

COL783 ASSIGNMENT-4

ROBUST FORMS PROCESSING

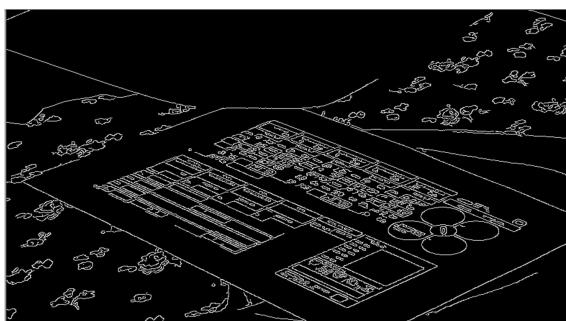
Submitted By- Vikram Kumar and Divya Garg

IMAGE ALIGNMENT

- a. Image was resized to a standard size
- b. It was converted into a binary image to detect edges using Canny Edge Detection
- c. Once the edges were detected, hough transform was used to calculate the angle of rotation and then built-in function was used to rotate the image using perspective transformation



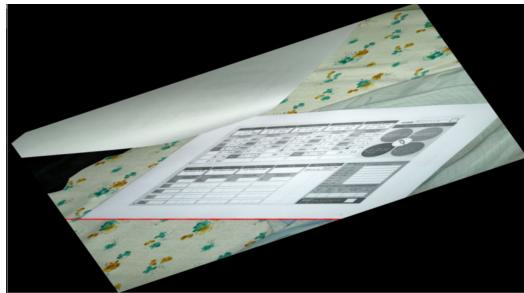
Resized



Canny Edges (params are varied for thresholding)



Hough lines



Rotated image

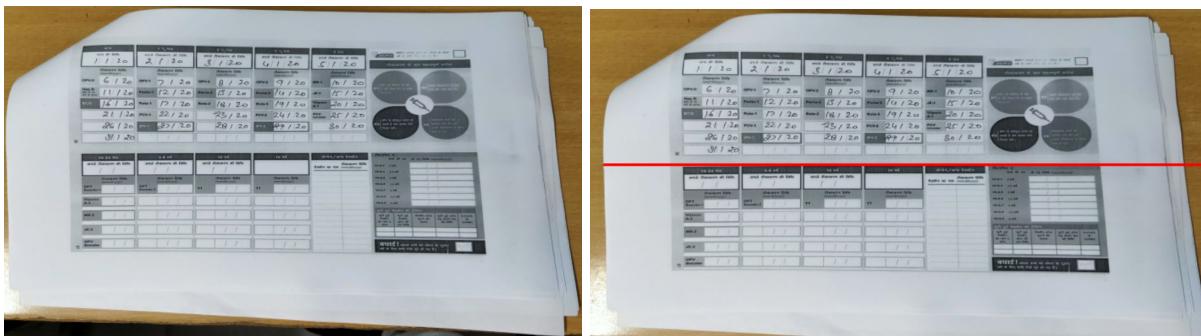


For perspective transformation

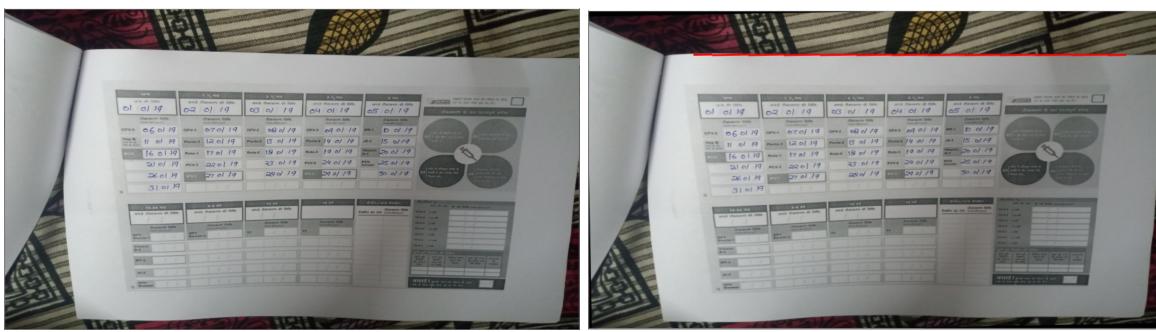
Image	Angle of Rotation for alignment	Canny Edge Parameters (min, max, aperture)	Hough Params (Rho, length accuracy)
booklets/3.jpg	0	30, 150, 3	
booklets/7.jpg	3.0349316553235823	0, 255, 3	
booklets/8.jpg	-0.926762659901782	0, 255, 3	
booklets/12.jpg	0	30, 150, 3	
printouts/2.jpg	0	0, 255, 3	
printouts/9.jpg	1.010997052330402	0, 255, 3	
printouts/18.jpg	25.9996506538092	0, 255, 3	
printouts/20.jpg	16.941542392836567	0, 255, 3	
printouts/44.jpg	3.9654874256263213	30, 150, 3	
printouts/48.jpg	6.087008331931995	(30, 150, 3)	(1, 5)
scanned/9.jpg	2.021994104660804	0, 255, 3	
scanned/10.jpg	1.031212669887953	5, 20, 3	
scanned/11.jpg	0	5, 20, 3	
scanned/12.jpg	0	5, 20, 3	

ALIGNED IMAGES:

Printouts\2.jpg (Angle of rotation = 0), Canny Edge params = 0, 255



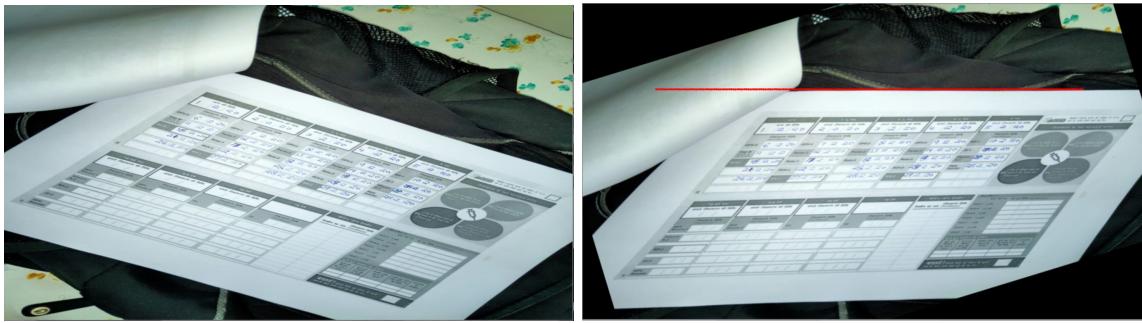
Printouts\9.jpg (Angle of rotation = 1.010997052330402) Canny Edge params = 0, 255



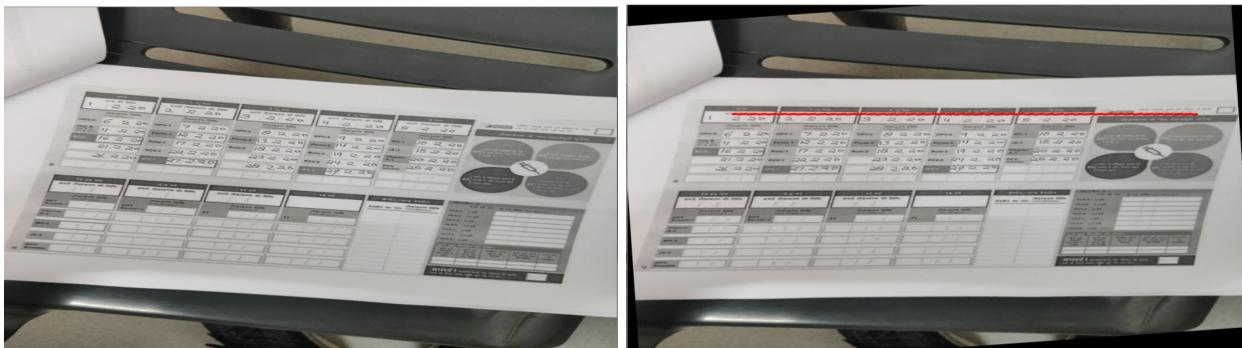
Printouts/18.jpg (Angle of rotation = 25.99) Canny Edge params = 0, 255, rho = 1, accuracy=100



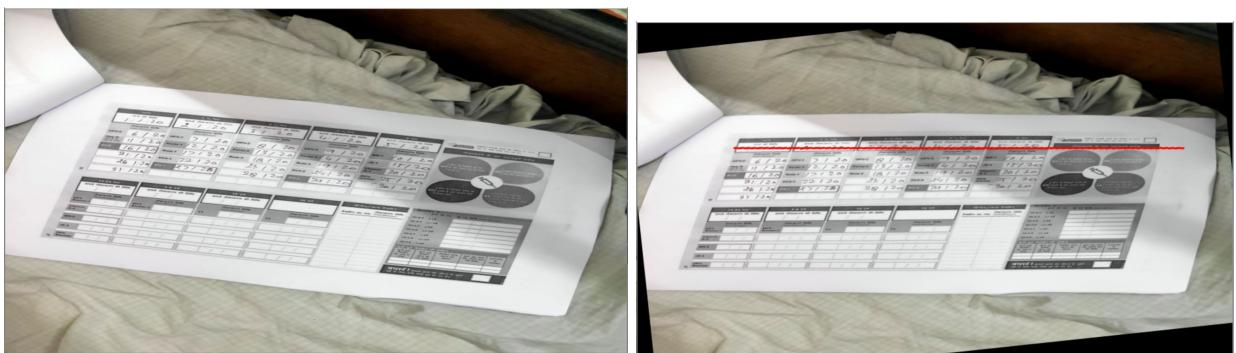
Printouts/20.jpg (Angle of rotation = 16.941542392836567) Canny Edge params = 0, 255



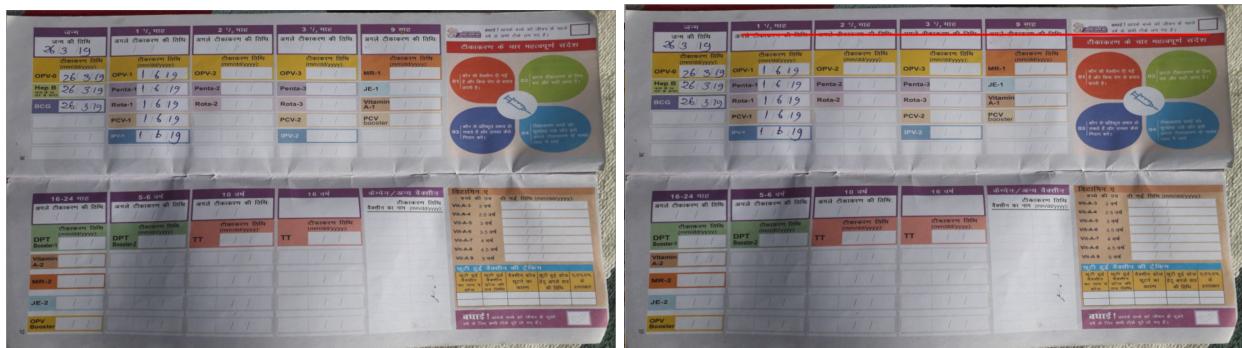
Printouts/44.jpg (Angle of rotation = 3.9596658293138676) Canny Edge params = 30,150



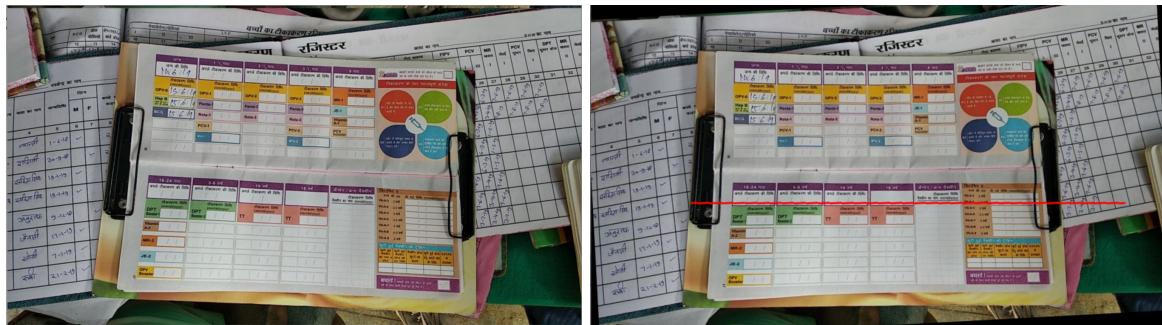
Printouts/48.jpg (Angle of rotation = 6.079588957838487) Canny Edge params = 30,150



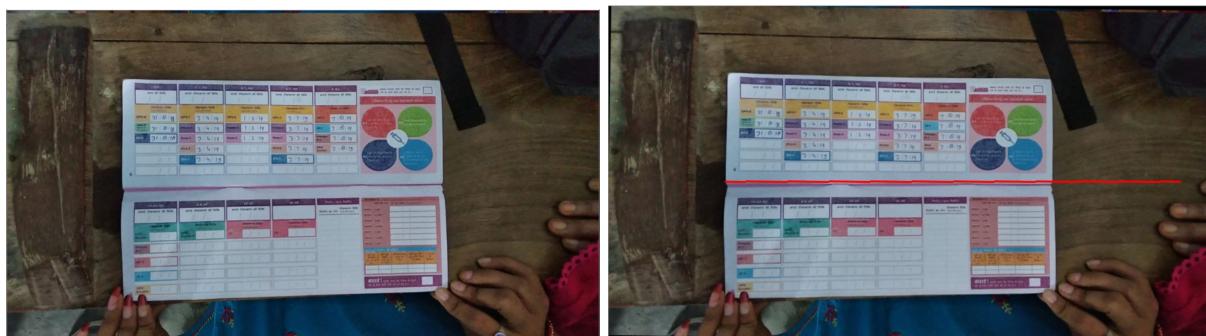
Booklets/3.jpg (Angle of rotation = 0) Canny Edge params = 30,150



Booklets/7.jpg (Angle of rotation = 3.0349316553235823) Canny Edge params = 0, 255



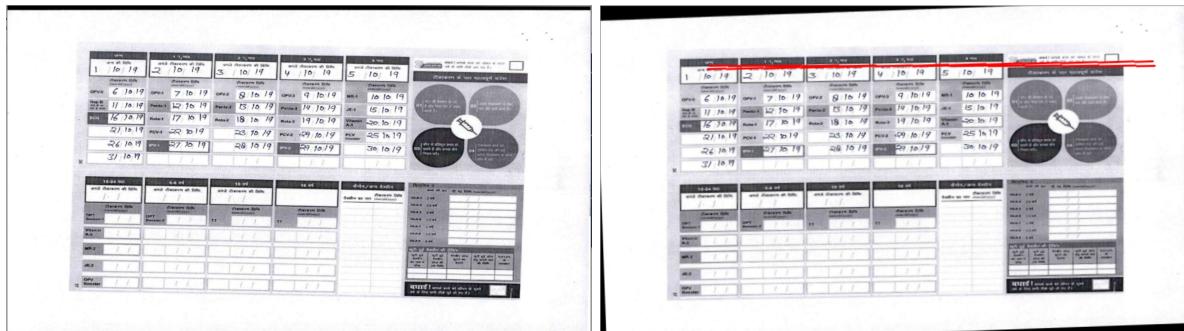
Booklets/8.jpg (Angle of rotation = -0.926762659901782) Canny Edge params = 0, 255



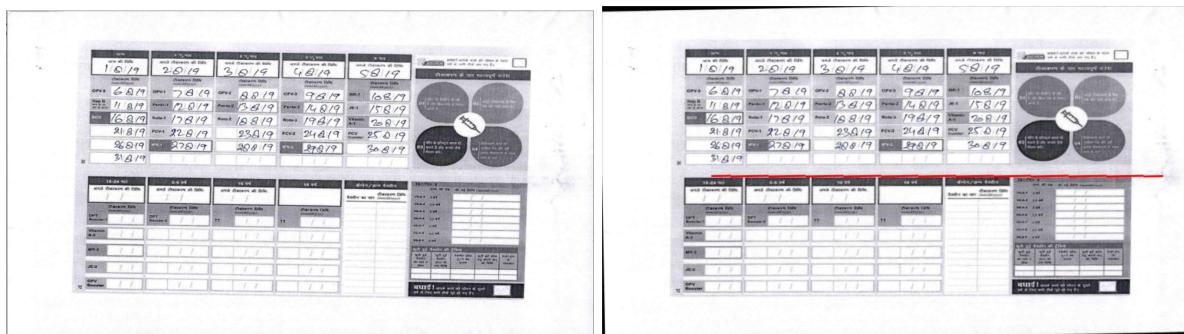
Booklets/12.jpg (Angle of rotation = 0) Canny Edge params = 30,150



