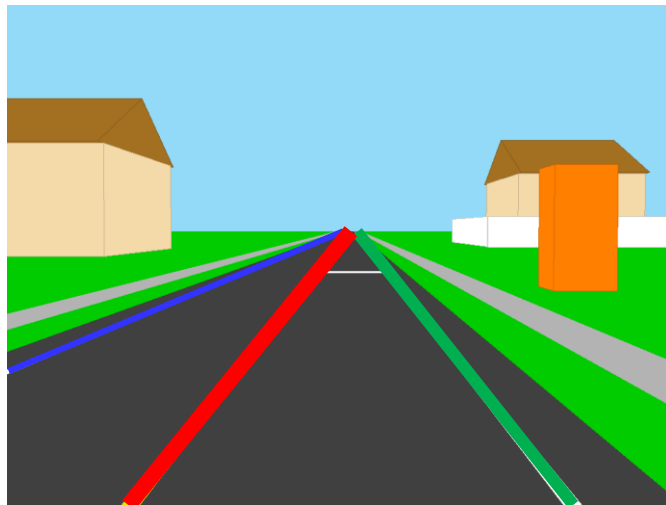
- First, transfer the pixels  $(u,v)$  in  $[uHorizon:Height-1, 0:Width-1]$  by forward warping (Image to World) to get the range  $[x_{min}:x_{max}, y_{min}:y_{max}]$  of IPM image  $(x,y)$ 
  - The values of  $x$  and  $y$  may be negative
- If the range of IPM image  $(x,y)$  is too large, you can resize it to a smaller one  $(x',y')$  with size  $(x_{max}-x_{min})/r1 * (y_{max}-y_{min})/r2$ 
  - E.g.  $r1=r2=100$ :  $x'=(x-x_{min})/100$ ,  $y'=(y-y_{min})/100$
- Then, use inverse warping (World to Image) to get the IPM image:  $(x',y') \Rightarrow (x,y) \Rightarrow (u,v)$



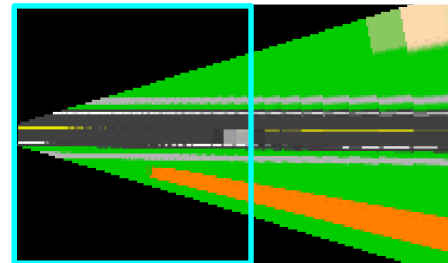
# HW3

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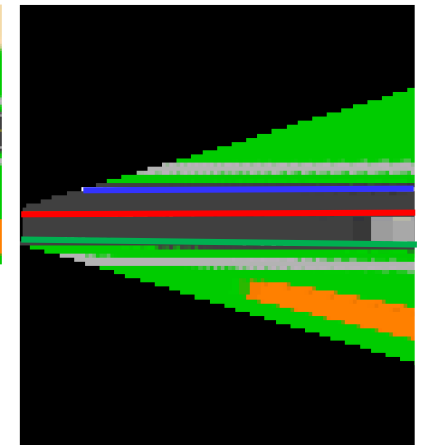
- Use edge detection to find the lanes
  - Detect the edge points of the lanes in the road image
    - Label the three lanes as BLUE, RED and GREEN, respectively
    - Crop the IPM image between the camera and white line on the road
    - Transfer the three lanes to IPM image, and label them in the IPM image



road image



Crop



IPM image

# HW3 - Bonus

- Image stitching with the projective transform
  - Refer to “Projective mappings for image warping, pdf”
    - Create an image with size  $900 \times 480$
    - Paste the left image at  $[80:449, 0:509]$
    - Evaluate the transformation matrix  $M$  by Eq.(3) or Eq.(4)
      - Set  $(x_0, y_0) = (130, 250)$ ,  $(x_1, y_1) = (470, 310)$ ,  
 $(x_2, y_2) = (475, 900)$ ,  $(x_3, y_3) = (0, 770)$
    - Use inverse warping ( $P_s = P_d M_{ds}$ ) to transfer the original  $(u, v)$  coordinate to the desired  $(x, y)$  coordinate
      - Hint:  $i=1, w=1, (u, v) = (u'/q, v'/q)$



left image



right image



# HW3

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## ☐ Requirements

### ■ Two Programs

- ☐ C or C++ source code with .exe file (You are NOT allowed to use any library, such as OpenCV)

- Except the R/W image

- You can also use .raw to complete your work

- ☐ by using OpenCV

### ■ Report

- ☐ Describe the employed source code editor and how to execute your program (input/interface/output)

- ☐ Introduce your work, method, and discussions

- ☐ With all of the images or results

### ■ Upload to i-school Plus