Name(s)

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Project Number

S1405

Project Title

Using Artificial Intelligence Systems for Autonomous Visual Comprehension and Handwriting Generation

Abstract

Objectives/Goals

Our object is to see if multiple neural networks can be used in a pipeline to parse various types of offline math problems and generate a handwritten answer as well as a human would (with at least 95% accuracy). Note: offline here means as an array of pixels, while online means as a collection of points and strokes.

Methods/Materials

Laptop and C++ compiler suite along with libraries for image processing and neural networks. We also used a lot of different openly published training data sets. The pipeline process an image of a worksheet taken from a webcam in a series of five steps: division, identification, parsing, solving, and finally writing the answer.

Results

We found the accuracy of our pipeline to be difficult to measure, as even though all the components are above 90% accurate on tests sets, the actual input of the pipeline is a real-world image which can vary greatly in quality, readability, and style. Thus, further testing is required to analyze its specific accuracy.

Conclusions/Discussion

While the scope and breadth of our pipeline does not greatly improve on previous equation recognizers#especially online ones#our applications are not deeply rooted in equation parsing, and thus many of the same concepts can be used to solve other difficult tasks such as grading simple free-response tests.

Summary Statement

We showed that a pipeline of image processing and neural networks is a good way to solve handwritten math problems.

Help Received

None. We designed, implemented, and constructed this project ourselves.