

The project is a semester assignment developed for the Embedded Systems course, under the supervision of Dr. Minas Dasygenis. The system is based on the PoseNet deep learning model and is designed to track and follow human faces autonomously. The turret can rotate continuously on its vertical Z-axis and tilt up to 75° on the horizontal Y-axis, allowing precise targeting. By moving the camera both on Z and Y rotations, it creates a closed-loop control system that eliminates the need for encoders in the motors and corrects rotational errors using controllers like PID. Distance estimation for face switching is done by measuring face size in video frames rather than using depth sensing, which, while potentially less reliable, proved effective in testing.

The hardware includes the stepper motor 42BYGHW804 of the wantai stepper motors, along the A4988 stepper driver, for Z-axis rotation and the high-torque HS-645MG servo from Hitex for the Y-axis. Both are controlled via an Arduino Nano CH340. Video capture is handled by the Creative BlasterX Senz3D camera, although its depth features were not used due to driver limitations. A Google Coral Dev Board with Edge TPU accelerates the PoseNet model in real-time, offering fast and reliable facial tracking. The system is powered by two separate sources: a power bank for the Coral and a NiMH battery pack for the motors. Software-wise, the movement scripts are written in Arduino IDE, utilizing libraries such as, Servo and A4988, and the face recognition script is written in python, enhancing the already existing script pose_camera.py made by Posenet. The overall system integrates motion control, computer vision, and machine learning in a compact platform.