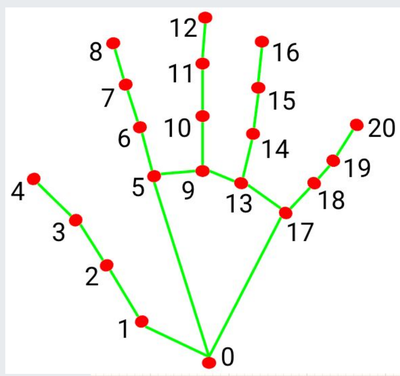
Tower

The project:

This project focuses on creating a responsive camera system that can detect and track faces and recognize hand gestures in real time. Leveraging the power of OpenCV for face detection and Mediapipe for gesture recognition, the camera adjusts its position using servos to keep the target centered. The system uses a Raspberry Pi 4B, an IMX519 camera module, and a PCA9685 servo driver for smooth, precise movements. The mechanical assembly includes 3D printed components for lightweight and durable construction. The setup ensures real-time processing and responsiveness, providing a foundation for integrating the camera tower into more complex robotic systems, such as a robot dog.



0. WRIST
1. THUMB_CMC
2. THUMB_MCP
3. THUMB_IP
4. THUMB_TIP
5. INDEX_FINGER_MCP
6. INDEX_FINGER_PIP
7. INDEX_FINGER_DIP
8. INDEX_FINGER_TIP
9. MIDDLE_FINGER_MCP
10. MIDDLE_FINGER_PIP
11. MIDDLE_FINGER_DIP
12. MIDDLE_FINGER_TIP
13. RING_FINGER_MCP
14. RING_FINGER_PIP
15. RING_FINGER_DIP
16. RING_FINGER_TIP
17. PINKY_MCP
18. PINKY_PIP
19. PINKY_DIP
20. PINKY_TIP

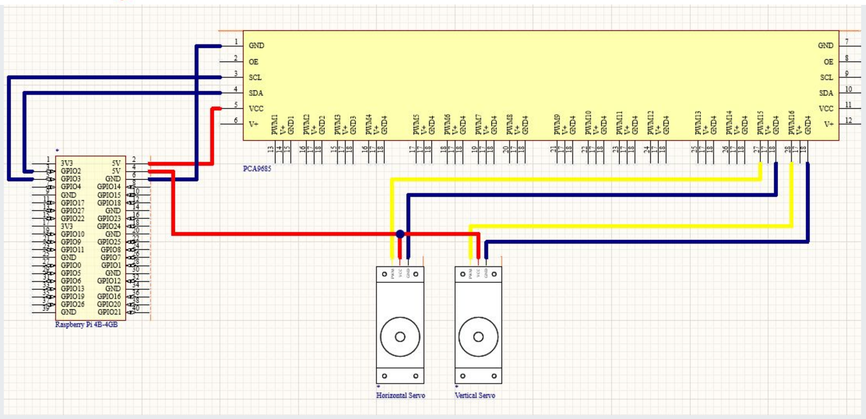


Abb. 1a 1b: Mediapipe and Hardware

The future goal:

Looking forward, the next phase of this project involves integrating the tower into a robot dog design that responds to gestures. This step will enhance functionality and interaction capabilities significantly.

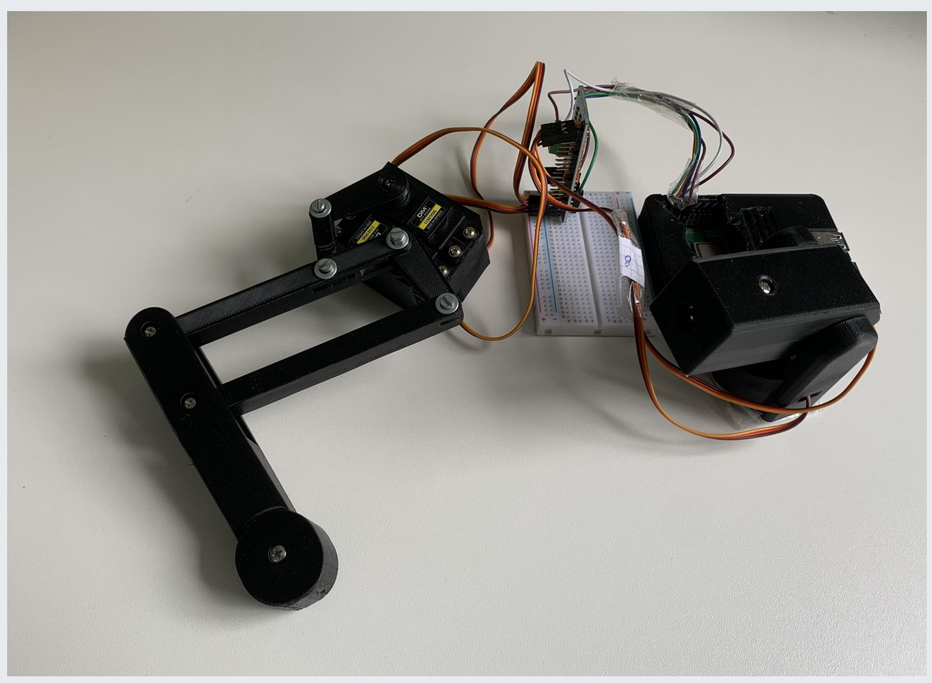


Abb. 2: Robot dog leg

The goal:

Develop a smart camera tower using Raspberry Pi for real-time face and gesture recognition, with applications in interactive robotics and automation.

