

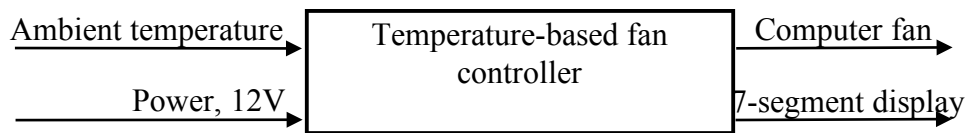
ECE 411 – Fall 2017
HW#5: Functional Decomposition

Temperature Controlled Fan

Group #2: Melinda Van
Reem Abdo
Qiuren Wang
Yusheng Tian

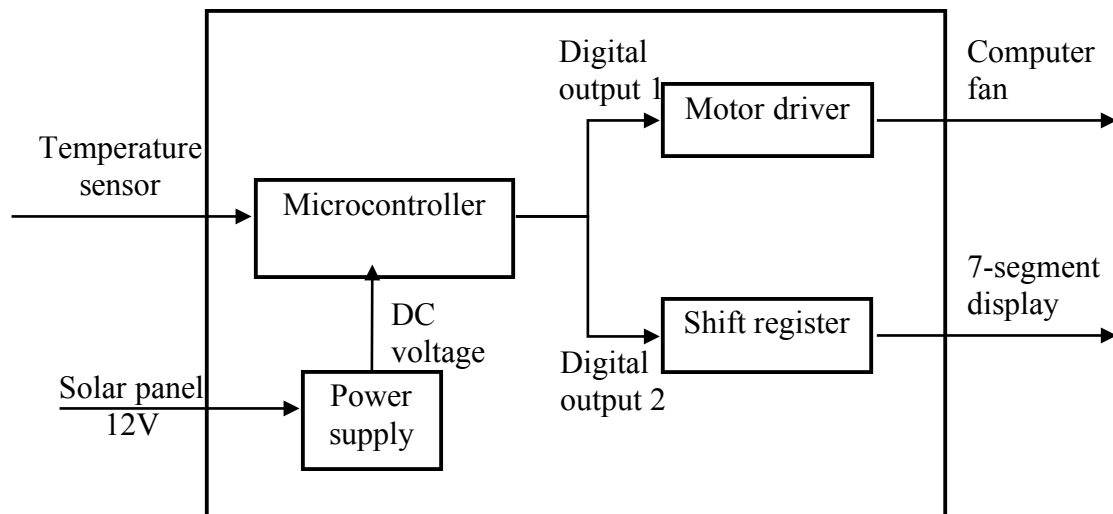
Date: Dec 5th, 2017
Revision v.1.2

Temperature-based fan controller: Level 1

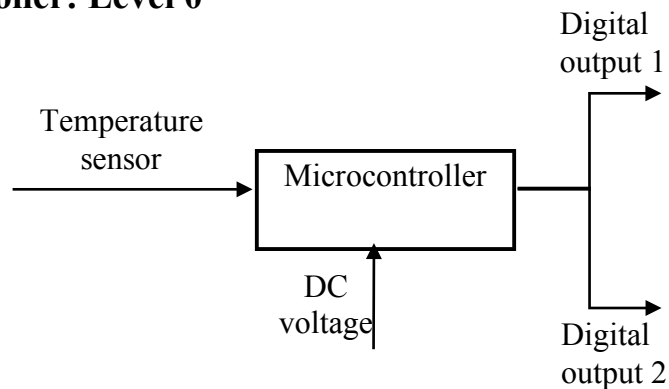


Module	Temperature-based fan controller
Inputs	Power: 12V from a solar panel Ambient temperature: temperature sensor, variable
Outputs	Computer fan: up to 12V and 1A 7-segment display: 2 digits
Functionality	Reads the ambient temperature and then automatically adjusts the speed of the computer fan and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

Temperature-based fan controller: Level 0

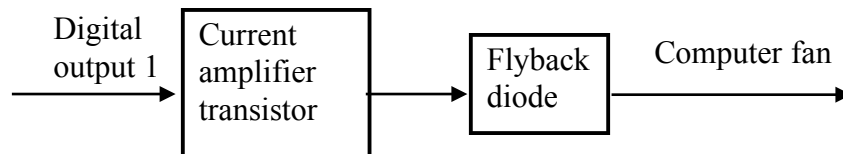


Microcontroller: Level 0



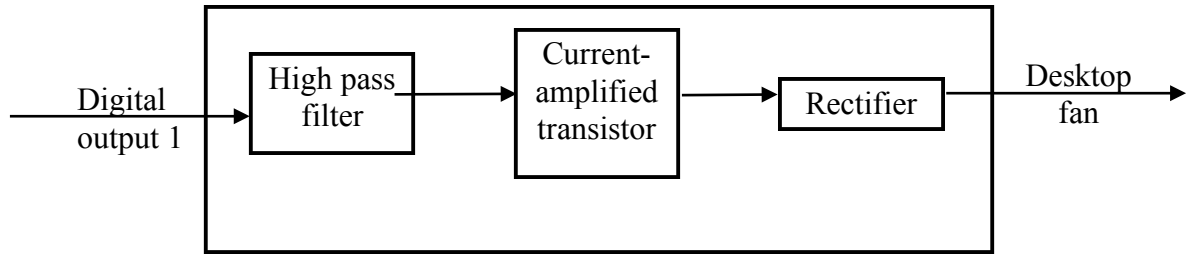
Module	Microcontroller
Inputs	Temperature sensor: -40°C to 110°C, 4V to 30V Input voltage: 5V regulated using the LP2905
Outputs	Digital output 1 to motor driver: 40 mA maximum Digital output 2 to shift register: 40 mA maximum
Functionality	Reads and converts the analog temp data to digital input and 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

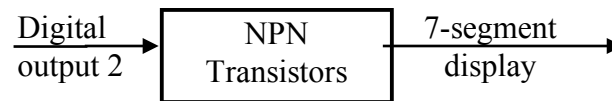


Module	Motor driver
Inputs	1 PWM output from MCU: 40 mA maximum
Outputs	Computer fan: up to 12V and .16A
Functionality	Ampifies the current level of the signal from the microcontroller to drive the computer fan. The max output current is .2A

Motor driver: Level 2

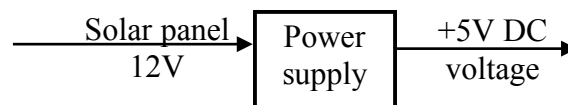


Seven segment display multiplexing



Module	Seven segment display multiplexing
Inputs	2 digital outputs from MCU to the two controlled npn transistors 7 digital outputs from MCU connected to the two seven segment displays
Outputs	Seven segment display: $I_F = 20\text{mA max}$, $I_R = 10\mu\text{A}$
Functionality	The 2 outputs from MCU controls two npn transistors sending signal to turn on one digit at the time. The rest of the outputs are connected to the segment pins.

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

