**Abstract**

Automatic control systems rely on closed loop feedback to achieve fast robust control. An example of a such a system a servomotor is being explored in the following set of systems. In essence, the feedback is generated by a rotating potentiometer and a tachometer to generate a voltage signal which is feedback through a combination of op-amps that mix it with the driving signal. This way the motors speed and position, affect the signal going towards driving the motor. Throughout the experiment we develop the values of some dimensionless constants, which connect various equations of motion together. The overall all goal of the lab is to develop a full model of a critically damped position and speed control servomotor. The following parameters were found to achieve this end: **kt** (Tachometer Constant) = 0.76 ± 0.05, **km** (Motor Constant) = -980 ± 40, **c** (Velocity Constant) = 1.51 ± 0.05, **kp** (Potentiometer Constant) = 9.8 ± 1.5, **r3** (Proportional Gain) = 0.105, **r4** (Derivative Gain) = 0.50, **VA** (Driving Voltage) = 1Vpp Square Wave 𝛕=9s.

**Conclusion**

We can now conclude several things. Firstly, using active amplification and integrating negative feedback we can create a servo-ed motor. This system is capable of achieving a desired position, desired velocity, or both. In doing this we can tune feedback parameters, in this case resistances controlling the gain of various amplifiers, to adjust the response of the system. This response can be tuned to exhibit under, critical, or over damping. Finally, using the multiple experiments conducted here we get a final table of values used in the equations of motion for our particular servo motor:



|  |  |  |
| --- | --- | --- |
| Symbol | Constant | Value |
| **kt** | Tachometer Constant | 0.76 ± 0.05 |
| **km** | Motor Constant | -980 ± 40 |
| **c** | Velocity Constant | 1.51 ± 0.05 |
| **kp** | Potentiometer Constant | 9.8 ± 1.5 |
| **r3** | Proportional Gain | 0.105 |
| **r4** | Derivative Gain | 0.05 |
| **VA** | Driving Voltage | 1Vpp Square Wave 𝛕=9s |