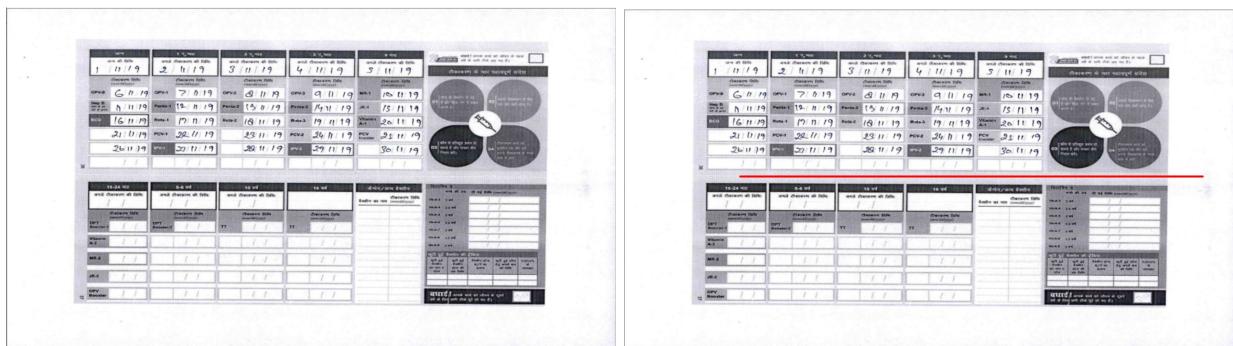
Scanned/9.jpg (Angle of rotation = 2.021994104660804) Canny Edge params = 0, 255



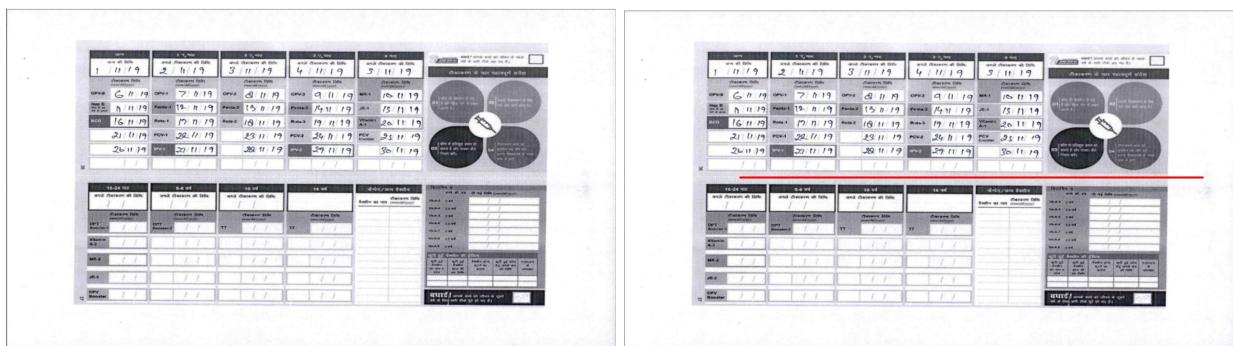
Scanned/10.jpg (Angle of rotation = 1.010997052330402) Canny Edge params = 5, 20



