Group 9 AI Group Project Model Proposal

AI Path Finding for Laser Cutting

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Description

Scope

The study will focus on a user being able to convert a photo or a hand drawn image into a DXF file that is then optimised and can be exported to be used by a laser cutting machine. A DXF file is an open-source CAD data format which is a type of vector file to enable sharing of drawing data across CAD applications (Adobe, 2024)

Problem Statement

The problem is that converting a photo or hand drawn image into a DXF file for laser cutting can be challenging due to drawing packages not being configured for cutting.

Rationale

Part of this problem can be referred to as the cutting path determination problem (CPDP). As highlighted by Amaro et al (2023) the CPDP aims to determine the most efficient cutting path for a tool to manufacture a part, reducing the processing time and costs and improving productivity.

Aims and Objectives

The aims and objectives of the study is to create an end-to-end product that can take a photo or a hand drawn image and convert it to a format that can be used by a laser cutter. Laser cutters follow a sequence of instructions to cut the shapes so the use of AI-assisted

pathfinding will optimise the cutting order using an algorithm such as a graph-based algorithm.

Methodology

Proposed Approach

The proposed approach is:

- Process the image and extract features,
- Vectorise the extracted edges into vector paths,
- Convert a photo or hand drawing into a DXF file,
- Optimise the cutting order and minimise travel when not cutting.

Project Management method

The project management method we will be using is the agile method.

Project timeline

After the completion of the project proposal, the remaining time will be broken down into two-weekly blocks / sprints as specified below:

1. The first two weeks will be spent researching the problem and finding ways to solve each step of the proposed approach. User stories and requirements will be defined.
2. The following 2 weeks will be building the image processing and vectorisation pipeline
3. Implementing the conversion from vector image to a DXF file
4. Implement pathfinding optimisation
5. Testing the UI and functionality
6. Additional testing

References

www.adobe.com. (n.d.). *Learn About DXF Files | Adobe*. [online] Available at: https://www.adobe.com/creativecloud/file-types/image/vector/dxf-file.html.

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