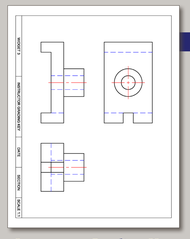
A Web-Based Application that Compares PDF CAD Drawings

Lukas W. DiBeneditto, MET undergraduate
Bailee R. Kruer, CGT undergraduate
Rustin D. Webster, PhD, MET faculty

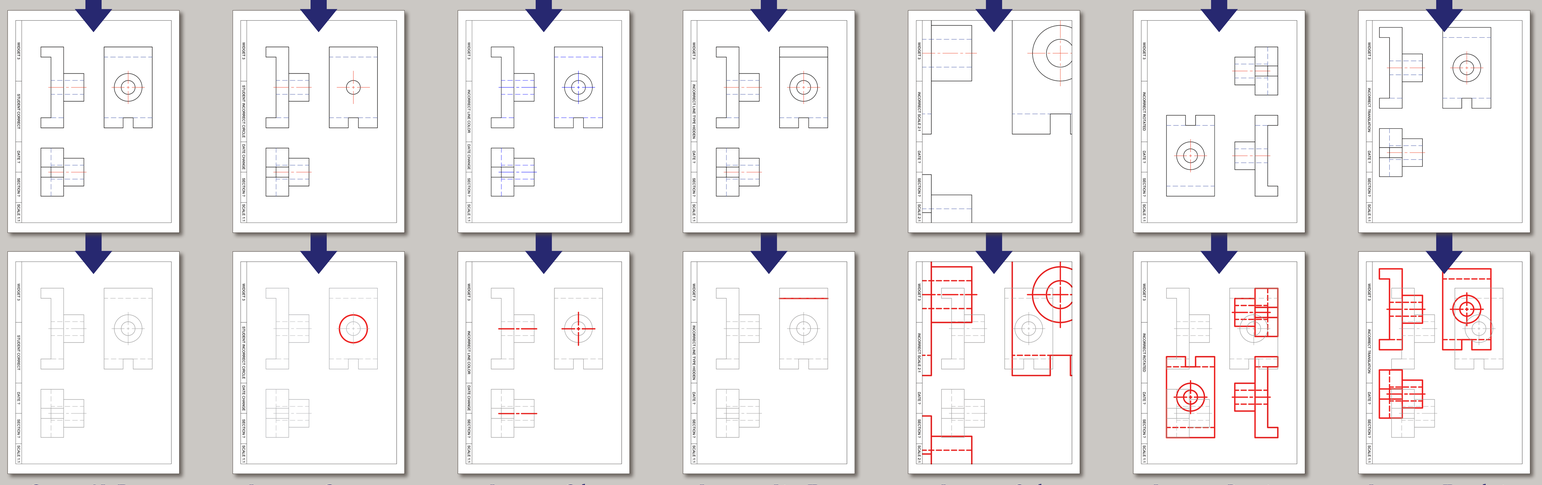
Introduction

- CADcompare™ is a web-based application that automatically compares, displays, and highlights differences in Portable Document Format (PDF) files of Computer-Aided Design (CAD) drawings.
- Capable of comparing multiple PDF files simultaneously.
- Designed specifically to augment the grading process of non-annotated engineering drawings in introductory engineering graphics courses.
- Highlights differences that can be easily missed by a human grader.
- Helps instructors grade faster, more accurately, and without unintended bias.



Instructor Grading Key

These images represent the Instructor Grading Key compared to multiple student PDF files and the results generated by CADcompare highlighting the differences.



Correct - No Errors | *Incorrect - Geometry* | *Incorrect - Color* | *Incorrect - Line Type* | *Incorrect - Scale* | *Incorrect - Rotation* | *Incorrect - Translation*

Purpose

- The purpose of CADcompare is to decrease grading times of engineering drawings and grading bias for instructors in introductory engineering graphics courses. Typically, a course focusing on geometric entities, solid primitives, line types, line precedence, projection types, creating engineering drawings with computer-aided design (CAD) software such as AutoCAD and SOLIDWORKS, etc.
- CADcompare is designed for non-annotated PDF engineering drawings produced by CAD software.
- Often student engineering drawings only differ slightly. CADcompare should be able to highlight those differences quicker than humans, thus decreasing grading times.

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Use Case

- Often university computer systems are set up so that each time the computer is restarted it goes back to a known configuration.
- If every university-owned computer is basically the same and students are instructed to reproduce an instructor given 2D CAD drawing in a certain way, any differences found are potentially incorrect or at least need to be reviewed by a human grader.
- CADcompare highlights those differences so that the instructor is analyzing only what may be incorrect and can ignore the irrelevant (i.e. the correct) parts of drawings, this should decrease grading times.

Market Comparison

	CADcompare	Acrobat	AutoCAD	Creo	NX	SOLIDWORKS
Output PDF Files	✔	✔	✔	✔	✔	✔
Compare Two PDF Files	✔	✔*				
Compare Multiple PDF Files	✔					
Compare Native Part Files				✔	✔	✔
Compare Native Assembly Files				✔	✔	✔
Compare Native Drawing Files			✔	✔	✔	✔
Selection Aligning and Registration	✔**					

**Acrobat "Compare Files" tool displays any small difference as a change to the entire page. ** CADcompare anticipated.*

Pixel-Based Comparison

- In general, computers display images with pixels, with each having a specific location and color value.
- When an image is stored as a file it contains the precise order of the pixels to be displayed and the color values for each.
- If two images are aligned and have what should be the same pixels in the same location but actually have different color values then those pixels are different.

Conclusion

- CADcompare highlights differences that can be easily missed by a human grader, such as incorrect line type(s), color(s), or double lines (i.e., lines on top of each other), as well as automating the comparing of multiple student files to a grading key.
- A research study is planned for Fall 2018 to determine if grading times are decreased.
- The instructor is still required to view and analyze the CADcompare generated PDF differences that have been highlighted and assign the external grade.