Lab 3

Justyn Harriman

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1 Download and build firmware for you PrintrBot

2 Read the source code for the firmware and answer the following questions

Explain what algorithm is used to manage the heater extruder.
The firmware uses a PID controller in order to manage the amount of voltage to send to the heaters. Eac
Initially, set D to a random value? (The code never assigns the unitialized \dTerm", so I assume they a
Then each time \manage_heater" is called:
Set P = The Kp tuning constant multiplied by the current amount of error
Set I = The Ki tuning constant multiplied by the amount of error since the last reset (which could be w
Set D = (The Kd tuning constant multiplied by the difference of the current temperature and the previou
Explain how Marlin implements arcs (G-codes G2 & G3) [motion_control.c]
G-codes G2 & G3 can take the following arguments X(x.x) Y(x.x) I(x.x) J(x.x) E(x.x), where (x.x) is an
(X,Y) are the coordinates for the destination point relative to the current position of the print head
(I,J) are the coordinates for the center of the arc (the position that the line will remain in a fixed
E is the amount of filament that will be extruded over the arc.
From these inputs, Marlin first calctulates: the center position of the arc, the z-axis travel over the
Explain how the steppers are controlled using \blocks"
Planner.cpp has a block_buffer of \blocks" which contain fields for the number of steps a stepper motor
After a new block is created, the planner adds the block to the block_buffer and then recalculates the
The planner smooths out these motions, in order to minimize jerks in motion by the stepper motors. By r
Give an example of how speed_lookuptable.h is used in the firmware.
It's used in line 267 of stepper.cpp and is used there in order to generate the timer that clocks the s
What is the watchdog timer used for?
The watchdog timer is used to make sure that firmware doesn't block for longer than 1 second. If there
Give some examples of what the planner is used for.
The planner is used to plan motion between the current position and a new position using \plan_buffer_l
Where is assembly language used in the firmware? And why?
For an example, line 127 of stepper.cpp a function called \MultiU16X8toH16(intRes, charIn1, intIn2)" is

3 Build a block control flow diagram that covers the general functions of the Marlin firmware and how they call each other.