

A large, horizontal red brushstroke with a textured, painterly appearance serves as the background for the text. The stroke is centered and extends across most of the width of the slide. A white rectangular border is superimposed over the center of the red stroke, framing the text.

Leonardo Da Robot Design Review

Team D0

Chris Bayley

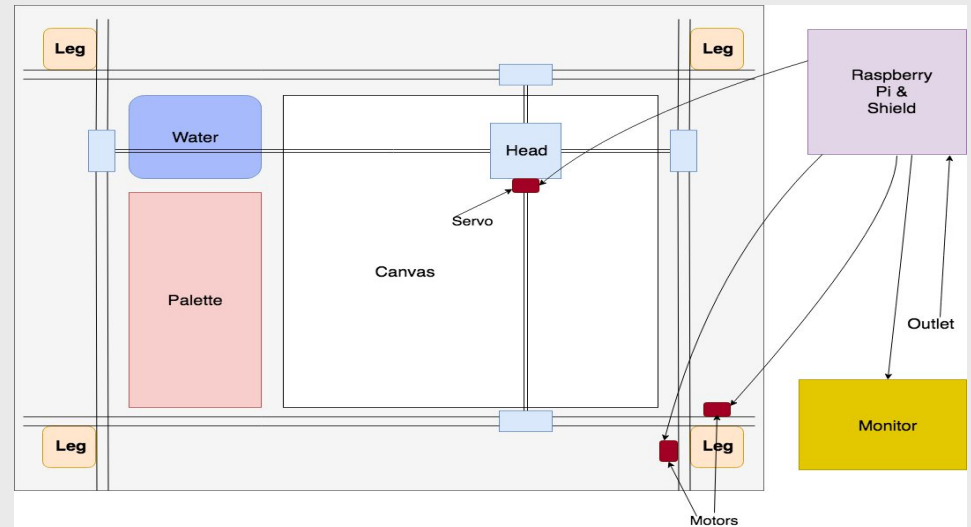
Eric Chang

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

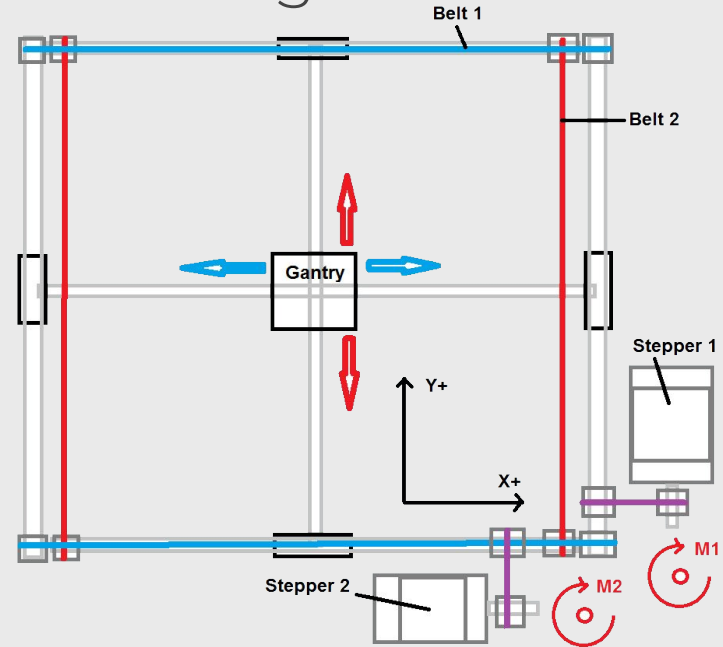




Solution Approach

Problem: Coordinating brush

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

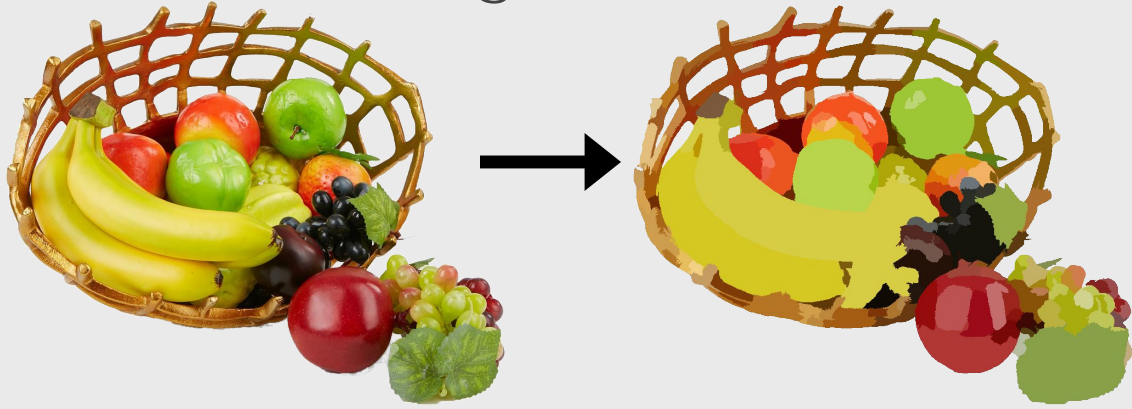




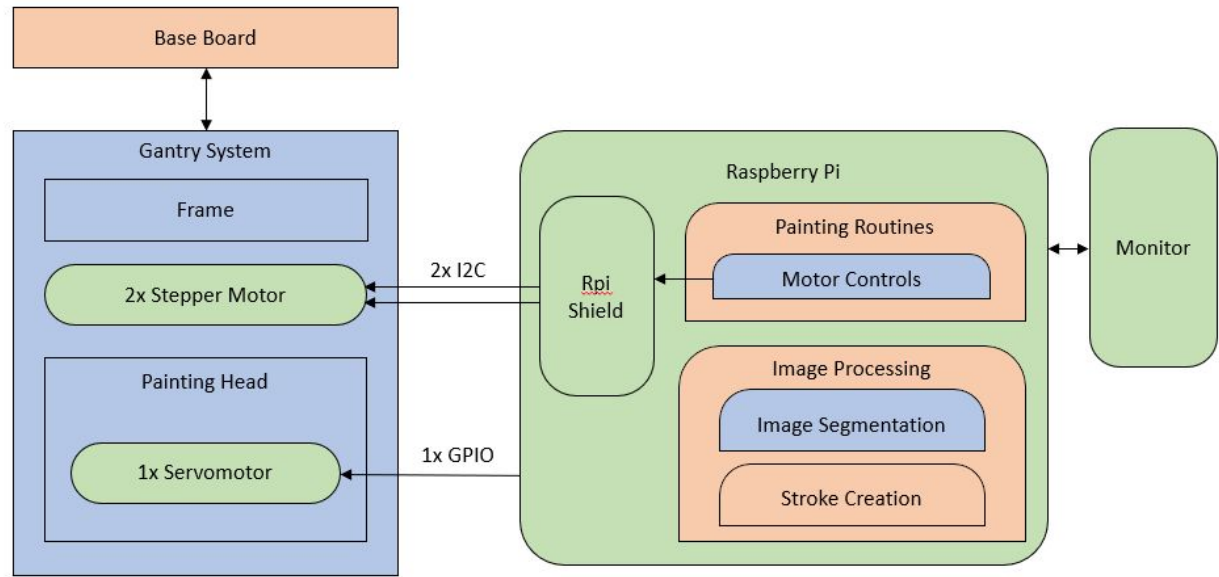
Solution Approach

Problem: Image to Paint

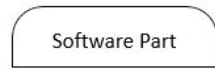
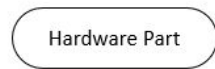
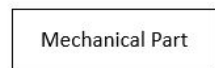
