ECE 411 – Fall 2017
HW#5: Functional Decomposition
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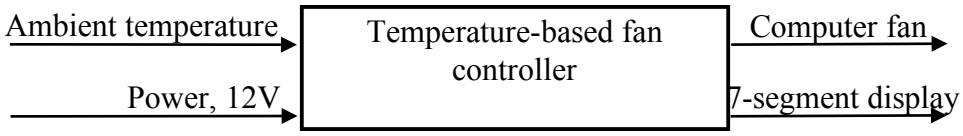
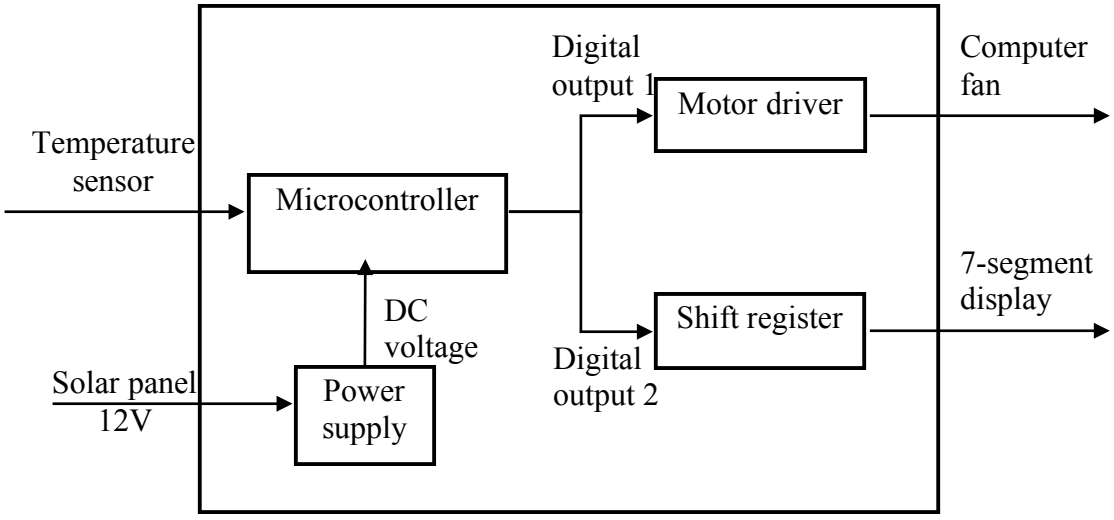
Temperature-based fan controller: Level 0

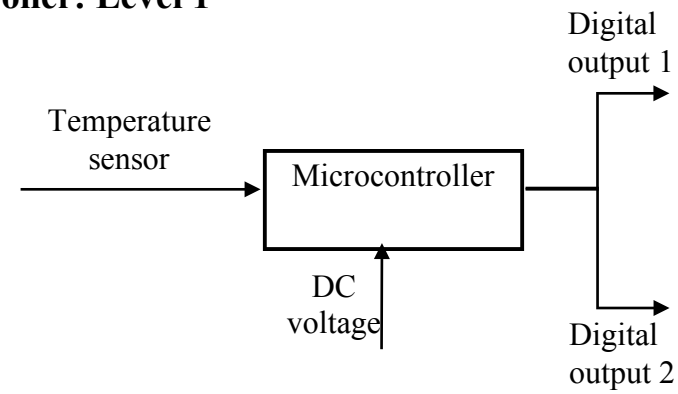


Module	Temperature-based fan controller
Inputs	Power: 12V from a solar panel Ambient temperature: temperature sensor, variable
Outputs	Computer fan: up to 12V and 1A 7-seegment display: 2 digits
Functionality	Reads the ambient temperature and then automatically adjusts the speed of the computer fan and displays the current temperature on the 7-segment

Temperature-based fan controller: Level 1

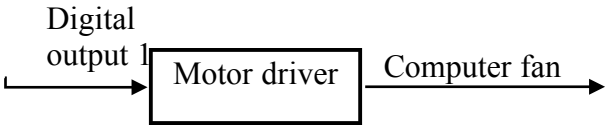


Microcontroller: Level 1



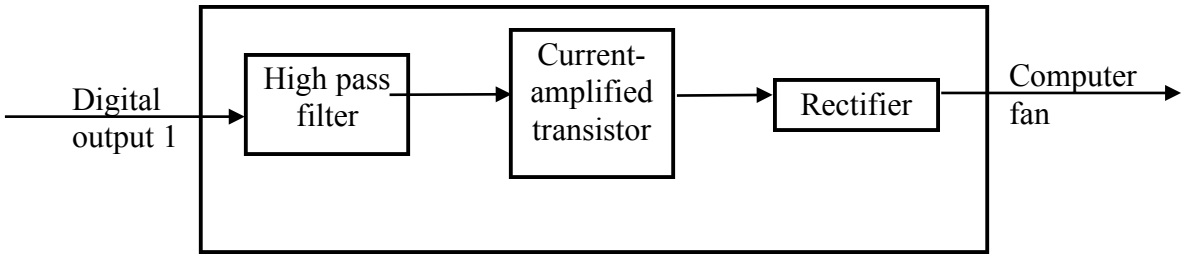
Module	Microcontroller
Inputs	Temperature sensor: -40ºC to 110ºC, 4V to 30V
Outputs	Digital output 1 to motor driver: 40 mA maximum Digital output 2 to shift register: 40 mA maximum
Functionality	Reads and converts the analog temp data to digital input and then compares with the set values to determine the speed of the fan (0-off to 3). Outputs the data to drive the motor driver Concurrently, the temp data after converted is fed to a shift register.

Motor driver: Level 1



Module	Motor driver
Inputs	Digital output 1: 40 mA maximum
Outputs	Computer fan: up to 12V and 1A
Functionality	Ampifies the current level of the signal from the microcontroller to drive the computer fan. The output current is from -1.2A to 1.2A

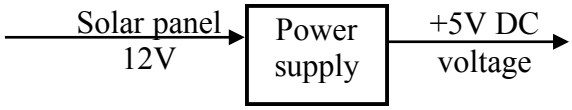
Motor driver: Level 2



Shift register: Level 1

Module	Shift register
Inputs	Digital output 2: 40 mA maximum
Outputs	Seven segment display: I_F= 20mA max, I_R = 10μA
Functionality	Takes the digital data from the microcontroller and displays the current temperature using the multiplexing method.

Power supply: Level 1



Module	Power supply
Inputs	Solar panel: 12V, 20W
Outputs	DC voltage: 5V, 1.5A
Functionality	Filters out all undesired signals to output a pure 5V dc voltage. Also switches the power supply on/off and indicates when power is on

Power supply: Level 2