Introduction to Control Systems

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Introduction

In order to understand about control systems, we will need to first understand some definitions.

1. System

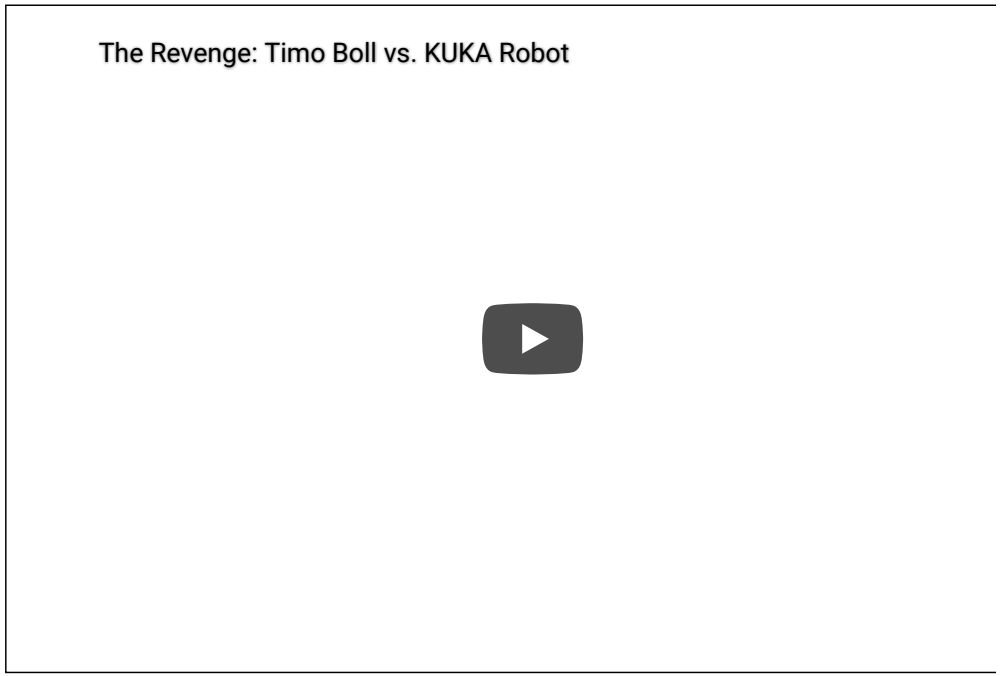
- A **system** is a **combination** or an arrangement **of different physical components** which act together as an entire unit to achieve certain objective.
- For example, **a classroom** or **a lamp**.

2. Control System

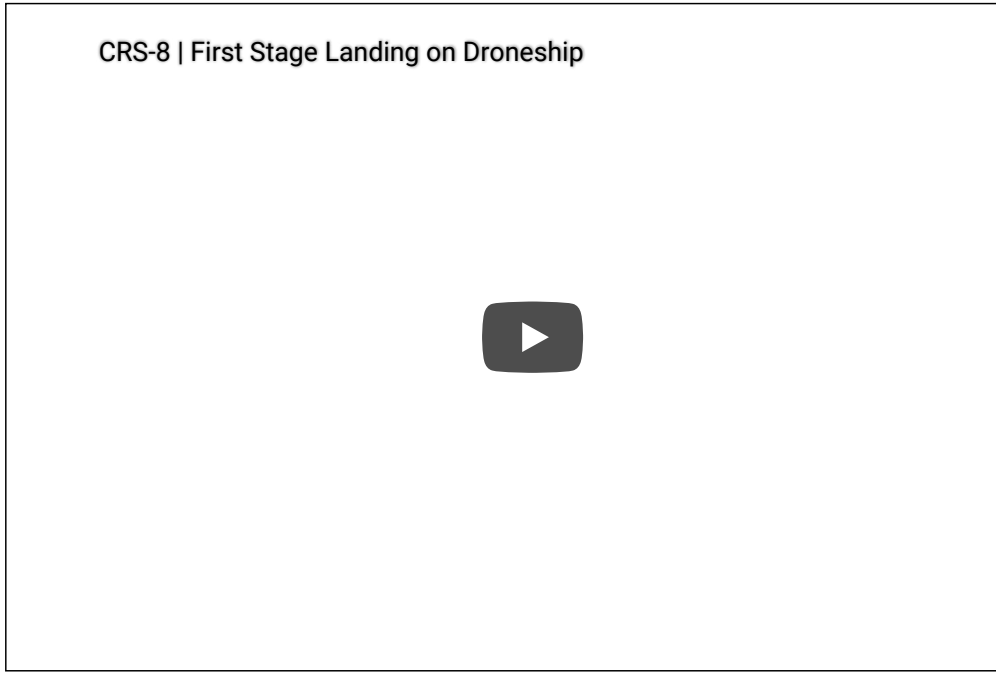
- To **control means to regulate**, to direct or to command.
- Hence a **control system** is an arrangement of **different physical elements** connected in suc a manner so as to regulate, direct or command itself or some other system.
- An **important classification** of control systems is as follows:
  - **Open loop systems**

- A **system** in which output is dependent on input but **controlling action or input is totally independent of the output** or changes in the output of the system, is calle an **Open Loop System**.
- An open loop system is also **called an uncontrolled system**.
- The output of such a system is not controlled as **the system has no feedback**.
- For example, **an electric toaster**.
  - The quality of the toast totally depends on the timer the user sets and it is to be judged by the user.

- **Closed loop systems**
  - A system in which the controlling action or **input is somehow dependent on the output** or changes in the output is called a **Closed Loop System**.
  - A closed loop system is also **called a controlled system**.
  - The output of such a system is controlled **as it receives feedback**. **Proportional Integral Derivative** aka **PID** is an example of a close loop system.
  - For example, **a human being.** Yes you read correctly. The best example is us i.e. humans. Lets see how.
    - Suppose you want to pick up a book.
  - The first thing that you will do is to locate the book using your eyes. Right?
    - Once you locate the book, you will estimate the position of your hand with respect to the book.
  - This is **called as feedback**.
    - The difference in the positions is nothing but the distance your hand will have to move to grab the book.
  - This is **called as error**.
    - Now, your brain will give signal to your hands.
  - This process will continue till you grab the book.
  - Need a **much more complicated example**? Watch this video by **KUKA - Robots & Automation** to understand the importance of control theory in robotics industry.



- Here is one more by **SpaceX** where they landed the first stage of a rocket on a droneship.



- This what control systems are all about. You have **1000s of control systems** around you.
- Look around and determine **at least 3 control systems** and discuss with your team mates.
- Control Systems is a **huge** field of engineering and you have just started your journey.
- Here are some **references** for you to get more information:
- These resources cover material that is **typically taught over the course of one engineering semester**.
- Do not worry, **you will not require** all of this material to solve the Theme tasks.

Voilà !!

You just completed the starter pack of control systems.

References

1. **Feedback Control Systems: A conceptual Approach** by U.A. Bakshi, V.U. Bakshi
2. **Control Theory** YouTube Playlist **by Brian Douglas**:

3. Control Systems Course offered by **National Programme on Technology Enhanced Learnin** (NPTEL) here.

ALL THE BEST