Scanned/11.jpg (Angle of rotation = 0) Canny Edge params = 5, 20

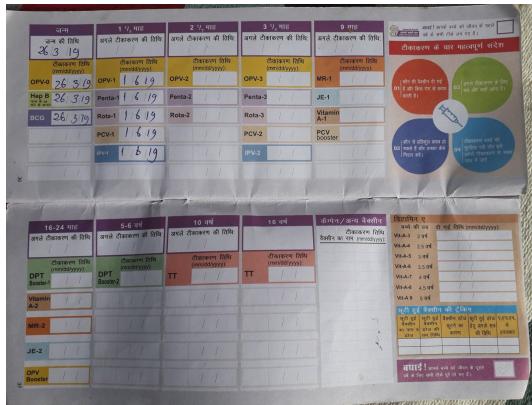


Scanned/12.jpg (Angle of rotation = 0) Canny Edge params = 5, 20

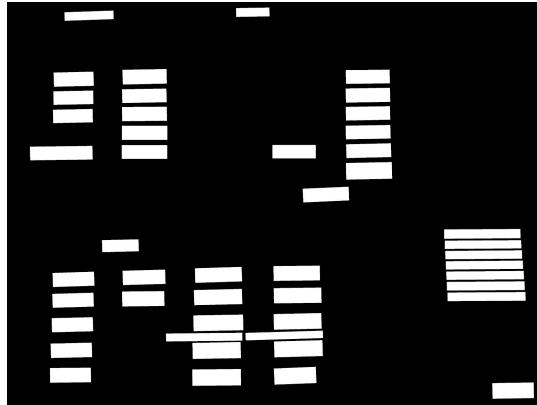


Failed approaches included edge detection using normal blur and Sobel Operators

Form Field Segmentation



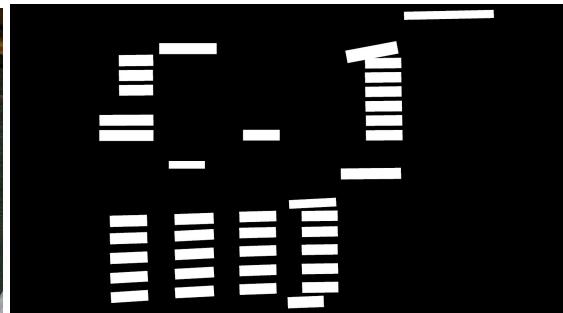
booklets/3.jpg



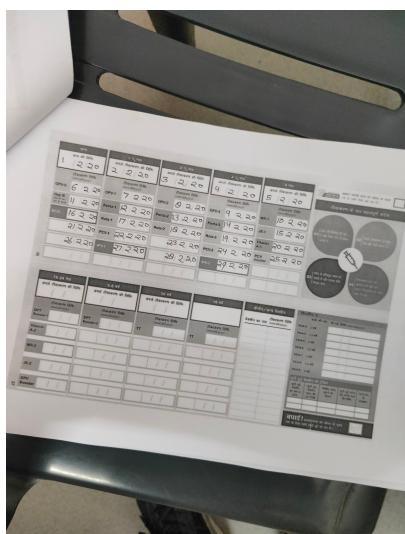
output field



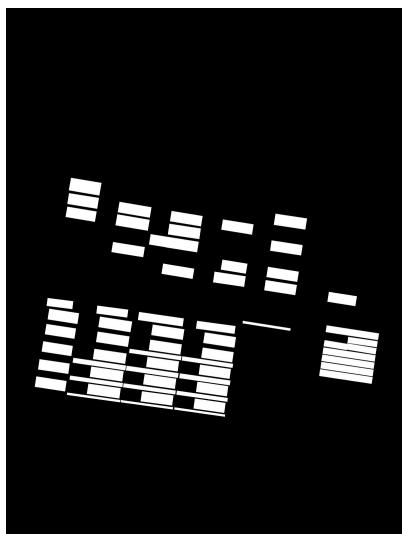
booklets/12.jpg



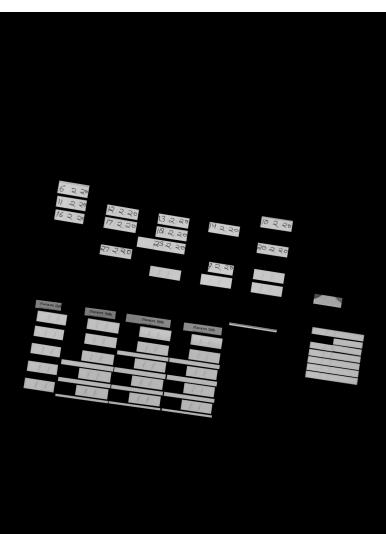
output



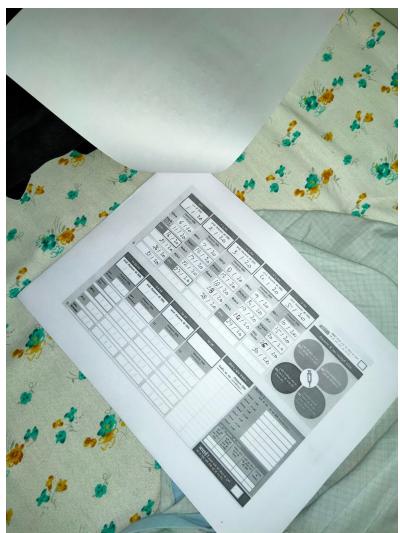
printout/44.png



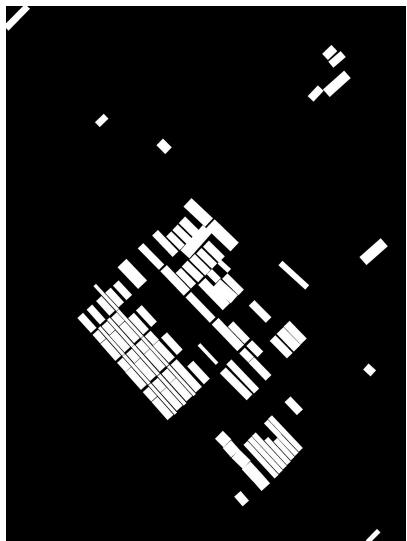
output form field



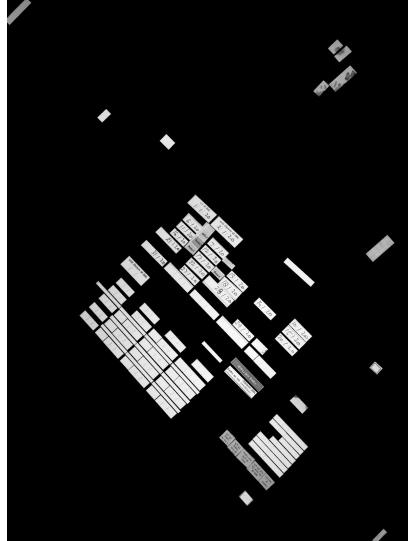
character extraction



printout/18.jpg



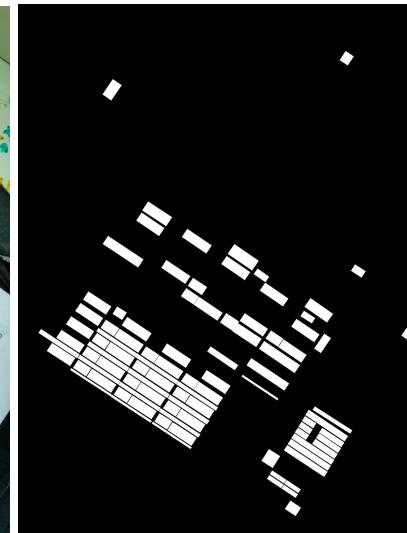
output(-85,-75)



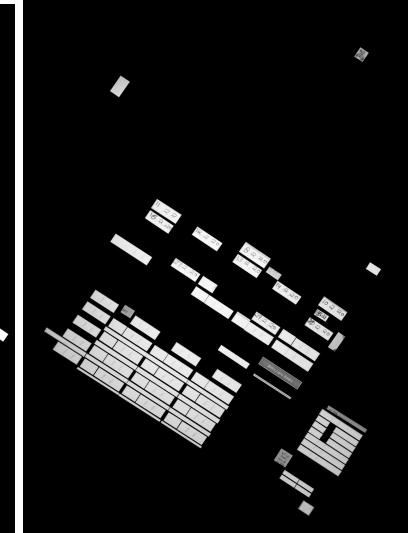
character extraction



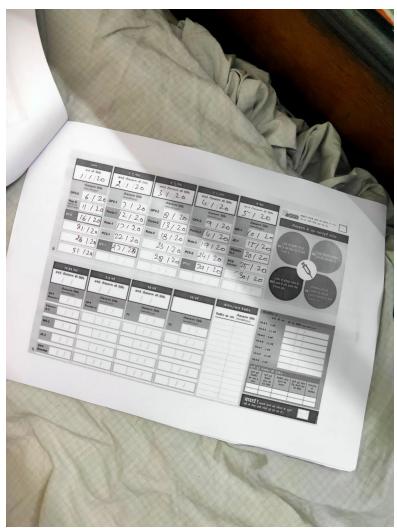
printout/20.jpg



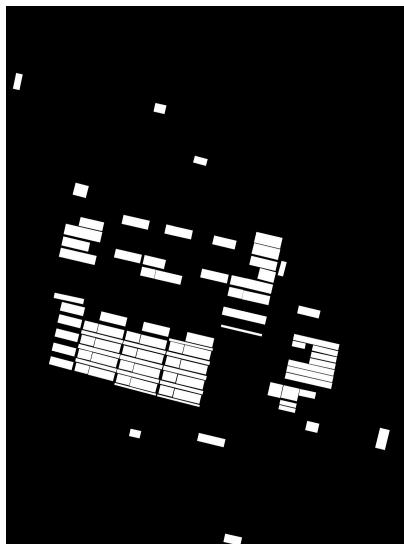
output(-58,-54)



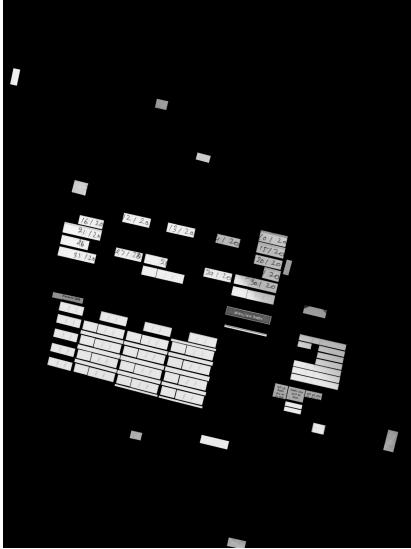
character extraction



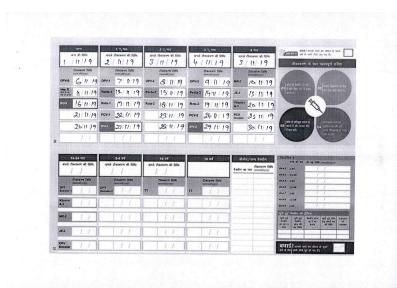
printout/48.jpg



output(-78,-75)



