

DC modular servo system

Objectives and Applications I

Objectives

- Studying closed loop position and speed control of DC motor.
- Also, studying the effects of gain and loading on closed loop speed control of DC motor.

Applications

Various applications of control of DC motors includes conveyor belts, driving propellers in air crafts, electric traction etc.

Objectives and Applications II

The following Fig. shows the use of DC motor for the driving the propeller of an aircraft[1, 2]. Various thrust levels of the aircraft can be achieved by varying the speed of the DC motor.



Figure: Driving propeller application

Objectives and Applications III

The following Fig. shows the use of DC motor in conveyor belts[3]. The conveyor belt speed can be adjusted by varying the speed of the DC motor.

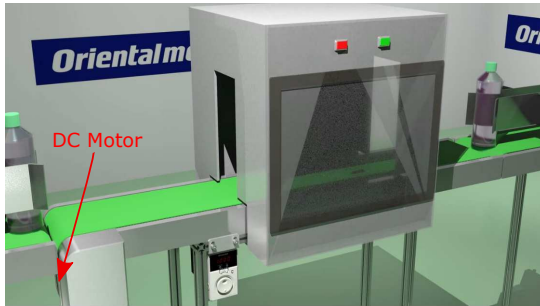


Figure: Conveyor belt

Objectives and Applications IV

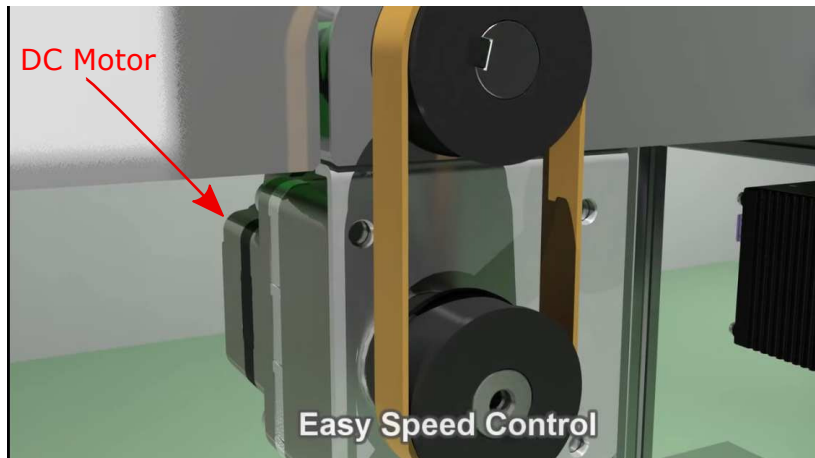


Figure: Motor in conveyor belt

Closed loop block diagram I

The following Fig. shows the block diagram of a closed loop control system.

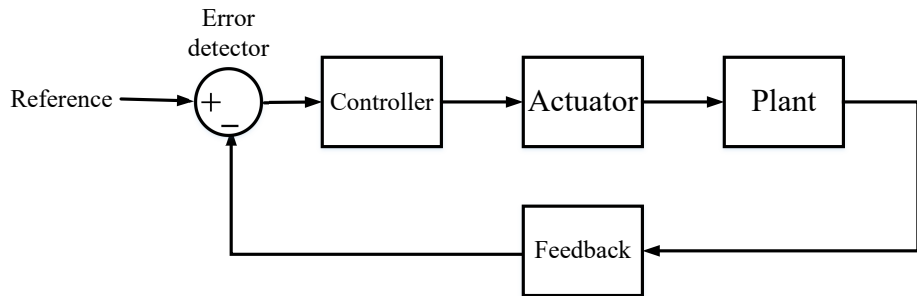


Figure: Closed loop control system

Closed loop block diagram II

The following Fig. shows block diagram of the the closed loop control of DC motor.

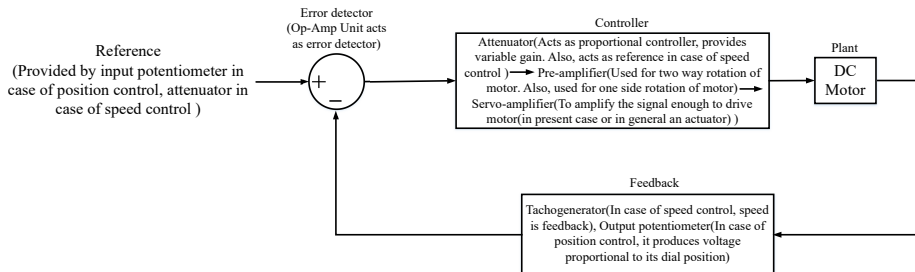


Figure: Closed loop control of DC motor

Questions

- Why are we using the pre-amplifier during some experiments even though we have the op-amp unit as an error detector ?
- What is need of the two out puts of the servo amplifier ?
- What kind of controller are we using in the experiment ?
- What is the effect of loading on the speed of the motor ? Also, what is the effect of the inertia disc on the speed of the motor ?
- Why the velocity feedback increase the damping ?
- What is the effect of the gain on the system performance ?
- What are effects of gain on dead band ?

References

- [1] <https://phys.org/news/2015-04-world-record-electric-motor-aircraft.html>
- [2] <https://www.youtube.com/watch?v=-OTEhBoBwRs&t=4s>
- [3] https://www.youtube.com/watch?v=XZzo5xR_P6I