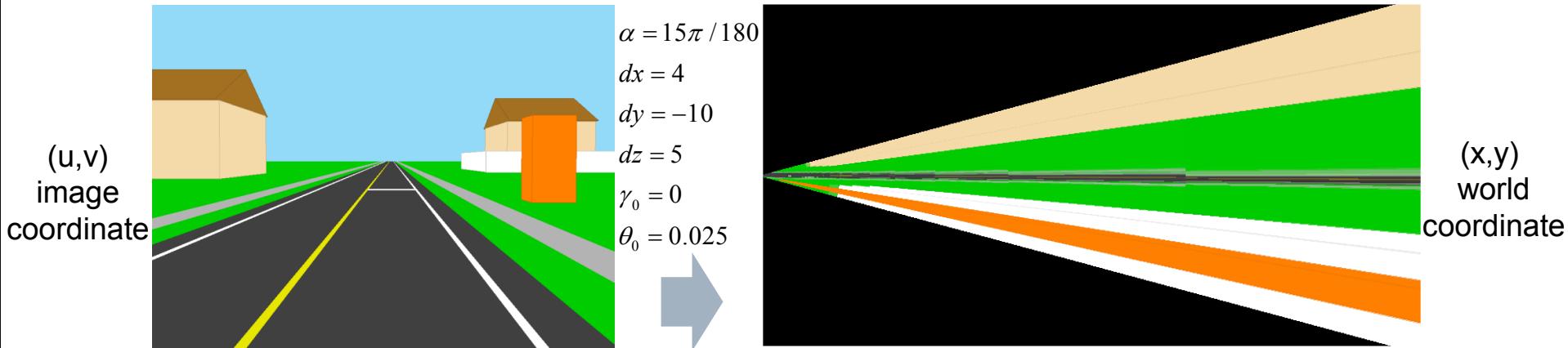


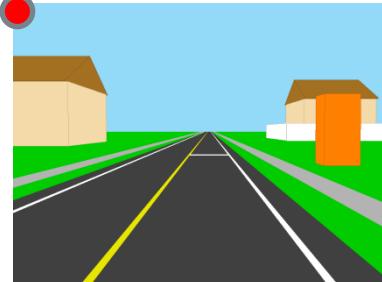
HW3

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



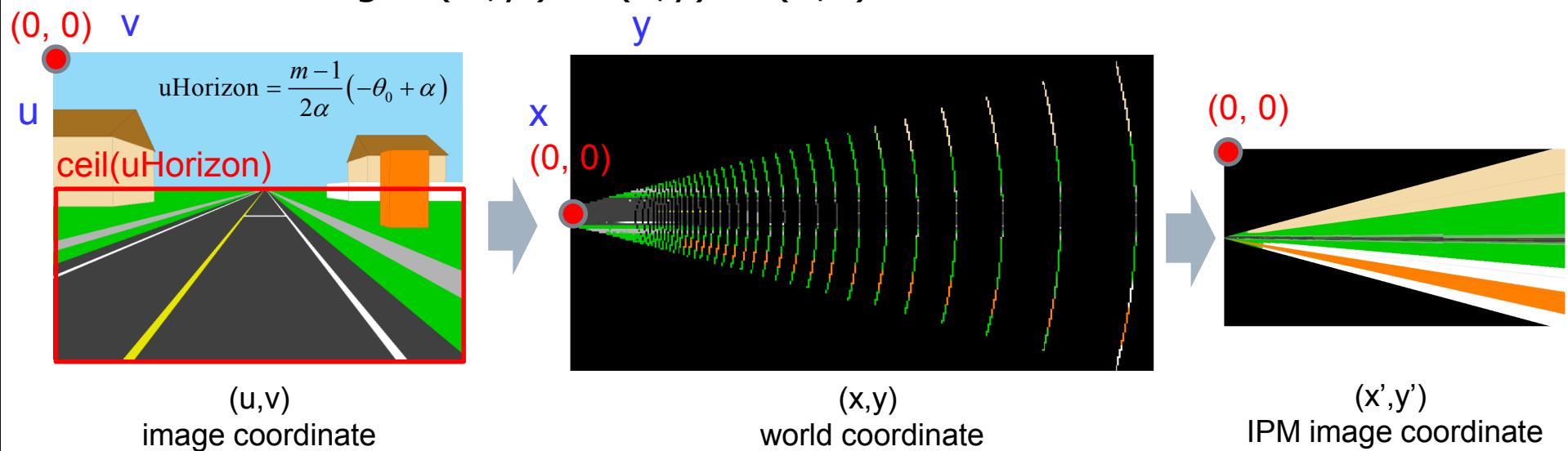
- Refer to "BertozziAndBroggi_IPM.pdf"
 - Hint
 - Image origin at left-top

(0, 0)



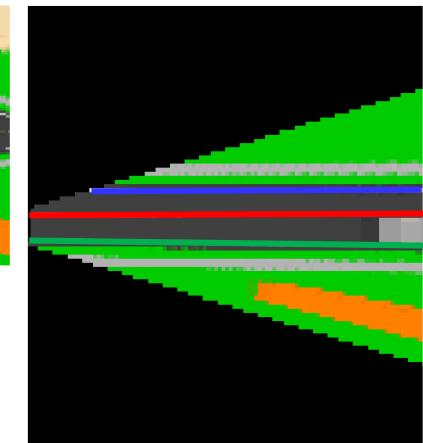
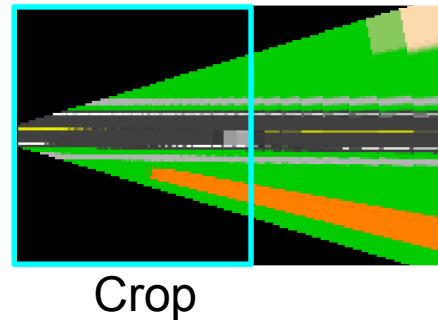
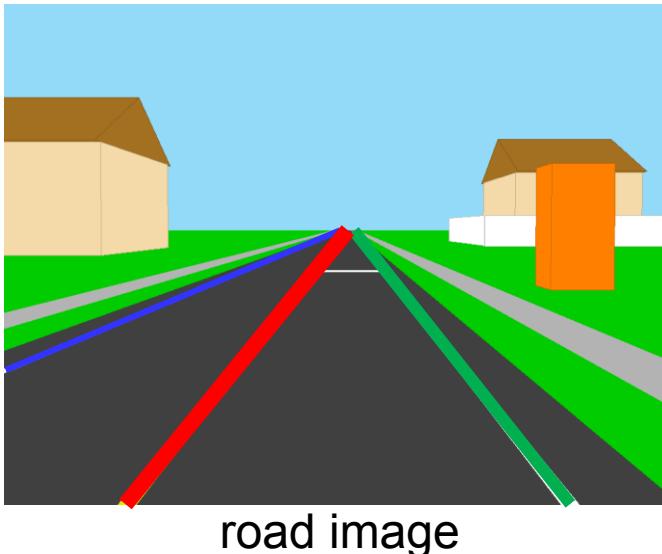
HW3

- First, transfer the pixels (u, v) in $[u_{\text{Horizon}}: \text{Height}-1, 0:\text{Width}-1]$ 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 $(x_{\max}-x_{\min})/r_1 * (y_{\max}-y_{\min})/r_2$
 - E.g. $r_1=r_2=100$: $x'=(x-x_{\min})/100$, $y'=(y-y_{\min})/100$
- Then, use inverse warping (World to Image) to get the IPM image: $(x', y') \Rightarrow (x, y) \Rightarrow (u, v)$