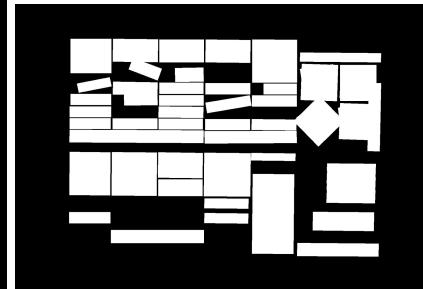
character extraction



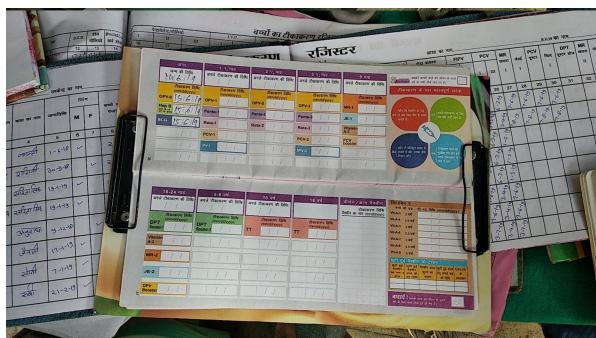
scanned/11.jpg



character extraction



output



booklets/7.png

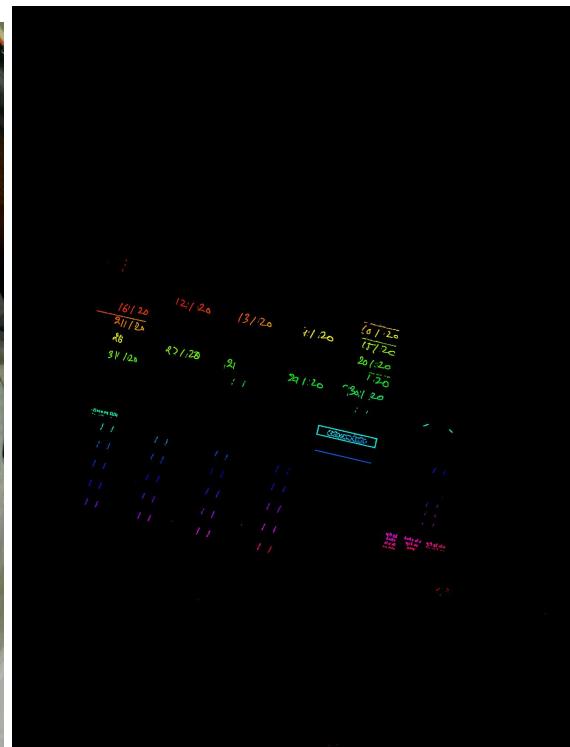
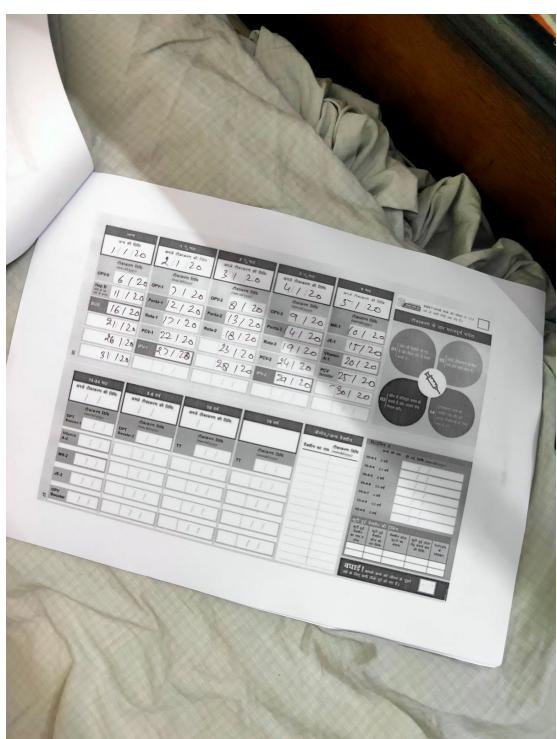
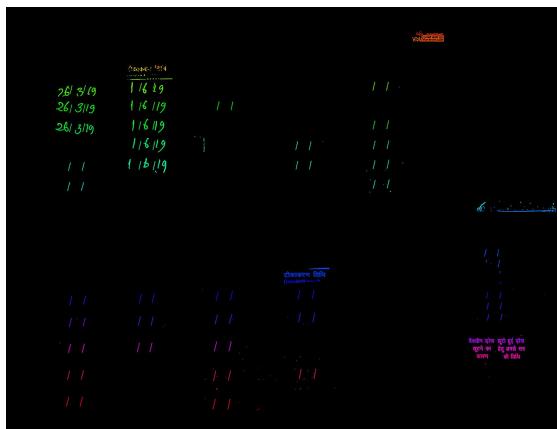
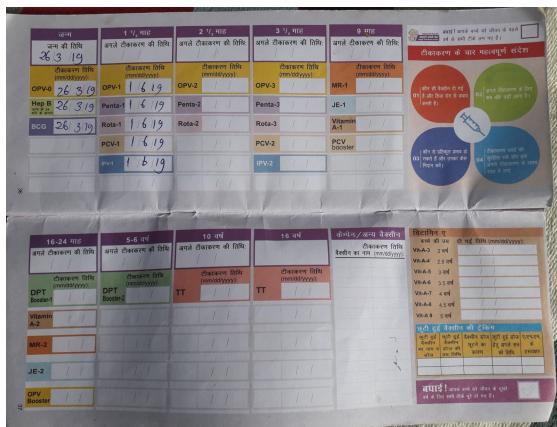


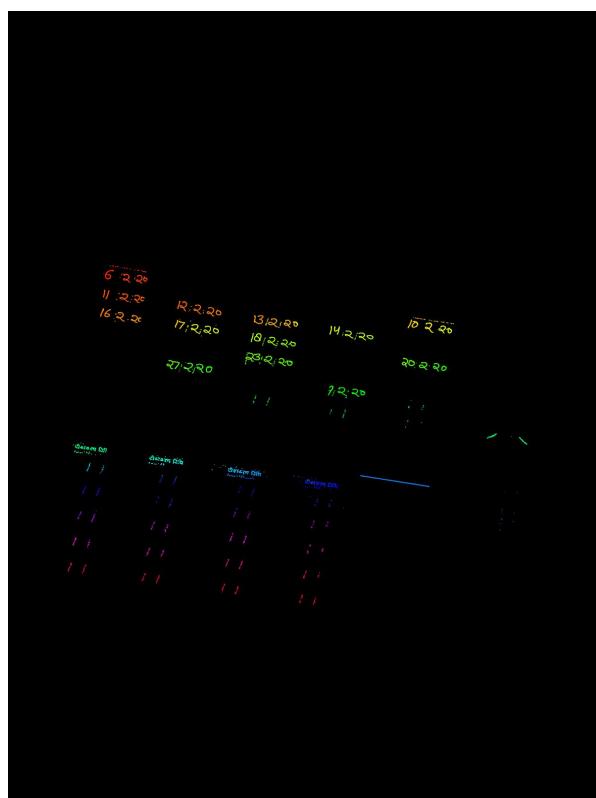
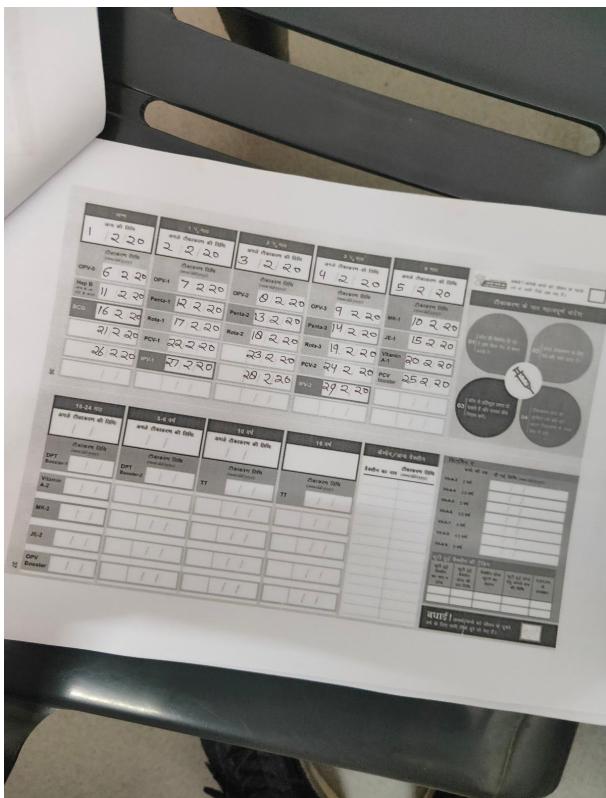
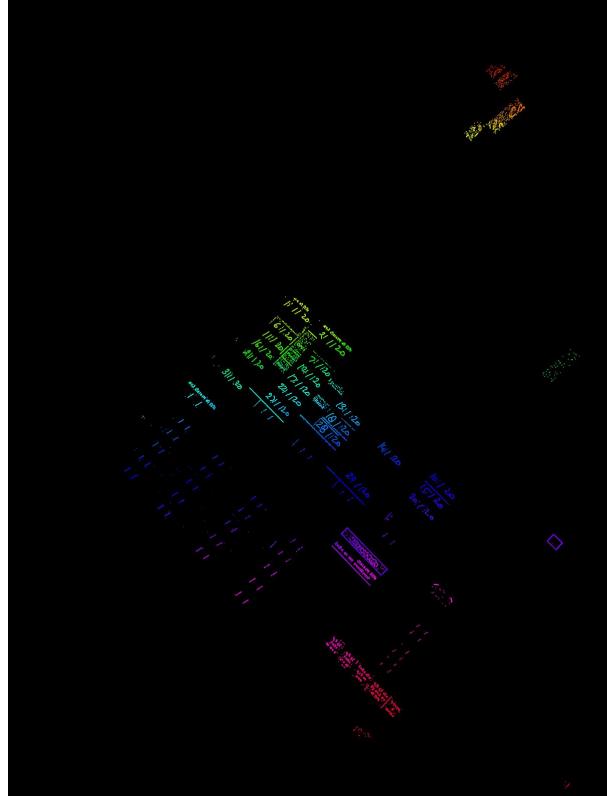
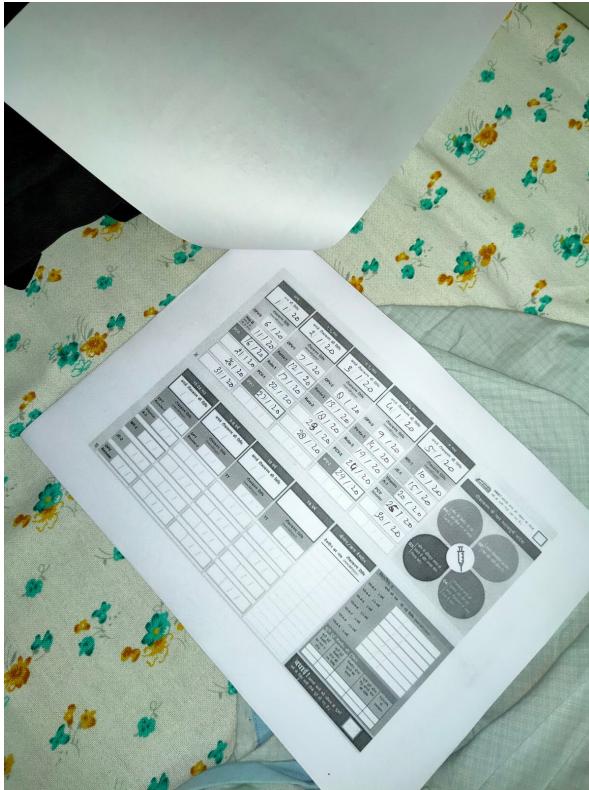
output

