Team 26

Gyropalm VIMPAACT

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Team Members: Abdulaziz Abuemah, Isaac Miller, Anthony Orloff, Markus Priest, Micah Rassi, Drew Sheridan
Mentor: Frederick Berry

Customer Background

GyroPalm is a universal remote for your wrist. The company is dedicated to the research, development, and manufacturing of the patented wearable gesture control. With the power of their wearable technology combined with open-source software such as ROS you are able to have dynamic control of any and all IOT devices.

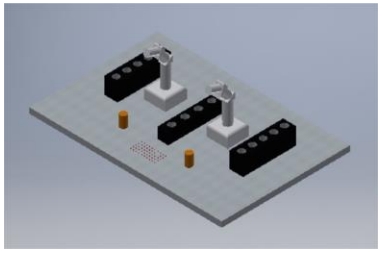
Problem Statement / Scope of Work

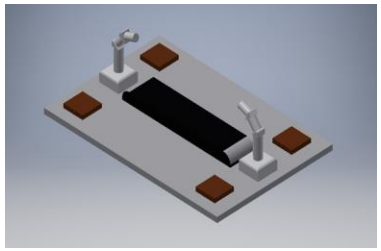
To complete this project, a problem related to sorting or handling will be addressed using a robotic arm powered on Robot Operating System (ROS) and the GyroPalm. A specific issue that has a significant impact on fulfillment, logistics, or other Pharmaceutical adjacent industries paired with a high return on investment will be selected. The advancement will integrate the technology of the GyroPalm with a 5 or 6-axis robotic arm. In addition, this robot arm will be a pivotal part of a larger assembly line. The end customer will be pharmacists, researchers, or production line workers who will integrate the robot arm assembly into their workflow for high efficiency. The user of the technology will be able to perform actions hands-free.

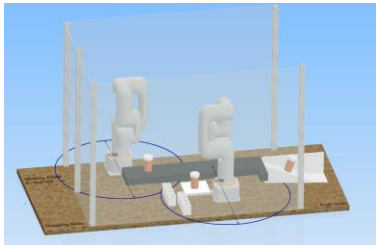
Requirements

Req. #	DESIGN REQUIREMENTS	DESCRIPTION	VALIDATION
1	Completion Time The course and therefore project will last for 32 weeks .	Project must be completed within 32 weeks.	Project Schedule
2	Power The device will be operating on a conveyance system that will require no downtime for recharging.	Device must be wall powered (120 VAC 60 Hz).	Power test
3	ROS controlled system ROS is a popular open-source system with compatibility and support for many robotics platforms.	The robot will be operating on ROS.	Testing
4	Use the Intel Realsense Vision Kit. The Intel Realsense system is a popular and effective solution for machine vision and object detection.	The robot will need to recognize objects that are being sorted.	Testing
5	Use the GyroPalm API to communicate with the GyroPalm server. A long-term goal of the project is to integrate with GyroPalm wearables for adaptive, gesture-based control.	GyroPalm has a cloud-based API to allow for communication between wearables and external hardware.	Testing
6	The robot must be able to lift a minimum of 200g. An example use case for the robot was in the pharma tech industry, so it is important to be able to support the weight of common items in that space.	Robot must be able to lift a pill bottle.	Testing
7	Gripper must open to a minimum 40mm. An example use case for the robot was in the pharma tech industry, so it is important that the robot will be able to grasp a pill bottle.	The gripper must be capable of holding objects such as pill bottles.	Measurement
8	Must have 5 degrees of freedom (DOF). The exact use case for the robot is not yet known, so it is important to have a versatile system capable of performing many different tasks.	The robot must be capable of interacting with a desktop sized work envelope.	Analysis

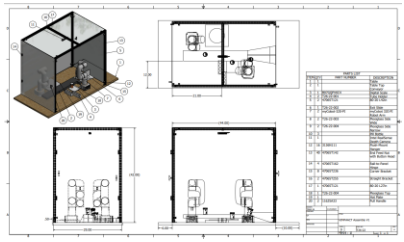
Experimentation and Concepts



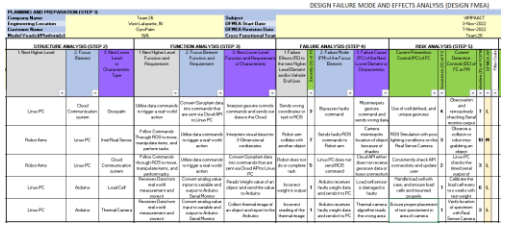




Final Design



Failure Mode Effect Analysis



Testing

Step	Test	Details	Outcome
		Robot Arm Functionality Test	
1	Robot Arm Movement	The purpose of this test is to determine if the robot arm moves to specified location in an expected path.	Pass
2	Robot Arm Force Capacity	The purpose of this test is to see whether the servo motor of the robot arms is effective enough to support the amount of force that is expected to be held by each bottle as one of the missions of the whole assembly line.	Pass
3	Robot Arm Collaboration	The purpose of the test is to see whether the two robot arms of the system can work together to complete the task.	Pass
		Vision System Test	
4	Cluster and Color Recognition	The purpose of the test is to see whether the Trossen arm can work properly using the vision system to determine the desired location and color of the cluster to be sorted.	Pass
		Measurement/Performance Component Test	
5	Conveyor Belt Functionality	The purpose of this test is to see whether the conveyer belt is working and running at the proper speed.	Pass
6	Load Cell Test	The purpose of the load cell test is to see whether the load cell can read the correct value place on the scale and output the value to the Pi.	Pass
7	Thermal Camera Test	The purpose of the test is to see whether the thermal camera will correctly recognize temperature.	Pass
8	Emergency Stop Test	The purpose of the test is to see whether the emergency stop functions properly and can shut down the entire assembly line when the button is pressed.	Pass