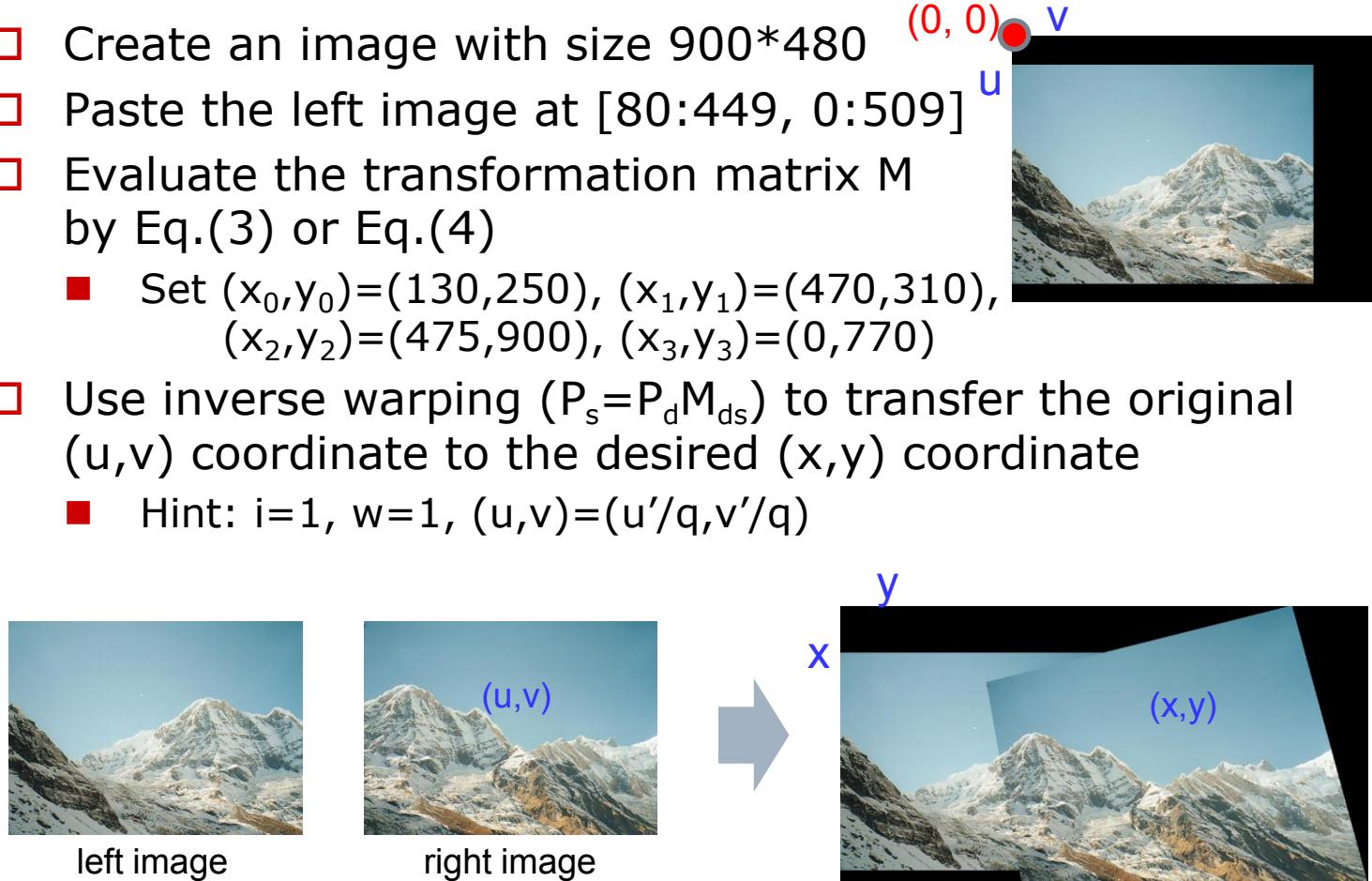
HW3

- 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



HW3 - Bonus

- Image stitching with the projective transform
 - Refer to “Projective mappings for image warping,pdf”
 - Create an image with size 900*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: $i=1, w=1, (u, v) = (u'/q, v'/q)$



HW3

□ 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