ROBT 310: Image Processing
HOMEWORK III
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Introduction

Digit recognition is one the basic challenges in computer vision and image processing. The main objective of the homework III is to recognize digits from the given dataset, so the digit must be recognized from modified images. The implementation of the task is demonstrated in digitrec.m script file, which is written as a function. The input is an rgb image matrix from a dataset provided with the script, and output is an integer found in the digit. A second chains.m script file contains a dataset of chain codes of digits for comparison that are going to be loaded in digitrec.m for further use. The dataset of Arial font digits was prepared using screenshot tools and contains all variations of 48 and 72 font size digits.

Methodology and the procedure

Digit recognition is implemented by using chain codes based on 8-connectivity. We chose this method of boundary representation because we do not involve rotation of digits into account, which simplifies digit recognition. The boundary segmentation was done using edge() function. To decrease noise and to close gaps in the boundary we use closing morphological operation using erosion and dilation. We encountered an issue where 1 and 5 digits' boundaries from edge() contained a gap, which was resolved using closing on the digit before applying edge() and closing on the boundary itself. The chain code starts at the most top and most left pixel in the boundary. The first pixel is consistently being picked as a first whenever we move the digit in the image. To avoid a problem, we store the coordinates of a first pixel in the chain to end the chain. Another issue we encountered is that after closings, several digits (especially 3 and 5) will have several extra pixels in the boundary, which are not being recorded in the chain as they are not needed for the boundary. This did not bring any problems and they are consistently created whenever a digit is placed in the image. After obtaining a chain code, we compare it with the provided dataset of chain codes using an order of the shape and chain code itself. Several shapes have the same order which was taken into consideration.