Problem 1

We want to write an algorithm to detect, isolate and transform letter e in the image of figure 1-left to a different letter or character of your choice. The main difficulty in the problem arises from the fact that letter e (as an image) is not exactly the same. One solution is to pick a structuring element that is shared by all e (such as the skeleton of the letter e).

1) Develop an algorithm and write code to detect and isolate letter e in the image (everything else must go).
2) Transform letter e to single points and count their number in the image.
3) Transform letter e to another letter or character of your choice.
4) Show your work and discuss your steps, method, and results.

Problem 2

Use the Hough transform to detect the lines in a given image of you choice. Pick an image with visible lines. Use command `houghpeaks` to identify the peaks and then mark them with a small rectangle or circle.

Problem 3

We want to find the the extraterrestrial beings (aliens) in figure 1-right. Apply morphological and template matching techniques to detect the extraterrestrial beings. Use structuring elements that characterize the aliens’ eyes.

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A proportional-integral-derivative controller (PID controller) is a control loop feedback mechanism (controller) widely used in industrial control systems. A PID controller calculates an error value as the difference between a measured process variable and a desired setpoint. The controller attempts to minimize the error by adjusting the process through use of a manipulated variable.

The PID controller algorithm involves three separate constant parameters, and is accordingly sometimes called three-term control: the proportional, the integral and derivative values, denoted $P$, $I$, and $D$. Simply put, these values can be interpreted in terms of time: $P$ depends on the present error, $I$ on the accumulation of past errors, and $D$ is a prediction of future errors, based on current rate of change.[1] The weighted sum of these three actions is used to adjust the process via a control element such as the position of a control valve, a damper, or the power supplied to a heating element.