Feedback Control over Communication Channel

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Introduction
A feedback control system is a system which feeds back the knowledge of the system dynamical behavior to control the system. Feedback systems are everywhere. For example, a feedback system is applied into air conditioner so that it measures the temperature to turn on or off the compressor motor. Nowadays, controlling a feedback system over communication systems becomes a trend as it is convenient for people to control the machine through communication systems.

Aim and Objective
In this project, the system studied is a swing-up of single inverted pendulum as it is a basic feedback system which has been used in control laboratories to demonstrate the effectiveness of control algorithms for a long time. Through studying the system, different control methods for non-linear and high order dynamic systems can be verified and investigated. For example: Proportional Integral Derivative controller (PID controller) and Linear Quadratic Regulator controller (LQR controller).
System Block Diagram

Control side

- Collect data from workspace through engine
- Visual C++
- Send data to workspace
- MATLAB
  - Workspace
  - simulink
  - Real time workshop
  - Simulation

Client Side

- Visual C++
  - Send command
  - User interface
  - Send data to workspace
  - MATLAB
    - Workspace
    - Graph Plotting
  - Com port
  - Bluetooth tooth

Overflow

Control Side

- Control PC

Client Side

- Control PC
- Mote
- Bluetooth communication channel
The final result seen above whose actual performance coincided with that of the theory. The LQR method can satisfy the controller aim and stabilize the system. Beside, the PID controller fails for stabilization of displacement of the cart.