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Robust Forms Processing
COL 783 - Assignment 4

     The automated processing for form processing is described below. The need for every step of the process has been mentioned and the sample output has been displayed on one image from each type - booklet, scanned and printed. The images that require manual fine tuning have been summarised below the generic procedure separately.

ROTATION

All the work has been done the black and white version of images. The image has been rotated after blurring to reduce noise followed by edge detection to determine the angle of rotation.
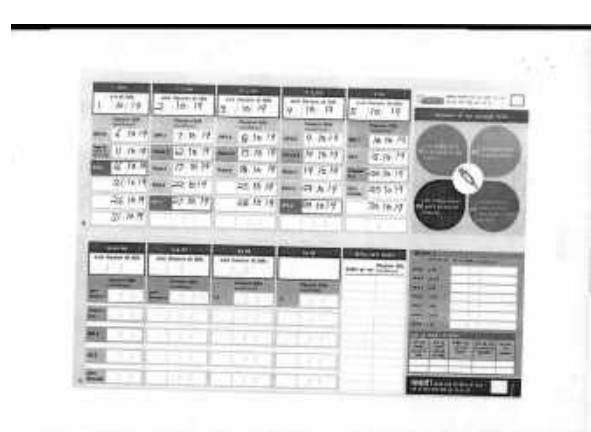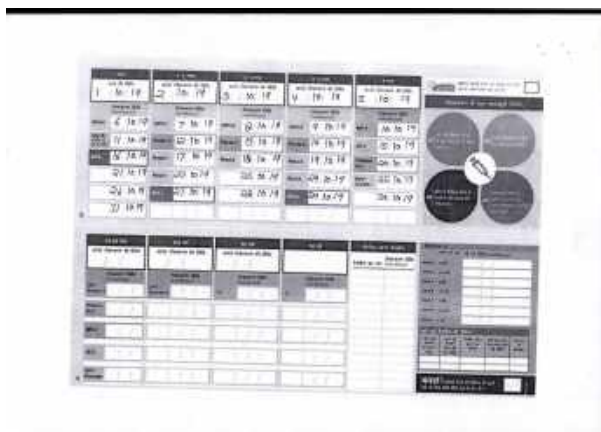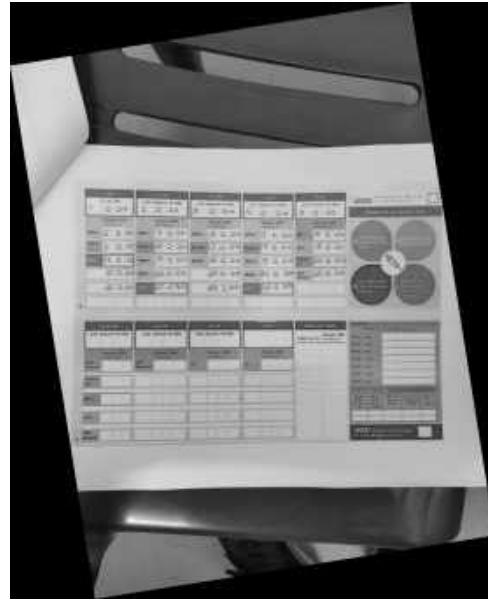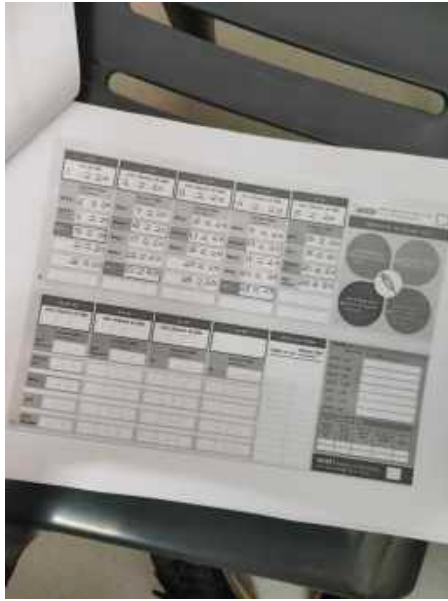
FORM EXTRACTION

A scanned form has been cropped out to serve as training image for key point detection.

Using this, the form has been detected in every image. A bounding box is made across the form and the form is extracted out.
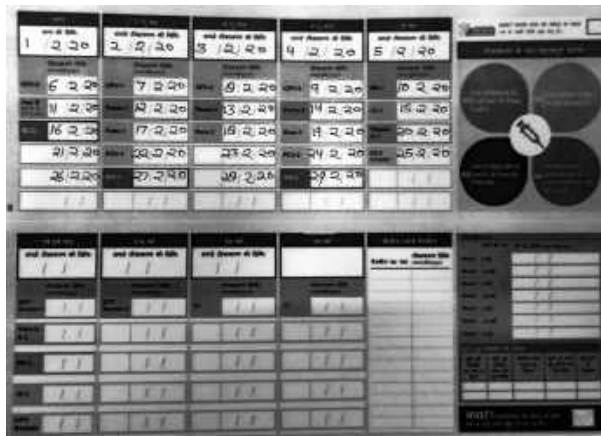
This cropped image of the form has been resized into a uniform shape.

