Team #19

PURDUE POLYTECHNIC

Machine Learning in Motion

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Mentors: Fred Berry (Capstone), Renee Murray (Client)

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Customer Background

The Machine Learning in Motion (MLM) team, composed of (Vertically Integrated Projects) VIP and Capstone students, seeks to develop a system that captures human motion while the data interacts with visual art. Led by Professor Renee Murray, the team utilizes machine learning to create a system that tracks multiple entities (dancers, in this case) so that the data can be used to interact with art.

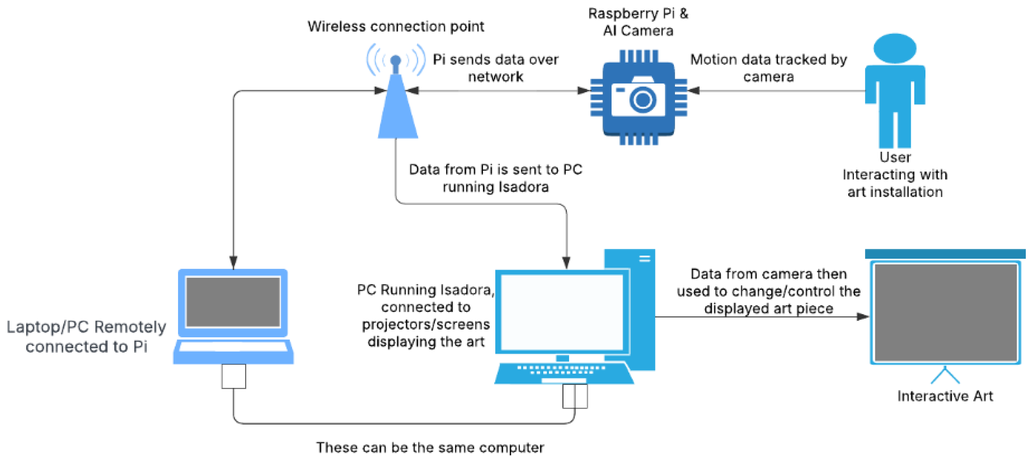
Problem Statement / Scope of work

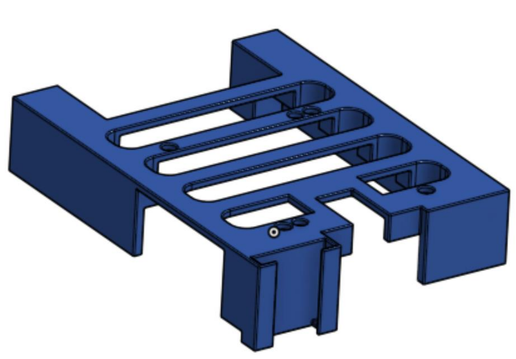
The project focuses on migrating existing motion-tracking APIs onto a Raspberry Pi to improve mobility and reduce cost. The Capstone team split into sub-groups to tackle the mechanical, electrical, and software aspects of setting up motion-tracking on a Raspberry Pi 5, as well as connecting the Raspberry Pi to a computer with Isadora for the interactive art implementation.

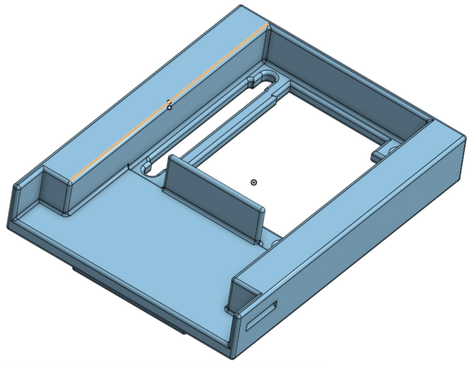
Requirements

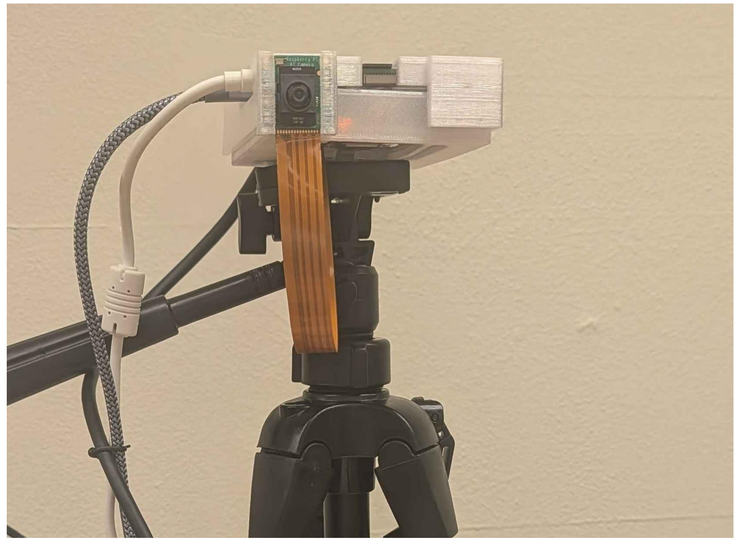
Requirement	Description
Isadora	Isadora is a graphics software that uses nodes to control what visual or audio output is created from input data
Raspberry Pi 5	The Raspberry Pi 5 is what takes in visual data, creates a set of coordinates based on it, then outputs that data
AI Pi hat	The AI hat creates skeletons of the people within the cameras view and then applies joints within a coordinate system
Computer	The computer does not need to be incredibly strong as all it is doing is running the data sent by the Pi and inputting it into Isadora
3D Printer	The case of the entire Pi assembly is 3D printed and designed to connect to most tripods

Final Design









Testing

Req #	Test Name	Test Description	Test Results
1	Set up RPI	Ensure RPI is working and general setup procedures.	Perform correctly just like the instruction
2	Set up motion-tracking environment	Install, set up HAILO library and test.	Require accurate installments on every aspect
3	Create case for RPI with camera	Model and print shell for RPIO.	The case required numerous versions and revisions.
4	Connect RPI to a desktop	Using OSC Client sent coordinate data through IP address	RPI-to-desktop communication established.
5	Test in dance studio	Attend dance recital, check performance of RPI.	Product performed well – few changes to implement.

During testing, several issues were discovered, such as a lagging issue due to the amount of data being processed. The lag was also caused in part by heating problems which limited the abilities of the Pi. Digital issues were uncovered as well, a notable one being the problem of creating an environment on the Pi for the code to run on in the first place.