Gesture Assisted Mechatronic Enabled Runtime

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Customer Background

GyroPalm, LLC, aims to blend the simplicity of gesture control with the cutting-edge advancements in wearable technology. Through the integration of bespoke gestures alongside AR technology using Gyropalm's proprietary platform, users gain the ability to seamlessly oversee and direct robots to execute tasks within industrial environments. The team's objective is to showcase the versatility and efficacy of employing gesture controls paired with AR within various industrial sectors.

Problem Statement

The project aims to address the challenge of remotely controlling robots within a production environment by integrating Vuzix AR glasses and GyroPalm Encore. The seamless connection between the GyroPalm watch and Vuzix glasses via Bluetooth Low Energy facilitates efficient operation. The objective is to enable users to visualize the robot's environment directly in the HUD of the Vuzix glasses while utilizing the GyroPalm watch for control.
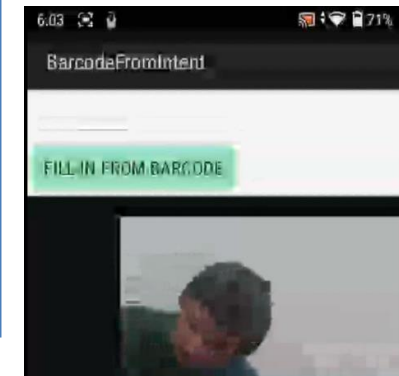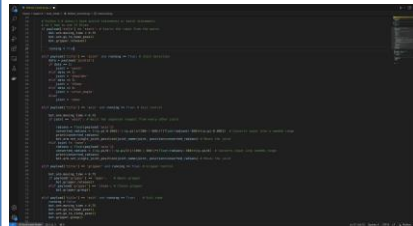
Requirements

Req. #	DESIGN REQUIREMENTS	DESIGN TARGETS	VALIDATION
	RATIONAL		
1	User-Friendly Interface	Create an interface that integrates all components.	Testing
	The user should be able to easily interact with both the GyroPalm Encore [1]https://www.zotero.org/google-docs/?broken=mvvgUZ and the Vuzix Blade [2].		
2	Completion Time	Project must be completed within 32 weeks.	Project Schedule
	The project must be completed by the time the course is completed [15].		
3	Android Application	Create an android app for the GyroPalm Encore.	Testing
	The android app must connect the GyroPalm Encore to the Vuzix Blade in order to use the Vuzix Blade as an AR(Augmented Reality) HUD [19]. This will be accomplished through Bluetooth Low Energy API's in android studio utilizing python programming.		
4	ROS 2 Controlled System	The robot will be operating on ROS.	Testing
	ROS 2 is a framework and set of tools that provide functionality of an operating system on a heterogeneous computer cluster [19]. ROS 2 is required over ROS due to the ability to support Python and C++, and its features of real time capabilities that are more suitable for robotic systems that require more precise timing and control. These robotic systems would be ones that would be used with Encore and Vuzix.		
5	Manual	Project Functions will be defined in a user manual.	Testing
	The steps to pair the Vuzix blade with the GyroPalm Encore will be defined in a manual that will also show pictures defining the gestures and their functions [19].		
6	Bluetooth Connectivity 2.4 GHz, or Bluetooth Low Energy	Vuzix blade and GyroPalm must communicate via Bluetooth	Testing
	Bluetooth connections are one of the most reliable, efficient, and secure ways to connect devices [12] [19]. The Encore and Blade both run on Bluetooth low energy or 2.4 GHz. Our program application must utilize BLE API's and act as a central scanner to discover nearby devices such as the Encore and Blade.		

Experimentation and Concepts
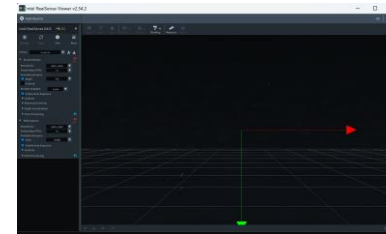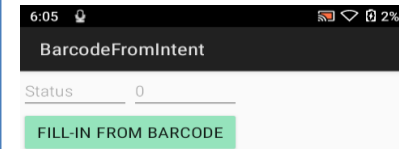
Real Sense Object Detection App

Final Design

- The watch has a menu for starting and stopping the robot, as well as selecting the joint to be controlled.
- Rotating the wrist the watch is on controls the robot joint.
- Snapping starts and stops sending positional data.
- The program on the computer receives data from the Watch and sends commands to the robot based on these commands.
- The positional data from the watch is converted into a range that is more suitable for the given joint.

- The Vuzix Blade AR glasses have an android app running that has an option to fill in MAC address from the GyroPalm watch to connect via the Bluetooth.
- Once the glasses are connected with the watch, it shows the camera stream from IntelliSense camera monitoring the robot onto the app.
- The camera stream is streamed on an IP address which is accessed from within the custom application.
- The app allows the user to monitor the robot's movements remotely via the camera stream.
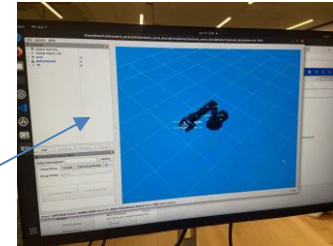
Testing

Linux Box(Robot Movement Code/Heartbeat)

Robotic Arm(Controlled from GyroPalm Watch)

Robotic Program(Shows robot movement visuals as well as different settings relating to the robot)

The QR code containing the MAC address of the watch