DIGITAL DC MOTOR CONTROL

Course: Control Engineering Laboratory
Course Code: ELP225

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MOTIVATION

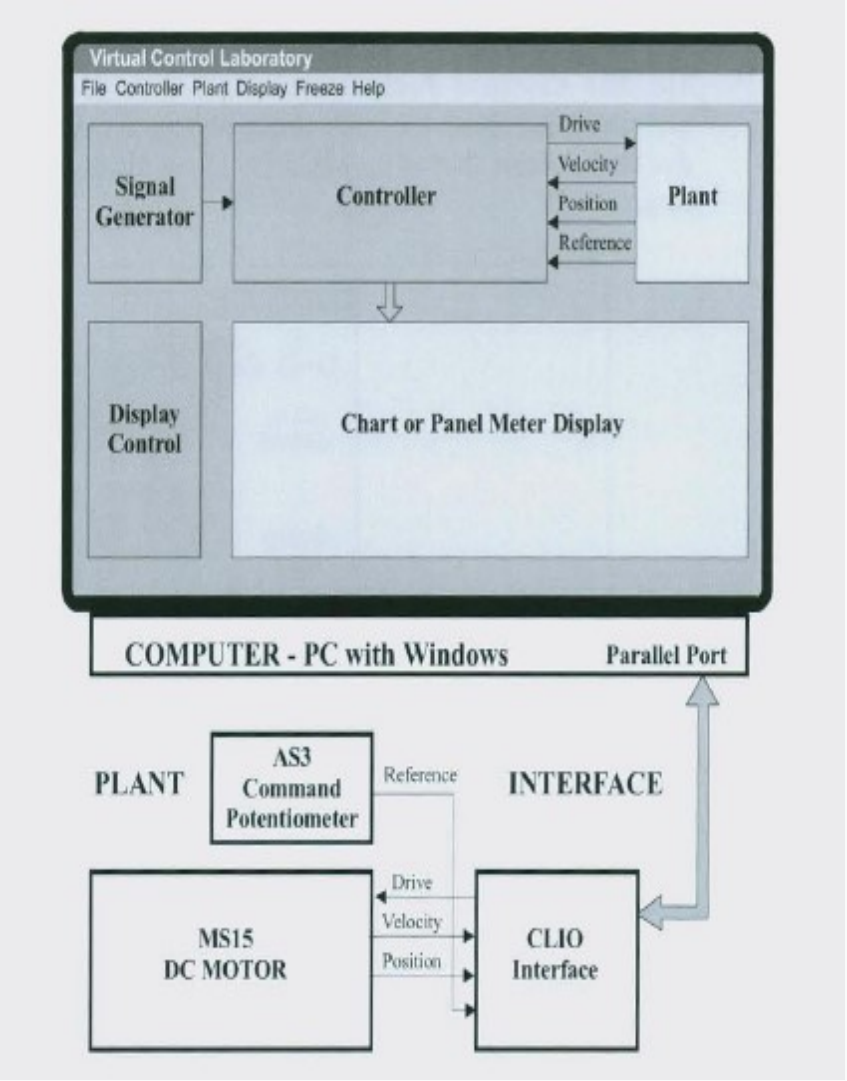
- Throughout industry today, microcomputers are increasingly being used to control electromechanical servomechanisms with applications that can vary from the driving and controlling of elevators to robotic drive and control systems.
- Such use of computer based technology has successfully eliminated the need of different traditional instruments that included signal generators, oscilloscope, multimeter or controllers (as was required in the case of ”Analog Motor Control”).
- In this experiment, digital control of DC motor is achieved by interfacing a PC with MS15 DC Control Module through CLIO Interface Module.

OBJECTIVES

- To study the control of DC motor digitally using Virtual Control Laboratory (VCL) software
- Experiments to be done:
    1. Locate the analog features of the DC motor, Input potentiometer and interface modules, making the required connections.
    2. Getting to know the equipments and operate VCL
    3. Study the time response of DC motor
    4. Study the frequency response of DC motor
    5. Closed Loop Feedback control of DC motor
    6. Proportional Position Control of DC motor
    7. Study the behaviour of second order system in context of DC motor
    8. Position Control with velocity feedback
    9. PID Control

EXPERIMENTAL LAYOUT

- 3 components: DC motor module, CLIO Interface module, Command Potentiometer
- Virtual Control Laboratory Software, which includes signal generator (External/Internal) and controller settings
- Display of results as a graph, list, meter, bar chart, etc



QUESTIONS

1. Why do we study step response of the system even though theoretically step and impulse response give same information?
2. Why velocity was used to identify the plant time constant?
3. Do the frequency and time models agree reasonably with each other?
4. Can DC motor be accurately modeled by first order lag and why?
5. Were the measured phase lags as expected?
6. What is the output of a linear system whose input is a sine wave?
7. The drive signal never saturates with increasing gain. Explain why?
8. What are the drawbacks of using Proportional Feedback Control?
9. In Proportional Position Control, the closed loop transfer function is unity for low values of proportional gain. This observation does not match with the theoretical results. Why?