



NUMERICAL COMPUTATION

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Input and output

As our program works with every zoom level and every picture, at the beginning of our main file we have defined two variables the first one is file name and the second one is the zoom level; this information will be prompted from user.

As the output we show both before, after pictures, also the second one(zoomed version) will be written in “output.jpg” file.

What does it do?

In order to make a picture bigger we need to have more pixels to show therefore we need to have bigger matrix that represents image pixels (RGB). Finding those extra pixels, we use Lagrange interpolation method to estimate them from pixels which are around that point.

To calculate Lagrange function, we get input e.g. X_i , X_j , X and $f(X_j)$ to calculate L_j and then multiply them to calculate $p(x)$.

$$\ell_j(x) := \prod_{\substack{0 \leq m \leq k \\ m \neq j}} \frac{x - x_m}{x_j - x_m} = \frac{(x - x_0)}{(x_j - x_0)} \dots \frac{(x - x_{j-1})}{(x_j - x_{j-1})} \frac{(x - x_{j+1})}{(x_j - x_{j+1})} \dots \frac{(x - x_k)}{(x_j - x_k)},$$

How we do this

Our program has two files lagrange.m and ImgPro.m

the first one calculates Lagrange function by getting three input consisting of all X s, all Y s and wanted X .

Next, we render the image into three 2-dimensional arrays (zoomedR, zoomedG, zoomedB) the RGB codes I mean!

Next, we use three “for” loops to calculate the rows and the columns and diagonal (places that are empty in our zoomed version of original image matrix)

The third “for” has two part one of them calculate the Lagrange by the row and the other one is by column and then we use the average of them as a better estimate.