Modelling and control summaries

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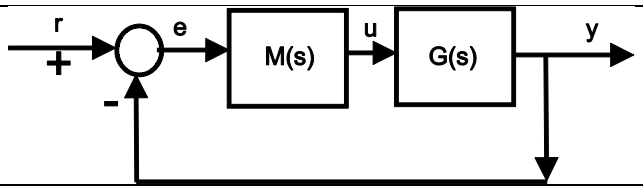
Intro. to feedback 4 – impact of feedback

FEEDBACK INVOLVES MEASUREMENT, DECISION MAKING BASED ON THE MEASUREMENT AND INPUT ADJUSTMENT.
In order to design this effectively, we need a systematic framework for analysing the process.

COMPARING OPEN-LOOP AND CLOSED-LOOP:
Detailed analysis of block diagrams is in the chapter on block diagrams. Here the equations are assumed. Let R(s) be desired target.



OPEN- LOOP (N(s) to be chosen)

$$Y(s) = G(s)U(s) = G(s)N(s)R(s)$$

CLOSED- LOOP (M(s) to be chosen)

$$Y(s) = \frac{G(s)M(s)}{1+G(s)M(s)}R(s) = G_c(s)R(s)$$

The transfer function between the target R(s) and the output Y(s) is very different in open-loop and closed-loop. This means that the closed-loop and open-loop will have different poles, different steady-state gains and different behaviour.

Control laws M(s) used by human drivers
A young driver with lots of testosterone is likely to accelerate fast, brake hard, corner fast, etc.
An elderly driver with slower reactions is likely to be far more cautious, accelerate slowly, brake slowly, corner slowly, etc.
KEY POINT: The use of a different M(s) has resulted in vastly different behaviour, that is, a vastly different $G_c(s)$.

Control laws with poor quality or high quality measurement

1. Learners who receive no comments on their progress are likely to make poor decisions and not improve.
2. Leaners who receive regular high quality comments (measurement) on their work have the **opportunity** to improve.

One key point here is that our ability to make good decisions is impacted by the quality of information we receive.
Students may wish to note that the best way to obtain regular measurement or comment on your own work is to learn effective mechanisms for obtaining this yourself (such as using MATLAB to test answers). Also, make good use of tutorial support.
FEEDBACK is what the student does when they reflect upon the information provided and then make and try out a new decision.

SUMMARY:

1. Including feedback (that is measurement and associated decision making changing the input) changes behaviour but different feedbacks lead to different behaviours.
2. It is important therefore to determine which feedbacks are good and which are bad.
3. We need the skills to identify and design effective feedback rules which lead to desirable behaviours.