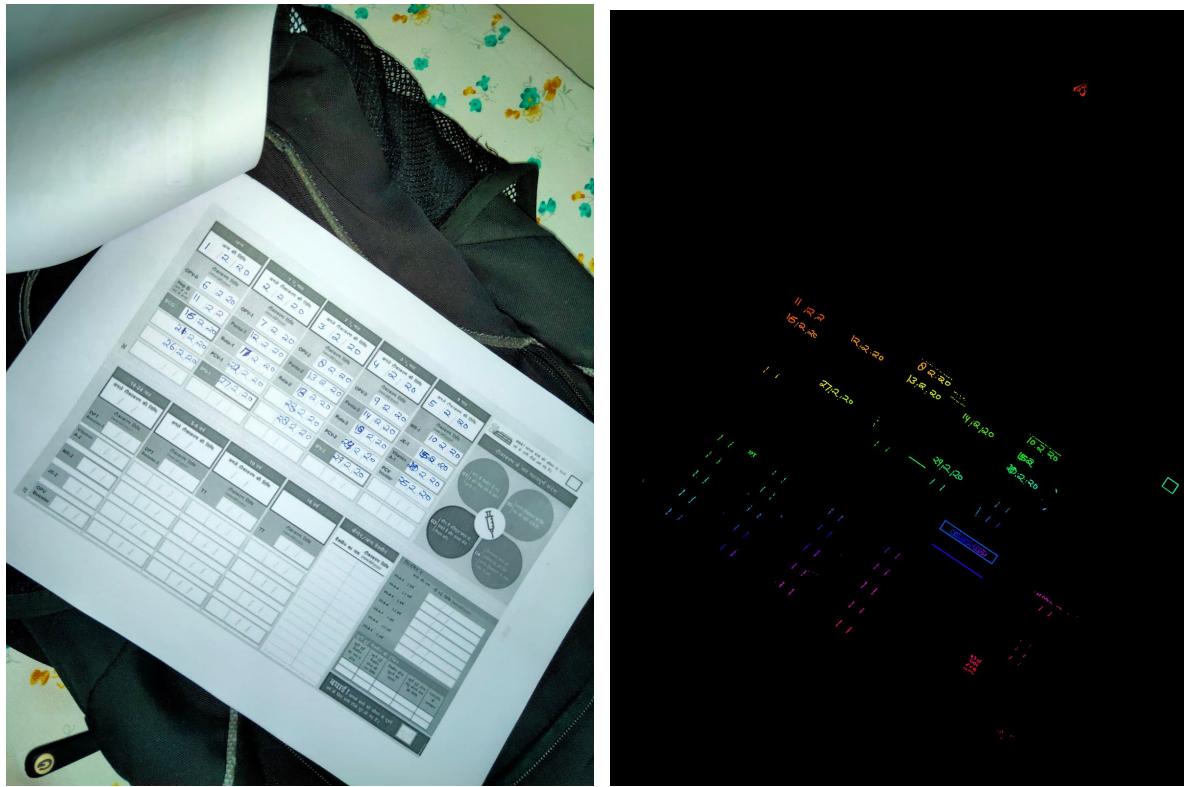


Character extraction

Character Detection







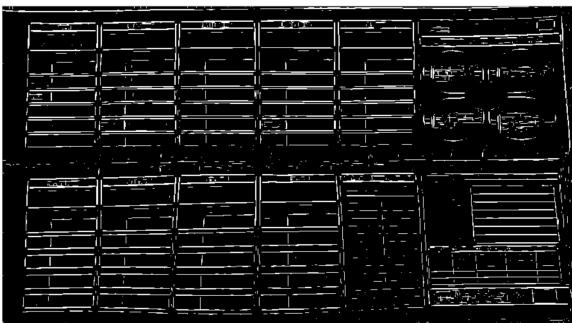
Extra Credit: Removing the slashes from the images:

The image is first binarized using adaptive thresholding and then hit and miss algorithm was used to remove all the slashes. It is then dilated for clear image

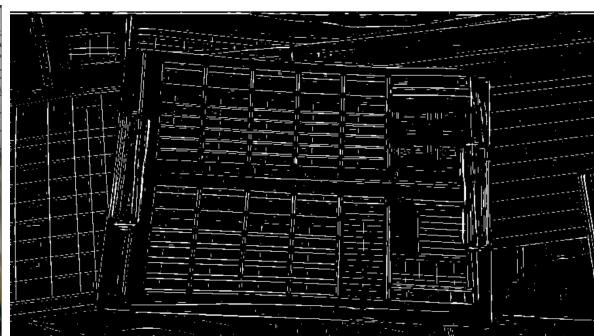
Image	Vertical kernel	Horizontal kernel	Adaptive Thresholding	Dilation
booklets/3.jpg	9	9	5, 1	rect(1,1)
booklets/7.jpg	9	9	5, 1	rect(1,1)
booklets/8.jpg	9	9	5, 1	rect(1,1)
booklets/12.jpg	9	9	5, 1	rect(1,1)
printouts/2.jpg	9	9	5, 1	rect(1,1)
printouts/9.jpg	9	9	5, 1	rect(1,1)
printouts/18.jpg	4	9	7, 1	rect(2,2)
printouts/20.jpg	diagonal(7,7)	13	9, 3	rect(2,2)
printouts/44.jpg	5	11	7, 1	rect(1,1)

printouts/48.jpg	5	11	7, 1	rect(1,1)
scanned/9.jpg	9	9	7,1	rect(2,2)
scanned/10.jpg	9	9	7,1	rect(2,2)
scanned/11.jpg	9	9	7,1	rect(2,2)
scanned/12.jpg	9	9	7,1	rect(2,2)

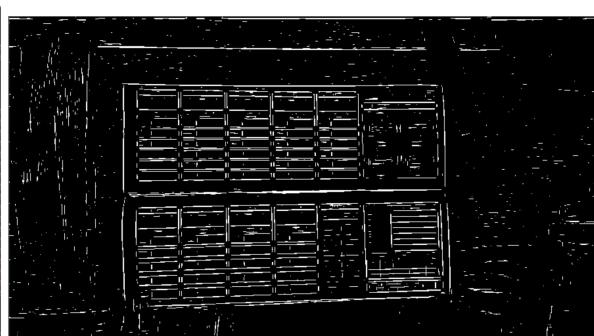
booklets/3.jpg



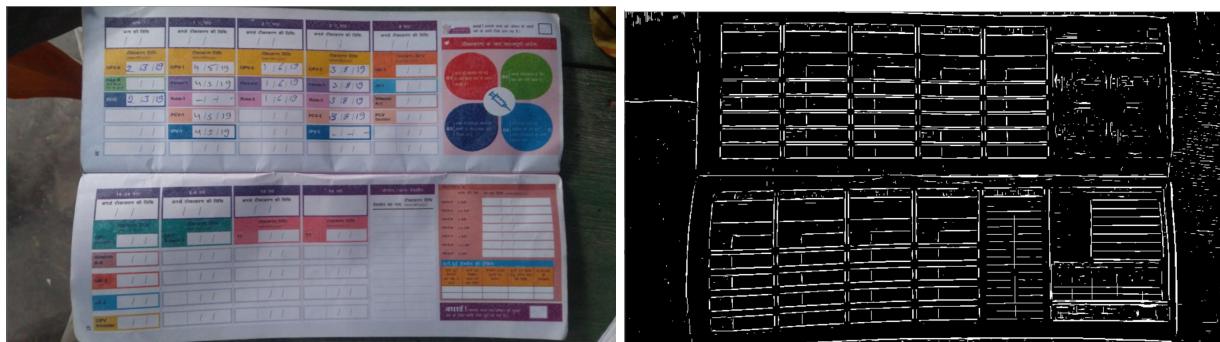
booklets/7.jpg



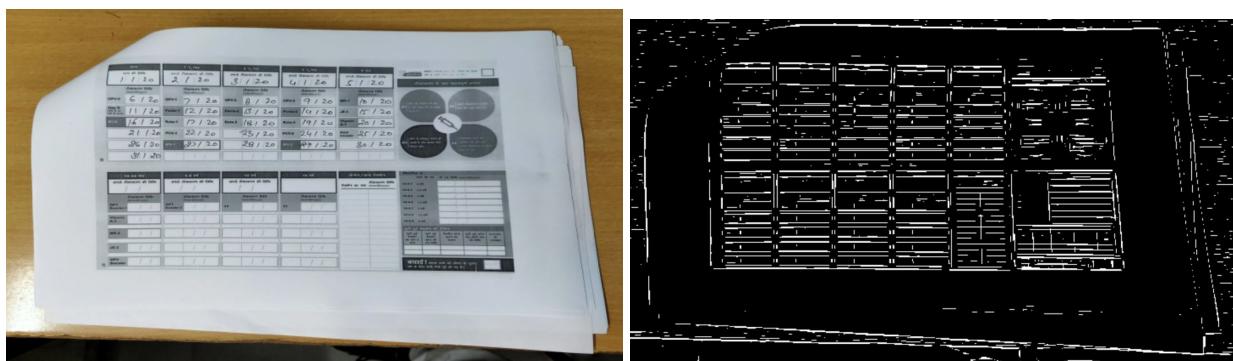
booklets/8.jpg



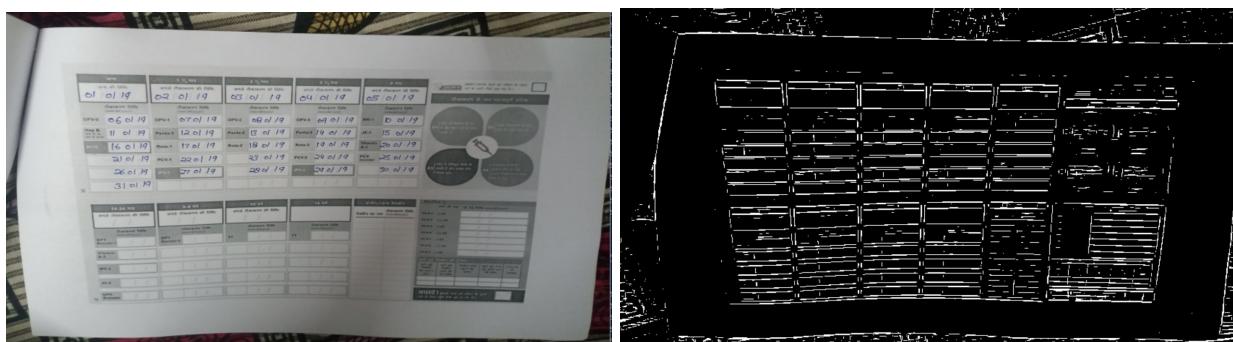
booklets/12.jpg



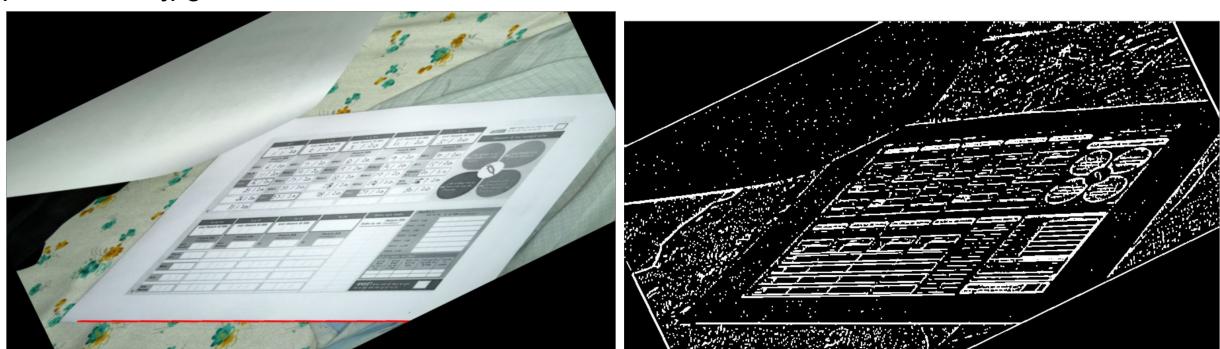
printouts/2.jpg



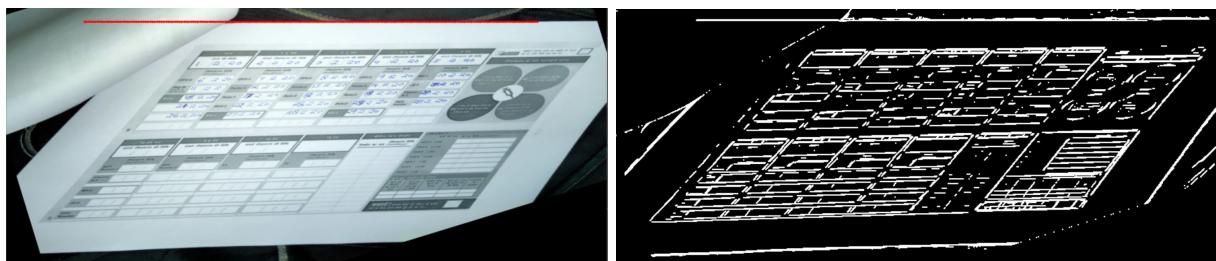
printouts/9.jpg



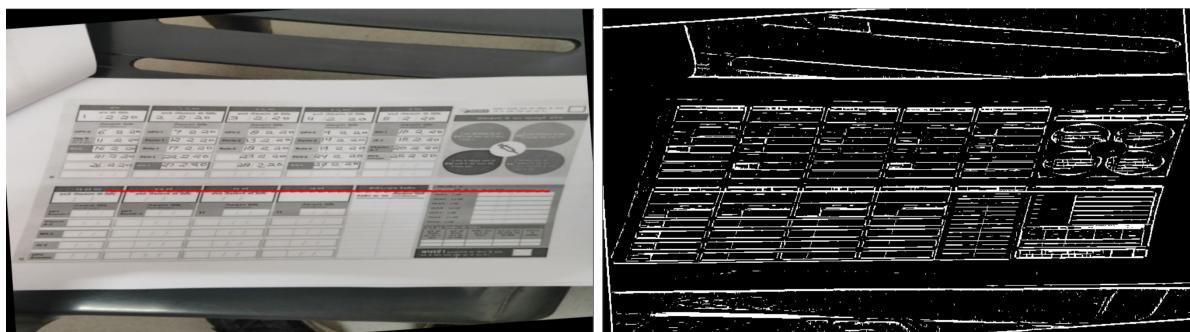
printouts/18.jpg



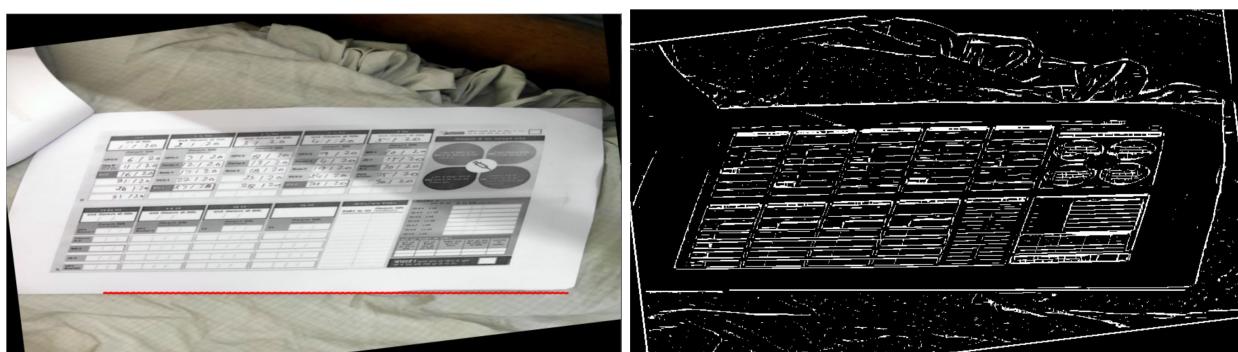
printouts/20.jpg



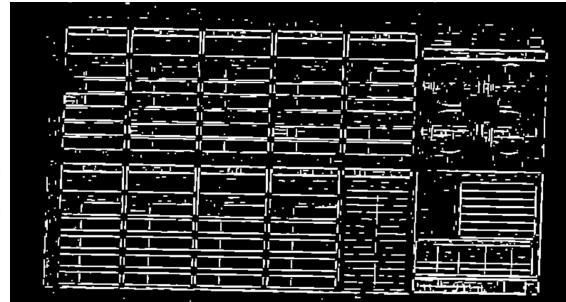
printouts/44.jpg



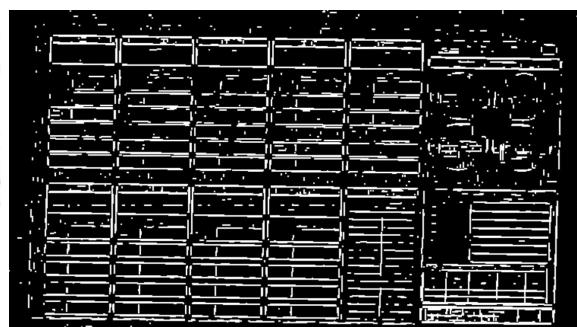
printouts/48.jpg



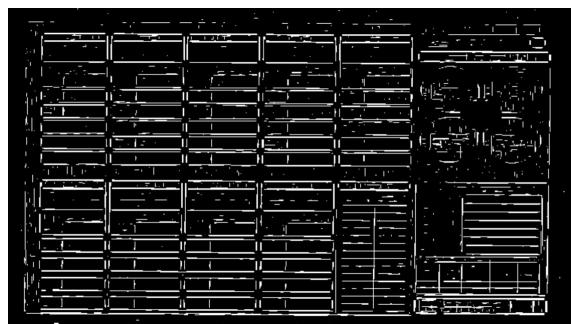
scanned/9.jpg



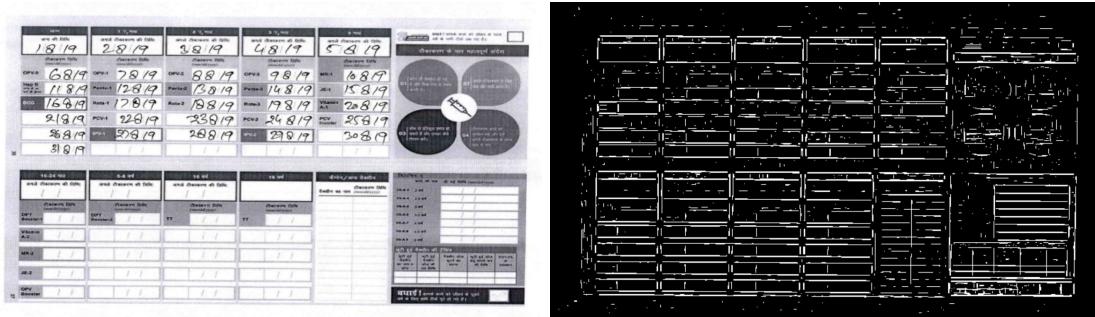
scanned/10.jpg



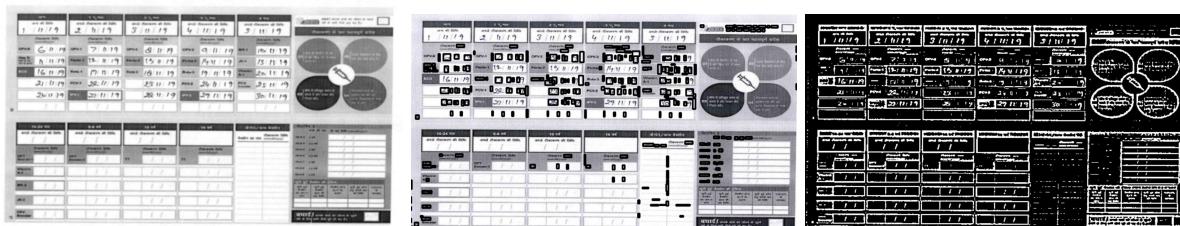
scanned/11.jpg



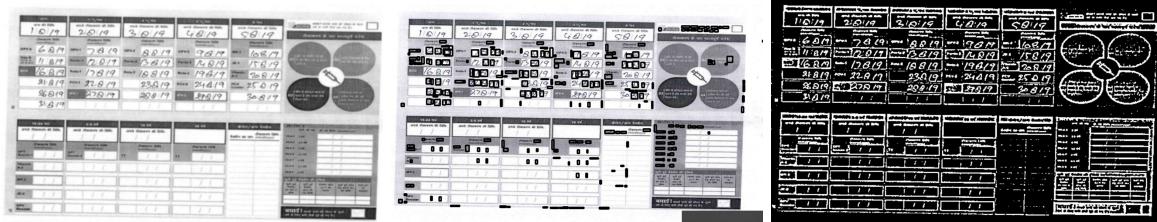
scanned/12.jpg



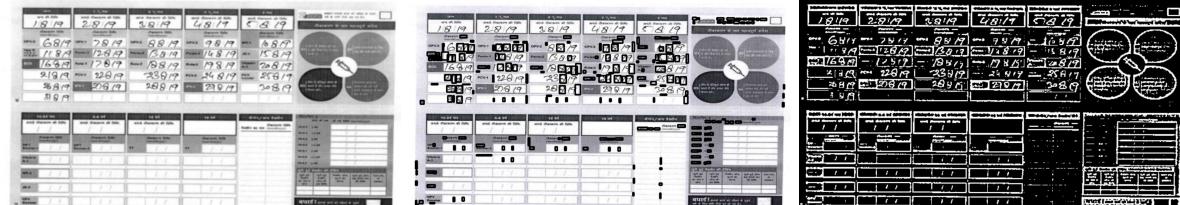
Scanned/11.jpg, (13,8) -> Adaptive thresholding: (13,8)



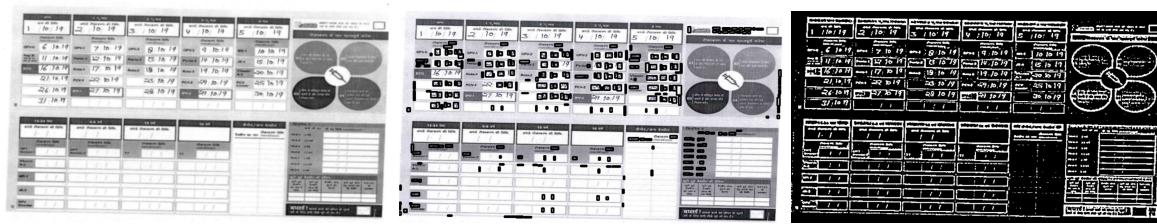
scanned/10.jpg



scanned/12.jpg



scanned/9.jpg



booklets/3.jpg



printouts/18.jpg (13,8)

