

Assignment 1	Project Summary
Course	Practical Robotics and Smart Things - 2023
GitHub Repository	<a href="https://github.com/skndi/smart-claw">https://github.com/skndi/smart-claw</a>

Project author		
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Project name	Smart Claw
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1. Short project description (Business needs and system features)
<p>The rise of ubiquitous connectivity and robotics provides many opportunities for creating appliances which can help people in their daily lives. This project proposes creating a robotic arm, which is motion controlled using a glove. The arm can be used to perform tasks, which involve handling dangerous things, or need exceptional precision.</p> <p>The hardware implementation is based on two ESP32 SoCs.</p> <p>The glove mounted ESP32 is equipped with the following sensors:</p> <ul style="list-style-type: none"> <li>• <i>Accelerometer</i> - Used to sense the movements the user is making.</li> <li>• <i>Button</i> - Used to trigger closing of the claw.</li> </ul> <p>The Smart Claw mounted ESP32 is equipped with the following actuators:</p> <ul style="list-style-type: none"> <li>• 4 <i>Servos</i> - Used to provide 4 degrees of freedom to the arm</li> </ul> <p>The Smart Claw has the following main modes of operation:</p> <ul style="list-style-type: none"> <li>• <i>Sleeping mode</i> - The default mode when the Smart Claw is inactive;</li> <li>• <i>Active mode</i> - Activated when the user turns on the glove and the Smart Claw. In this mode the Smart Claw will mimic the movements made by the user with the glove.</li> </ul> <p>The movement mimicking functionality is implemented by taking readings from the glove accelerometer, converting these to movement commands and sending them to the ESP32 on the Smart Claw where they are translated to servo movements. The communication between the two ESP32 SoCs is implemented using Bluetooth Low Energy.</p>

2. Main Use Cases / Scenarios		
Use case name	Brief Descriptions	Actors Involved

<b>2.1. Turn on the arm</b>	The user must turn on both the Smart Claw and the glove. After they establish a connection the Smart Claw will indicate that it's ready for use.	User
<b>2.2. Perform a movement</b>	The user performs a movement while wearing the glove and the Smart Claw moves in the same way.	User
<b>2.3. Perform a grab</b>	The user presses the button on the glove and the Smart Claw will close its claw and hold it closed until the user stops pressing the button.	User

3. API Resources (Bluetooth Low Energy)				
Service	Brief Descriptions	Service UUID	Characteristic UUID	Data type
<b>3.1. Arm control</b>	Write wanted position of the Smart Claw on the X axis	47db5aa3-ed1e-4a22-ba38-60ab5c98c3f5	88b37a4f-bb3e-4a8f-b8b5-3d88a2d95b7a	float
<b>3.2. Arm control</b>	Write wanted position of the Smart Claw on the Y axis	47db5aa3-ed1e-4a22-ba38-60ab5c98c3f5	79b26af5-bcd5-420f-a907-6926cbd6cf06	float
<b>3.3. Arm control</b>	Write wanted position of the Smart Claw on the Z axis	47db5aa3-ed1e-4a22-ba38-60ab5c98c3f5	070cffd5-3430-4a48-8dec-5e82419a0118	float
<b>3.4. Arm control</b>	Execute movement to the wanted position	47db5aa3-ed1e-4a22-ba38-60ab5c98c3f5	f39a0d51-833e-4bad-9489-fffe4d2f20bd	N/A