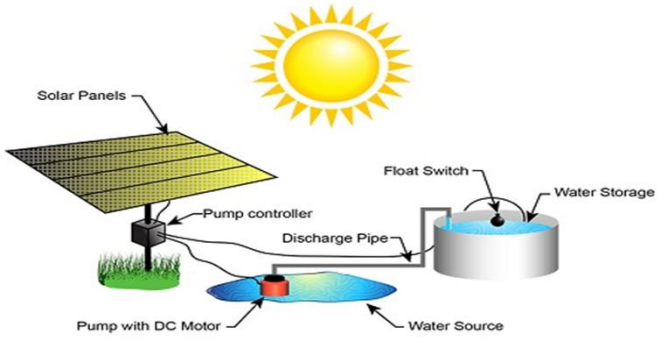



# Control System

## Servo System and its Classification

# Content

- Review of Last Lecture.
- Time Varying & Invarying System.
- Basics of Servo System.
- AC and DC Servo System.
- Significance of Laplace Transform.

# Learning Objectives

- Able to classify Time Varying and Time-Invarying System.
- Understand the basics of Servo System.
- Understand the mechanism of DC servo System.

# Time Variant and Invariant CS

**Time Variant:-**

- A system is said to be time variant system if its response varies with time.

**Time Invariant:-**

- If the system response to an input signal does not change with time such system is termed as time invariant system.

## Time Variant and Invariant CS

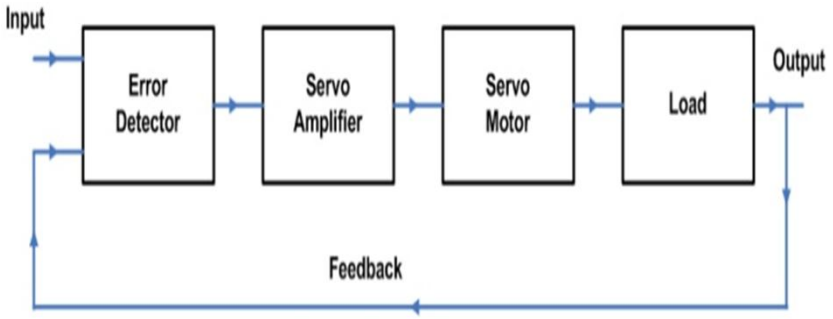
-Consider the cases of - **a bicycle** and **a rocket**.

- The model of the bicycle doesn't change much over time (almost no change during a ride).
- In rocket, tremendous amount of fuel is burnt the mass reduces quickly over short periods of time. This is an example of a time varying system.

## Servo System

- Servo system is defined as automatic feedback control system working on error signals giving output as mechanical position, velocity, acceleration.
- Servo system is one type of feedback control system in which control variable is mechanical load position & its time derivative like velocity acceleration.

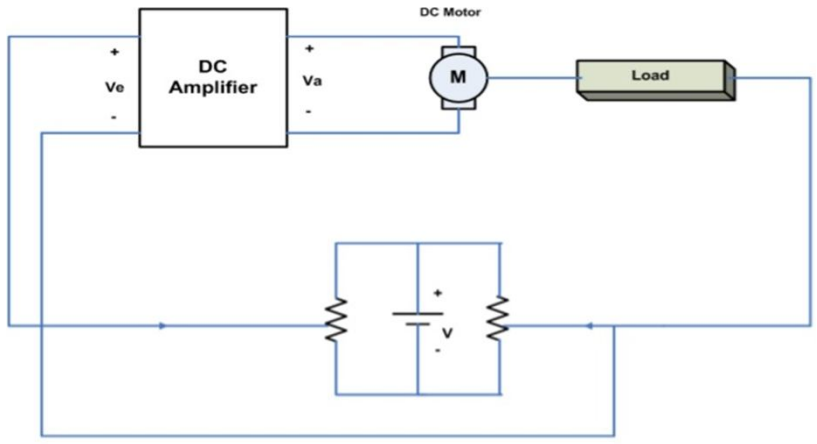
# Servo System




# Difference between AC &DC Servo System

| AC Servo System | DC Servo System |
|---|---|
| Efficiency is low. | Efficiency is high. |
| Low power output. | High power output. |
| It requires less maintenance. | It requires frequent maintenance. |
| Less stability problems. | More stability problems. |
| Smooth operation. | Noisy operation. |
| It has non-linear characteristics . | It has non-linear characteristics . |

# DC Servo System




# Working of DC Servo System

- DC servo system consists of potentiometer as a error detector, DC amplifier, DC motor, DC gear system and the DC load whose position is to be changed.
- Potentiometer has two input i.e. one is reference input and another is actual load position.
- The error between two position is given to DC amplifier which amplify the error.
- Output of DC amplifier is given to DC motor &finally Dc motor change the position of DC load.

## Laplace Transform

- To evaluate the performance of an automatic control system commonly used mathematical tool is "***Laplace Transform***".
- Laplace transform converts the differential equation into an algebraic equation in 'S'.
- Laplace transform exist for almost all signals of practical interest.

## Laplace Transform

- Solution of Integra differential equation of time systems can be easily obtained.
- Laplace transform provides an easy & effective solution of many problems arising in automatic control system.
- Laplace transform allows use of graphical techniques, for predicting system performance.

# Summary

- Time Varying and Time - Invarying Systems.
- Principle of Servo System.
- Block diagram of DC Servo System.
- Use of Laplace Transform.