Towards Sustainable Educational Institutions: The Automatic Assessment of Images in Student Assignments and Exams

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A large and important part of an instructor's role in education is the assessment of students. In some subjects, assessment methods such as multiple choice exams are successfully used to reduce the time required to assess students. In STEM subjects, however, it is argued that the procedure the student uses to get to the final answer is just as important as the final answer itself. Because of this, assignments and exams are structured to build on the student's problem solving skills. In order to assess these types of problems a marker is required. Difficulties with human assessment are that it takes time and can be sometimes inconsistent due to the lack of a rubric or even student biases. Replacing human assessment with artificial intelligence could potentially save institutions millions of dollars annually while at the same time provide students with instant feedback and consistent assessment. The current work is part of a larger project to automate marking of assignments and exams by replacing the traditional paper and pencil type exams with a tablet and stylus equivalent. The present work explores the process and development of the assessment software using a combination of the Java programming language with XML and SVG file format. The resulting software recognizes and marks a specific type of image used in physics and engineering (free body diagrams) that are digitally drawn by students using statistical neural network algorithms.