This step is necessary so that the region descriptors of the form fields of every image are uniform and do not depend on the size of the image.

CONTRAST STRETCHING

Histogram equalisation is performed to enhance the form field regions, especially in the printed images.

Adaptive Thresholding without contrast stretching does not give good results as most of the form field boxes are not closed and hence do not form separate components that can be filtered using region descriptors.

FORM FIELD SEGMENTATION

Adaptive Thresholding has been done after histogram equalisation.
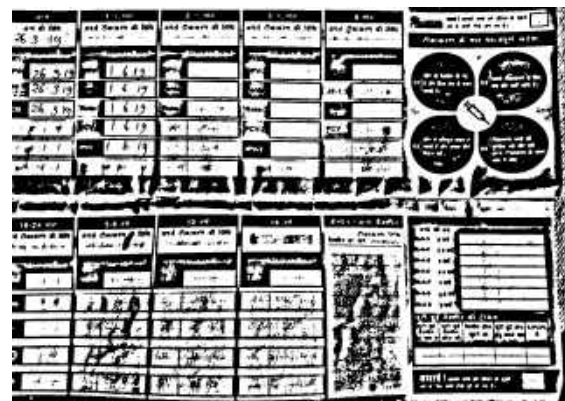
3-5 iterations of erosion have been performed using rectangular structuring element to close the remaining form fields. This is necessary to ensure that every form field is a separate component.
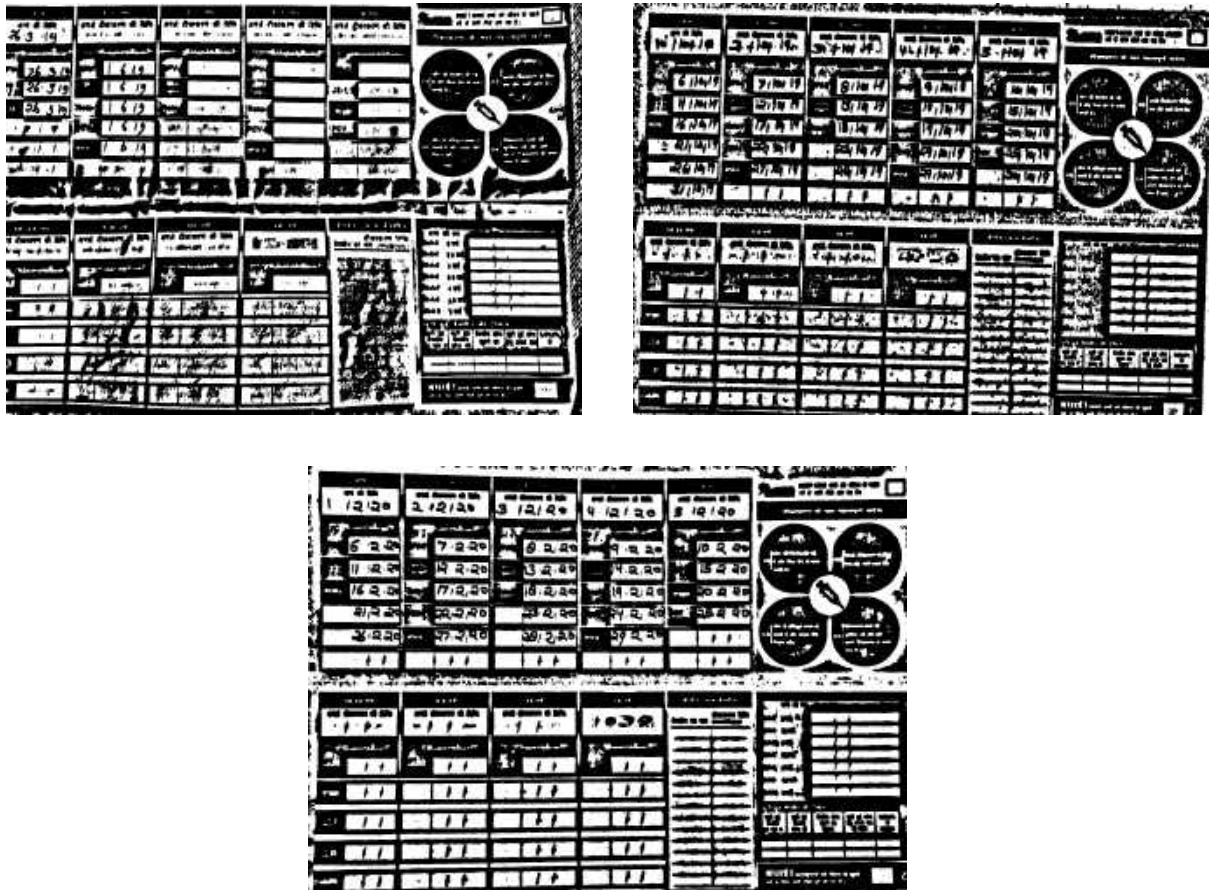

