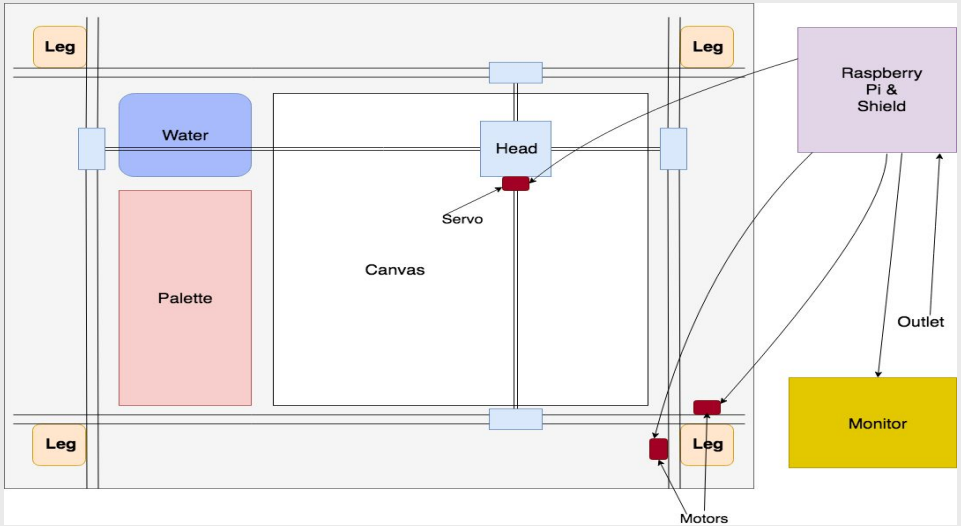
Leonardo Da Robot
Design Review

Team D0

Chris Bayley
Eric Chang
Harsh Yallapantula

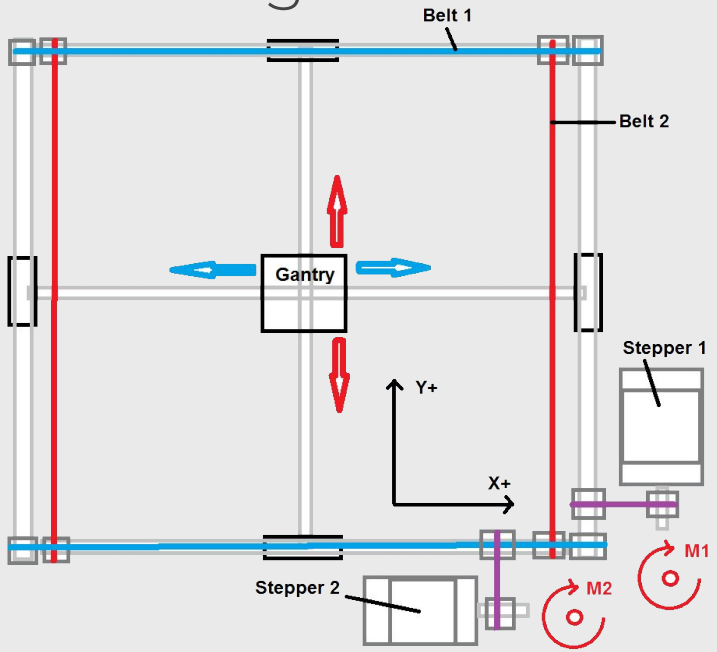
Overview

- A robot that paints a picture on a sheet of paper
- Looks at a digital image to draw
- The goal is to paint an image which looks like it’s been painted by a person



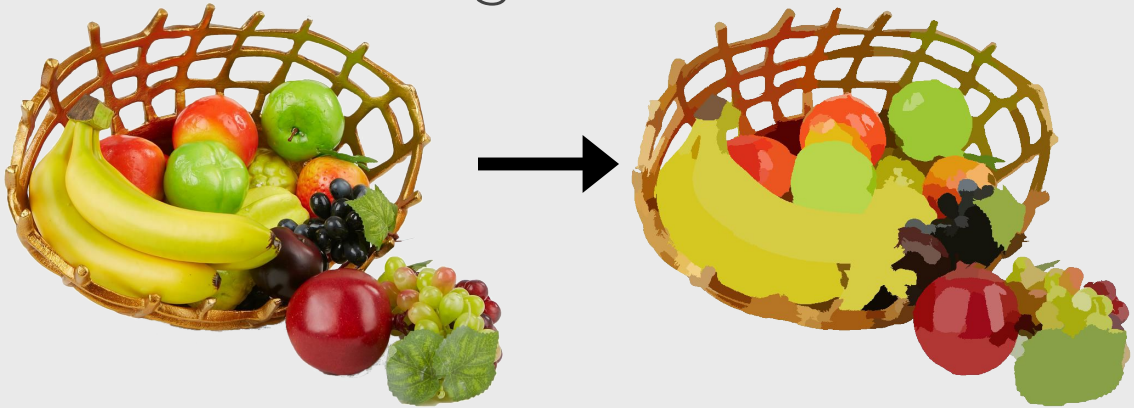
Problem: Coordinating brush

- Use a 2D gantry inspired by 3D printers
- Standing above base of board
- Controlled through Pi motor shield

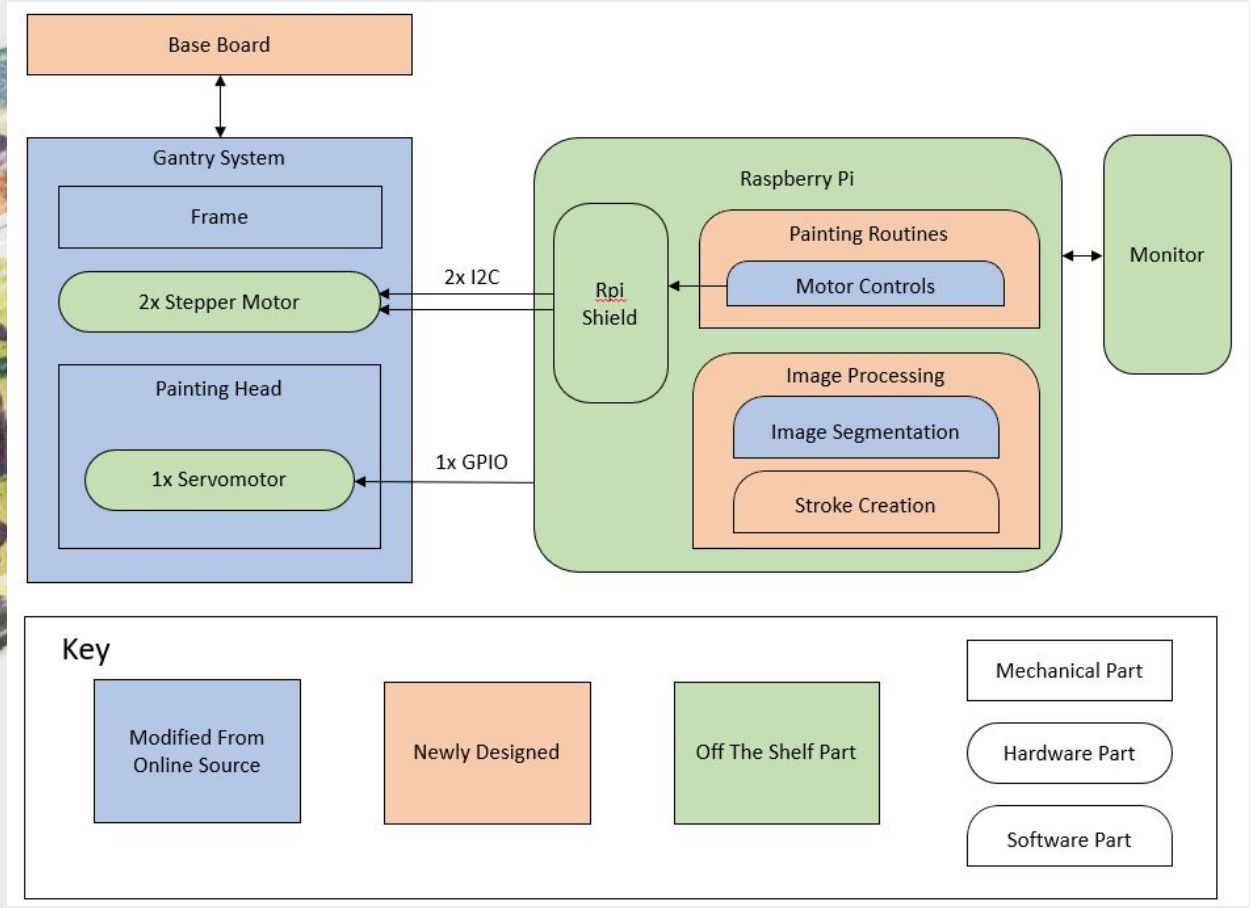


Problem: Image to Paint

- Preprocessing of image into objects of uniform color
- Make list of segments from low to high detail
- Send coordinates and color of segment to robot
- Draw using stroke bank

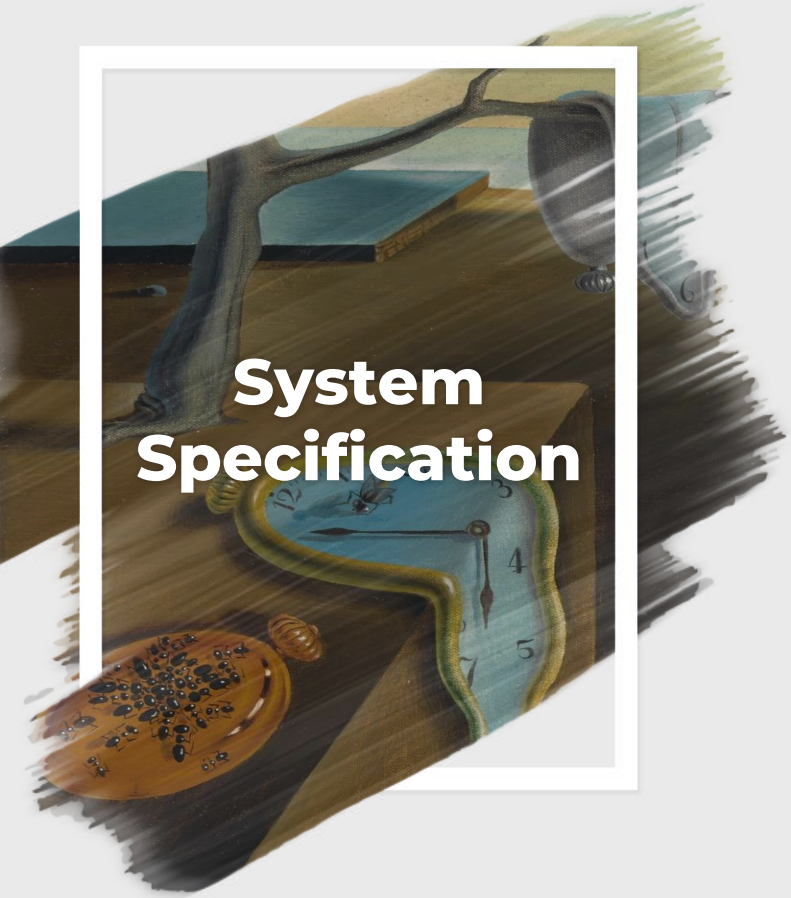


Block Diagram



System Specification

- Gantry offers interface to Pi through motor shield
- Pi and motor shield individually powered through wall adapters
- Interface layer built using stepper motor drivers
- Routines control pigment selection and cleaning brush

