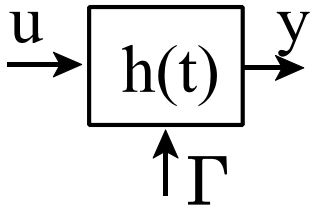
EE 380-1, Course Project - 071

Dr. Ahmad A. Masoud, Date posted: October 26, 2007, Date Due: January 9th, 2008

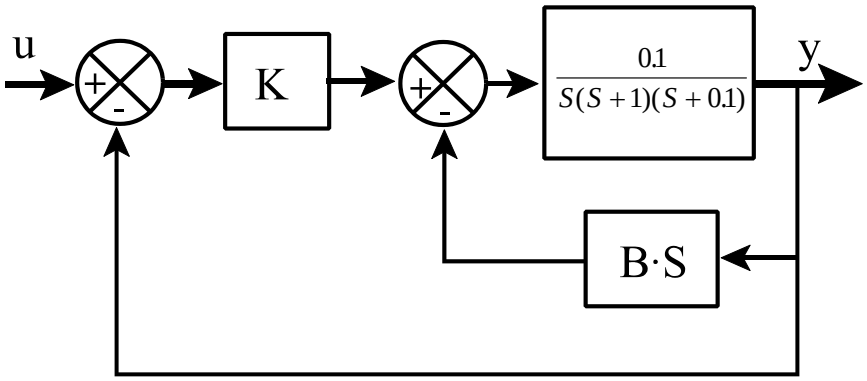
One advantage of using controllers is to make a device operate at a higher efficiency than the one it is originally designed for. A controller can make a slow motor (a motor with a large time constant) behave as if it were a fast motor (a motor with a small time constant). As far as the operator is concerned, this translates to a lot of savings. Instead of throwing away an old, inefficient device, just designed the proper controller for it, if possible, to make it behave as desired.

Behavior adjustment can only be carried out if the system concerned possess two type of input variables. The first type of variables is the one used to make the output of the system (y) complies with the orders of the operator. It is called the control input (u). The second input consists of variables that are used to tune the system. They are called the tuning variables (Γ). These variables are set prior to operating the device and are kept constant during operation.



Tunable system

It is not an exaggeration to say that probably 90% of the work in control theory focuses on system tuning in order to achieve an *a priori* specified performance. Consider the system shown below:



Write a matlab program that automatically tunes the free parameters $\Gamma = [\ K \quad B\ ]^t$ so that the maximum percent overshoot (δ) of the system and its settling time (Ts) are less than a specified value ($\delta < \delta_m$ and $Ts < Ts_m$). If simultaneously achieving such specifications is not possible the program should minimize the cost function:

$$F(\delta,Ts) = C1\cdot\delta + C2\cdot Ts \qquad \text{where} \quad 0 < C1, C2 < 1.$$

You mut submit a report containing:
1- introduction to design
2- methodology used for designing the program
3- flowchart of the program
4- results showing that the program work and the type of response obtained
5- the program
6- comments and conclusions
7- references