AUTOMARKING OF CAD TUTORIALS

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SCOPE

• Introduction
• Objectives
• Review
• Development of Codes
• Demo
• Conclusion
INTRODUCTION

• Solidworks is one of many 3D CAD software used by many educational institutes to teach 3D CAD modelling

• ME2103 Engineering Visualization & Modeling:
  320 – 400 students
  100% CA – Tutorials/CAD Tests/Quiz
INTRODUCTION

Examples of CAD Tutorials & Tests

CONTAINER

TOOL HOLDER

TOGGLE LEVER

PUMP BODY

JUNCTION BLOCK

ROLLER BRACKET

MACHINE VICE

Reciprocating Mechanism

Hand Grinder
INTRODUCTION

• Grading of Drawings & CAD models are tedious and error prone, as they are done manually.
INTRODUCTION

- Grading of CAD Assembly models and details drawings are equally tedious and error prone.
OBJECTIVES

• To investigate the possibility of developing an automated or semi-automated marking/grading system for SolidWorks part modeling and detail drawings.
REVIEW

• Features within SolidWorks
  • Part comparison
  • Draw compare
DEVELOPMENT OF CODE

• Part Comparison
  • Submitted parts consist of single part file
  • Submitted assemblies contain multiple part files
  • Sorting out the part files in these assemblies would increase the efficiency of the program.
DEVELOPMENT OF CODE

1. Open file from reference folder
2. Extract file name & type into separate strings
3. Create new folder in student folder with file name and type
4. Extract student file name into string
5. Does student file name tally with reference file name?
   - Yes: Open student file and save into created folder
   - No: Proceed to next file in student folder
6. Last file in student folder?
   - Yes: End
   - No: Proceed to next file in student folder
7. Last file in reference folder?
   - Yes: End
   - No: Proceed to next file in reference folder
DEVELOPMENT OF CODE

Run Macro
1. Select **Tools\ Macro\ Run**

2. Open the Macro file
3. The main program will appear.

Shortcut
1. Drag the code file into SolidWorks Interface.
2. The main program will appear.
PART COMPARISON

Select **Part Document**
Browse the **Results**, **Submission** and **Reference** folder location
Click **Generate**
The comparison is done in the background
Once completed, popup box dialog “Part comparison completed” will appear. Click OK and Exit to exit the program.
ASSEMBLY PARTS SORTING

Select **Assembly**
Browse the **Results** and **Student** folder location
Click **Sort**
Once completed, popup box dialog “**Assembly sorted**” will appear
ASSEMBLY PARTS SORTING

Click **OK** and **Exit** to exit the program.
DRAWING COMPARISON

- Angle of projection
- Hidden views
- Layout
DEVELOPMENT OF CODE

• Drawing Comparison
  • Identify projection angle and sort into folders for marks to be awarded
  • Projection symbols were saved as <PROJ-FIRST> and <PROJ-THIRD>, hence writing a code to search for Projection text as well.
DEVELOPMENT OF CODE

[Flowchart diagram]
Select Drawings\Sort by Projection
Browse to the Student folder location
Click Sort
DRAWINGS (SORT DRAWINGS BY PROJECTION)
Select **Drawings\ Auto Marking**
Browse to the **Storage**, **Submission**, and **Reference** file locations.
Click **Generate**.
Click the **red crosses**.
Select the drawings in the following manner (Ref)
Repeat the same for the other drawings.
Once graded, the popup dialog box “Completed” will appear
Click OK and Exit to exit the program
Select **Tools**\ Compare\ DrawCompare…

Browse the **Drawing 1** as the referenced file and the **Drawing 2** as the submitted file.
**DRAWINGS (DRAW COMPARE)**

Select `File\ Compare Drawings`

To save results, select `File\ Save Results`

Results are exported as .bmp files
CONCLUSIONS

• A number of issues were looked into and explored
  • Auto Sorting of assemblies
  • Auto Sorting by Projection angle
  • Semi-Auto Sorting of Drawing layouts
• These Auto/semi-auto marking programs were tested with sample files submitted by students.
• However, there are some other points to take note when running the program....
POINTS TO NOTE:

Part comparison – Origin of document (Create models in the Same Orientation and Origin as the master file from the start)

No API yet to automate the Draw Compare.
Exclude annotations between the reference drawing and the student’s drawing.

Bug with Hidden views
THANK YOU
Q & A