

Implementing PID Control on a Face Tracker

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Face tracking is a computer vision technology whereby human faces are identified in the frame of a camera and the camera is automatically manipulated to keep the face in the field of view. Face trackers have diverse applications ranging from security systems to social media.

The UVM Face Tracker was developed for use in the Digital Signal Processing Lab to provide a demonstration of the OpenCV face detection algorithm. The system is comprised of a webcam, two servo motors governed by an Arduino Uno microcontroller for x- and y-axis rotation, and a script run in the computer graphics IDE Processing that draws on the OpenCV Haar Cascade algorithm for face detection.

We present the advancement of the face tracker servo control from proportional control toward PID (Proportional-Integral-Derivative) control. The goal is to reduce overshoot, oscillation, and steady-state error in the motion of the camera. Applying integral control to the face tracker had the expected result of making the camera follow the face more quickly, but increasing overshoot and instability. These negative effects may be counteracted by the addition of the derivative term; however, this research exposed inadequacies in the system architecture stemming from the serialzier on the Arduino Uno. A promising future direction for this effort is the inclusion of a more robust microcontroller and the application of derivative control.