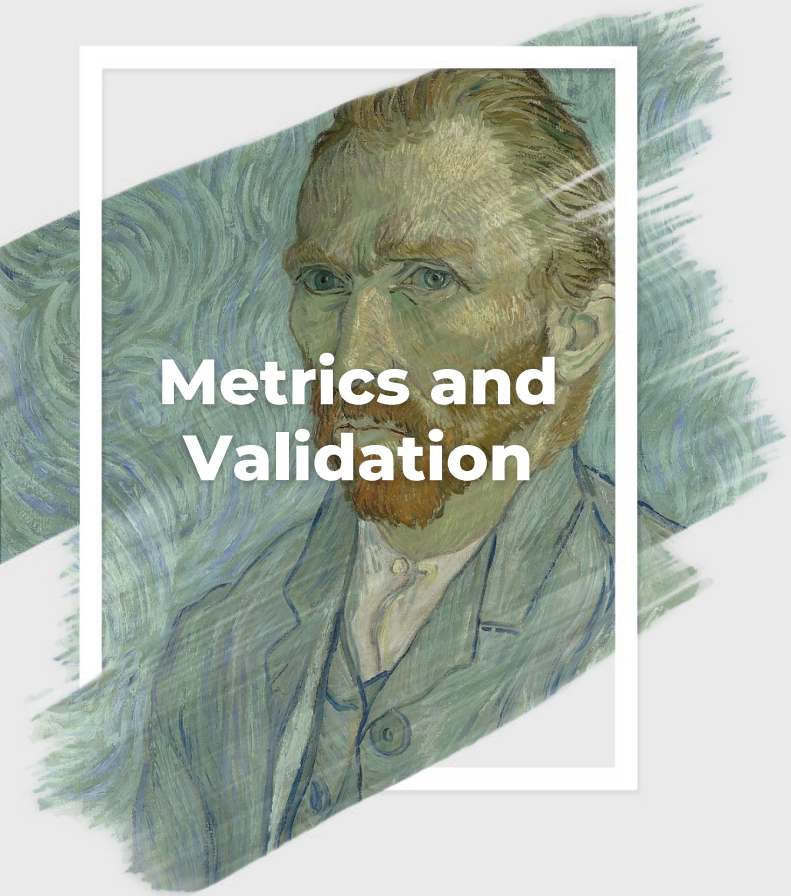


System Specification

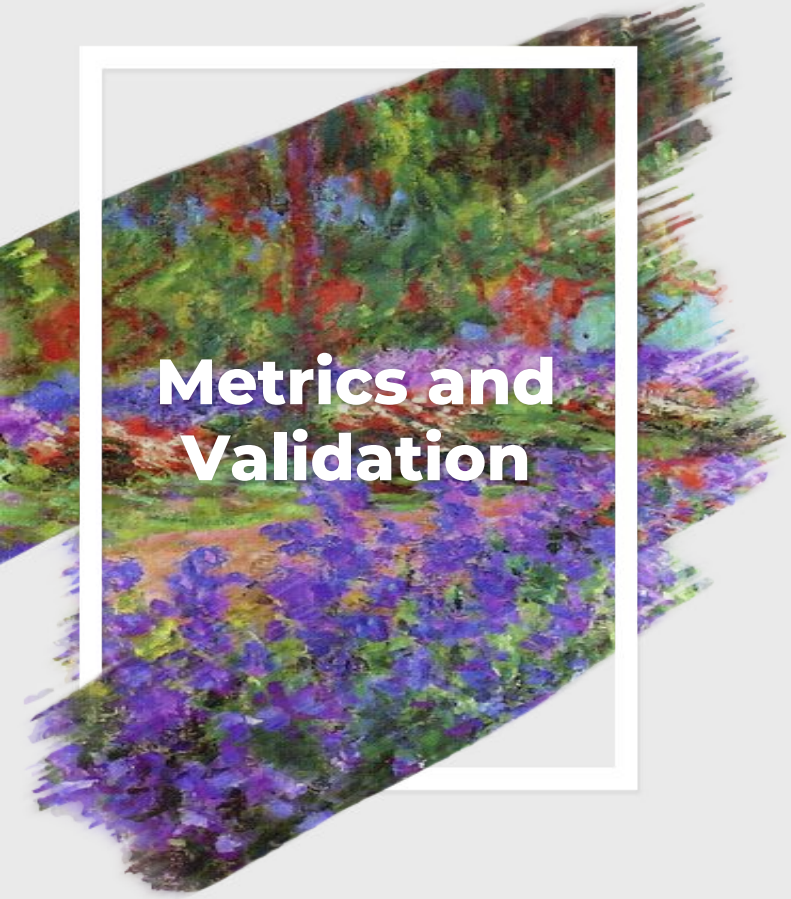
- Monitor display will connect to Pi, allowing selection of image file to paint
- Input image is rendered and displayed back
- Stroke algorithm generates input for gantry interface
- Watercolors used for easy blending

Implementation Plan

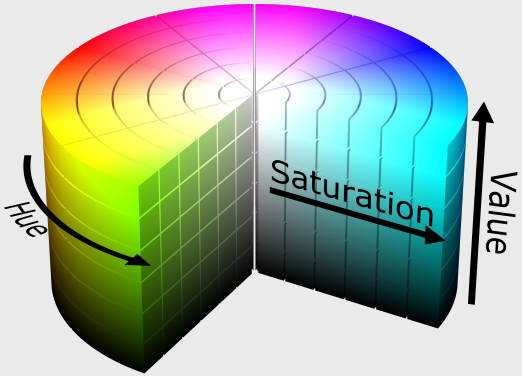
- 2D axis gantry system based off Ultimaker
  - Shafts, belts and bearings are purchased
  - Pulleys and connectors printed
- Using python library for mean shift segmentation and changing parameters to fit our design
- Motor drivers through libraries available from motor shield



- Use various sized image inputs
  - Successful render from any image input
  - Extreme cases like very large, very small, or disproportionate images
- Bank of 10 benchmark images
  - Quantitatively score using structural similarity index, aim for 0.2



Metrics and Validation



- Use color sample image to test color performance
  - Ensure closest numerical HSV color is used
- Use increasing complexity benchmark to test for time vs complexity performance
  - Aim for under 8 hours

Risk Factors

- Time for painting is uncertain and depends on algorithm and hardware
- Unsure of painted image quality
- On test failures, can modify painting routines

Capstone Schedule