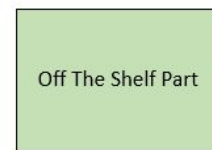
- Preprocessing of image into objects of uniform color
- Make list of segments from low to high detail
- Send coordinates and color of segment to robot
- Draw using stroke bank



Block Diagram



Key





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

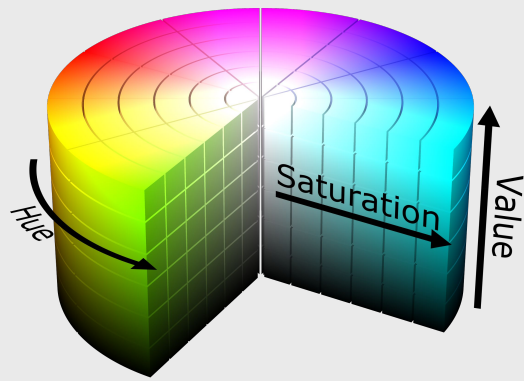
A portrait of Vincent van Gogh's 'Self-Portrait with Bandaged Ear'. The painting is a self-portrait of the artist, showing him with a serious expression, looking slightly to the left. He has a thick, reddish-brown beard and mustache. He is wearing a dark, textured jacket over a light-colored shirt. The background is a swirling, greenish-blue pattern. The portrait is framed by a white border.

Metrics and Validation

- 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

