What was accomplished in the first part of this lab?

1. Developed a vision-based measurement system for tracking the angular deflection of the needle on an analog meter.
2. Used vision-based measurement to model the static gain, $K_{\theta/v}$, of the analog meter which relates the deflection to the input voltage.
3. Developed a quick ‘open loop’ controller to demonstrate ability to track a desired angular position, $\theta_d$.

- Find that using \textit{static gain} may not be enough to help predict or control overshoot, or to estimate how long the system might oscillate before reaching a steady value; i.e., \textit{settling time}.
- These are important \textit{dynamic characteristics} of a system.
- There may also have been \textit{steady-state error}.
Overshoot and steady-state error in the step response with open loop control. System appears underdamped.
Typical specifications or metrics

- Overshoot (measure of ‘relative stability’)
- Delay time, $T_d$ (50%)
- Rise time, $T_r$ (90%)
- Settling time, $T_s$ (within 2-5%)
- Dominant time constant, $\tau_d$ (63%)
To improve the response characteristics of a system, modify:
1. system parameters by design, or
2. control input(s).

In this follow on lab study:
1. model the system to understand which parameters could be changed to affect and improve response, and
2. study and experiment with control systems to determine if effective in this problem.