All connected components of the images using connectivity value 4 are marked separately. These components are filtered out using area bounds, length and height of the components.
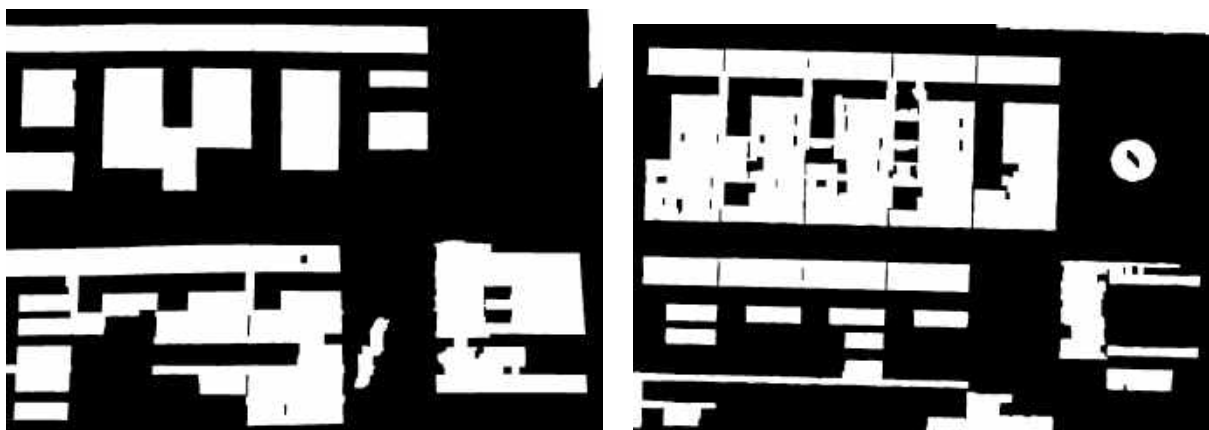
The obtained components are dilated 1-2 times in order to close the holes and create a mask.

CHARACTER DETECTION

The obtained mask is applied on the cropped form image to extract all the form fields only. The remaining region is converted to black colour. The negative of the image is taken and refined. Henceforth, we work on the negative of the image only.
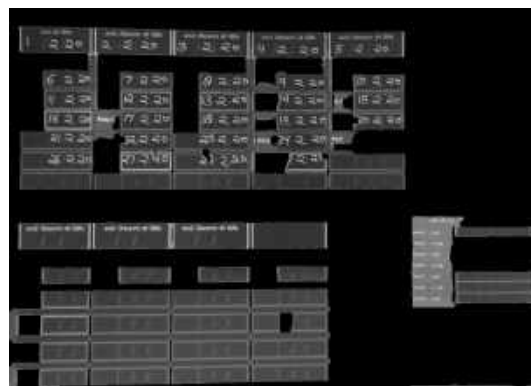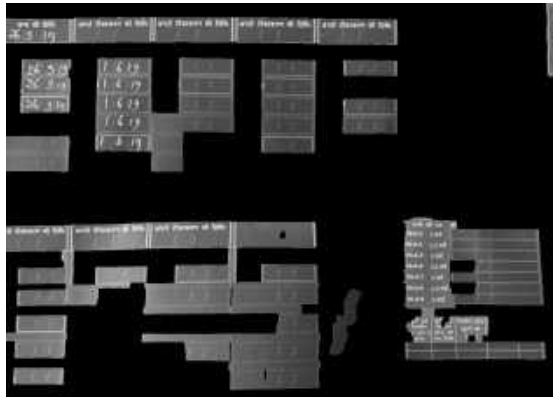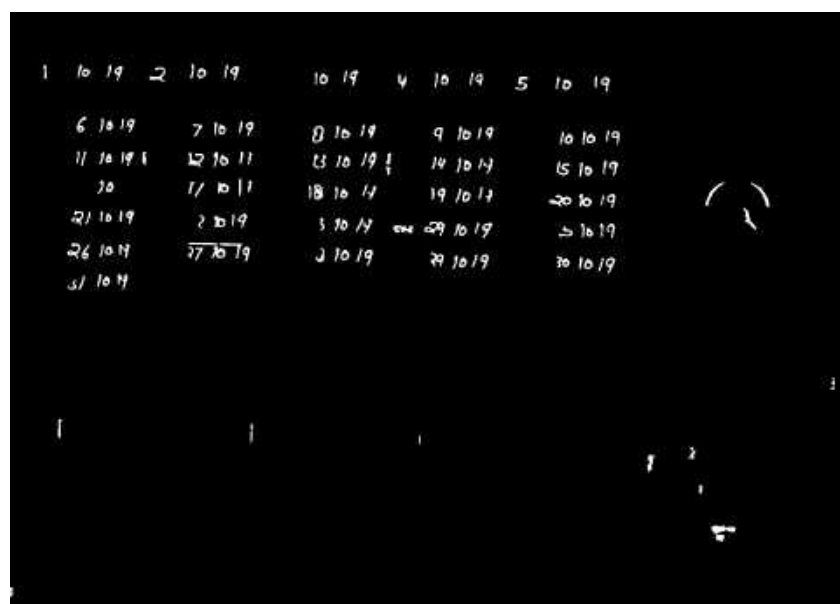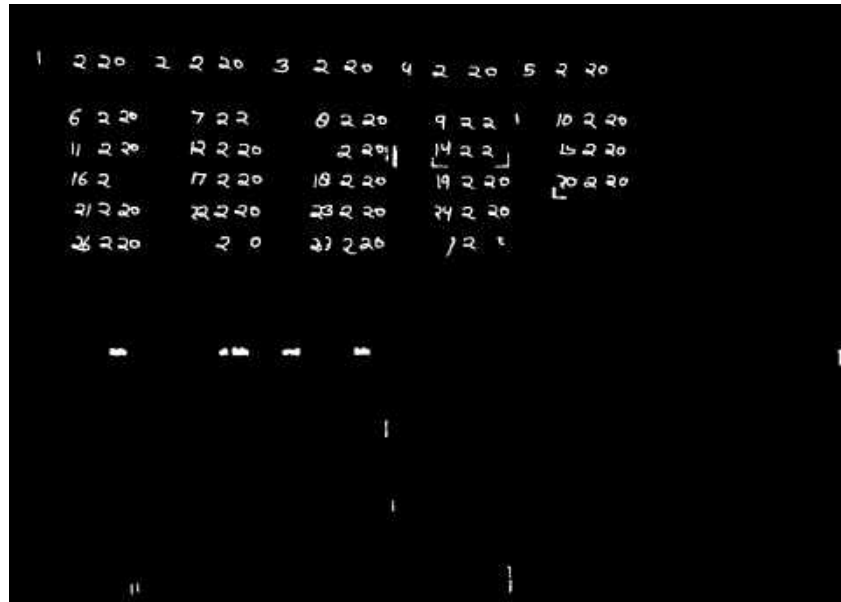

Histogram equalisation followed by thresholding is used. Pre-printed slashes are also excluded in this thresholding since they are lighter in colour than the handwritten text.
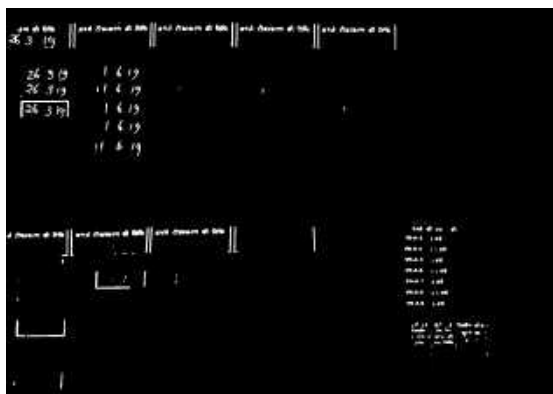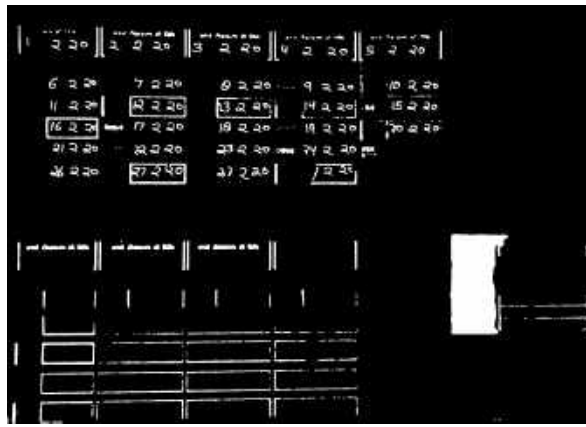
The components are again filtered on the basis of length, width and area to get only the characters.

MANUAL TUNING

1. For images with significant rotation, the rotation angle has been changed to 90 - rotation angle manually to prevent image from rotating in the opposite direction.

2. In character segmentation, the threshold value differs for scanned images, booklets and printed images. These values are manually changed for the 3 types of images.

For booklet, the threshold is 170. For other cases, the threshold is 110.