Digital and Embedded Systems
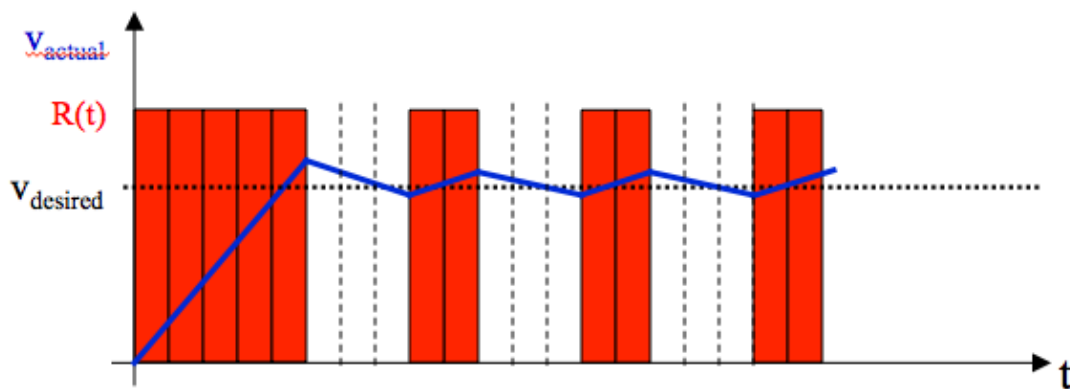Professor Thomas Bräunl
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Tutorial 6 – System Control in C

1. Implement a complete C program for on-off motor control (bang-bang control).

- The motor output pin is GPIO1.
- The encoder input pin is GPIO2.
- The motor is spinning only in one direction, so no motor direction pin is required and a single encoder input is sufficient.

Note:
- The main program has to initialize pins
- The encoder needs to be setup as a interupt to avoid wasting the CPU usage
- The motor routine reads the encoder, calculates the current speed, then decides whether the motor should be switched on or off.

2. Implement a C program that controls the temperature to the room using Hystersis control.

- The heater output pin is GPIO1.
- The heater is controlled through an SCR which requires PWM control, set this up as a separate function.
- The cooling system uses an anolgue controlled Chilled water valve on output pin GPIO3.
- The temperature input pin is GPIO2 and is an analogue value.
- The requirements for heater control is that if the room temperature falls below 20 degrees the heater should turn on at 20%. The heater output should increase as the temperature gets lower than 20 degrees where it will be running at 100% by 17 degrees.
- The chilled water valve should be controlled as follows:
  - If the temperature gets to 25 degrees then the chilled water valve should open to 30%. The valve should continue to open until it reaches 100% at 27 degrees.