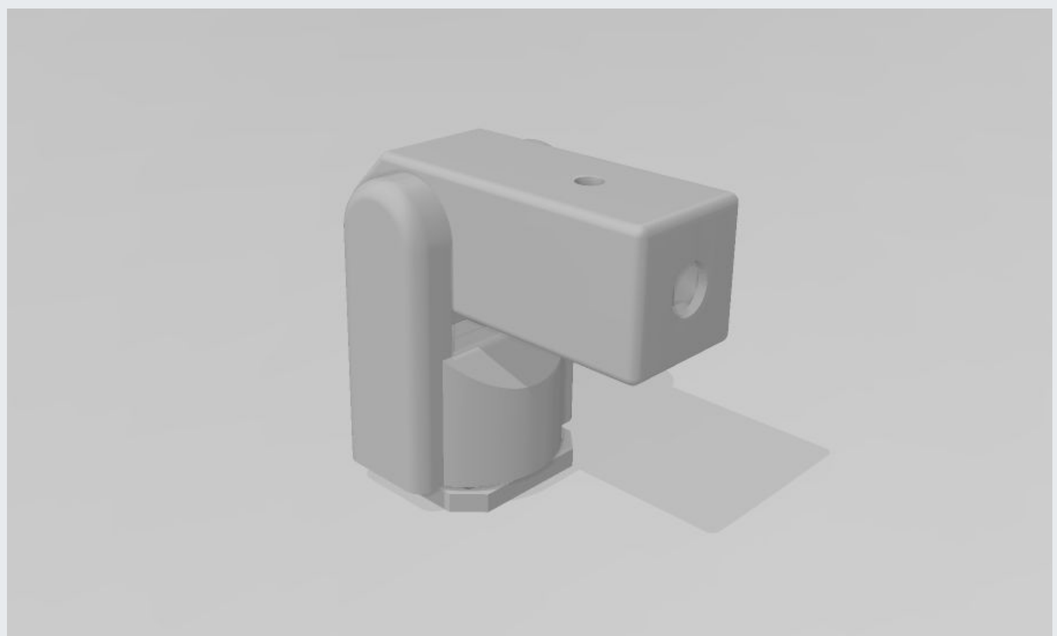


Abb. 3: Tower

The result:

The project successfully created a functional camera tower capable of detecting and tracking faces, recognizing hand gestures, and adjusting its position smoothly using multiprocessing. The system is reliable and efficient, with the capability to be scaled and integrated into more advanced robotic platforms. This lays the groundwork for further developments in interactive robotics and smart automation systems.

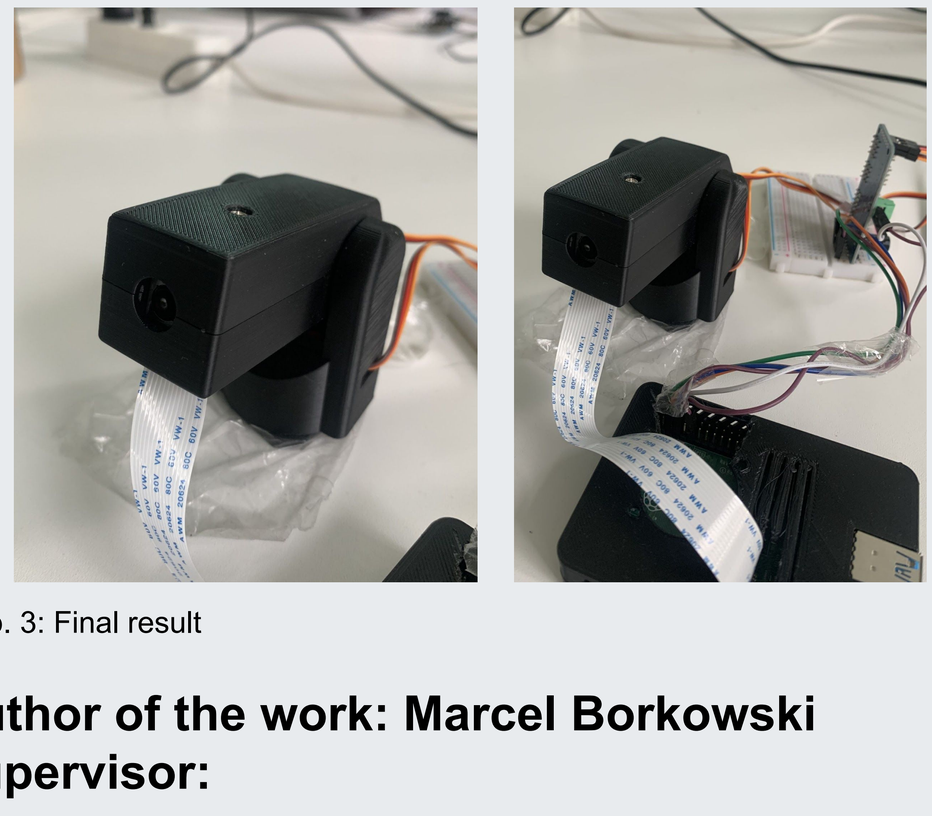


Abb. 3: Final result

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Supervisor: