Term Project Proposal: Math Based OCR

It is an undeniable fact that it is easier to handwrite mathematical expressions and symbols than it is to type them into a computer. Despite the innumerable workarounds that have sprung up to ease the pain of inserting special mathematical symbols into digital documents, digital input of mathematical and scientific symbols remain rather tedious and difficult. Yet it is also undeniable that computers remain a far better solver of mathematical and scientific equations than humans ever will be, and thus in one way or another mathematical expressions must be painstakingly input into digital form. This is the core issue that my term project proposes to solve, a way to input mathematical expressions into computers without the tedious process of writing pseudo code. Instead, the user can simply hand write whatever expression he or she needs and have my program scan, analyze, convert, solve, and display said equations. This combines the intuitive ease of handwriting mathematical expressions and the convenience of computers solving and displaying the results.

The proposed program is split into two processes, the conversion of handwritten scanned images into computer legible form, and the solving and displaying of the results. The first process is the most difficult and involves heavy use of image manipulation, analysis, as well as optical character recognition via machine learning. Using OpenCV the program will first process and parse the image into the individual characters that will be recognized later. This program will also use OpenCV to understand the formatting of the handwritten expression, such as subscripts or superscripts for better parsing. The next step will involve the use of a neural network to perform the OCR operations. The neural net will be custom written without the use of modules as well as the training samples. After the characters are parsed and formatted they will be reconstructed into computer legible code and fed into the sympy or scipy module in order to solve them. Afterwards the results will be displayed on screen using matplotlib.

Note: numpy is also used in this term project, since all other modules rely on it to function

Modules used in this project include: numpy, scipy, sympy, matplotlib, opencv