December 21, 2022

Analog Solar Tracker Project

Group 10

Blocks

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2	Differential Amplifier
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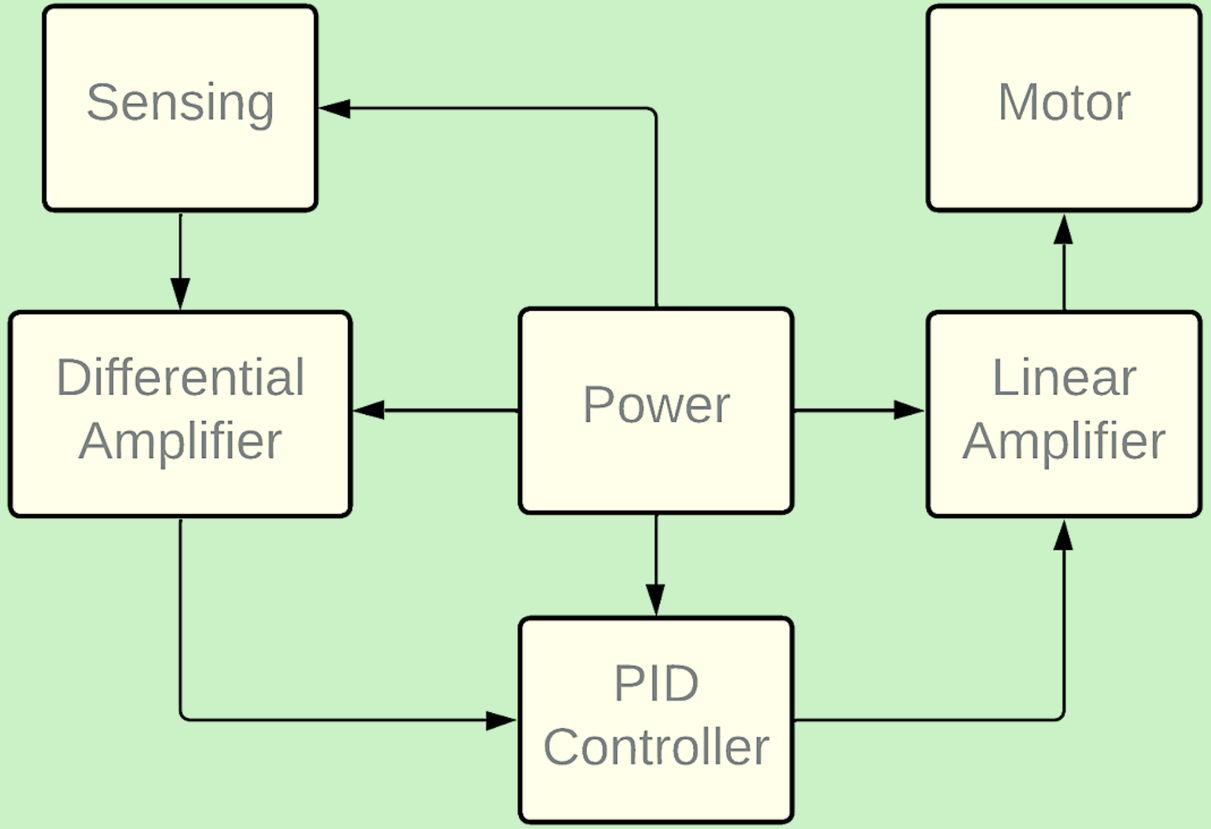


Sensing

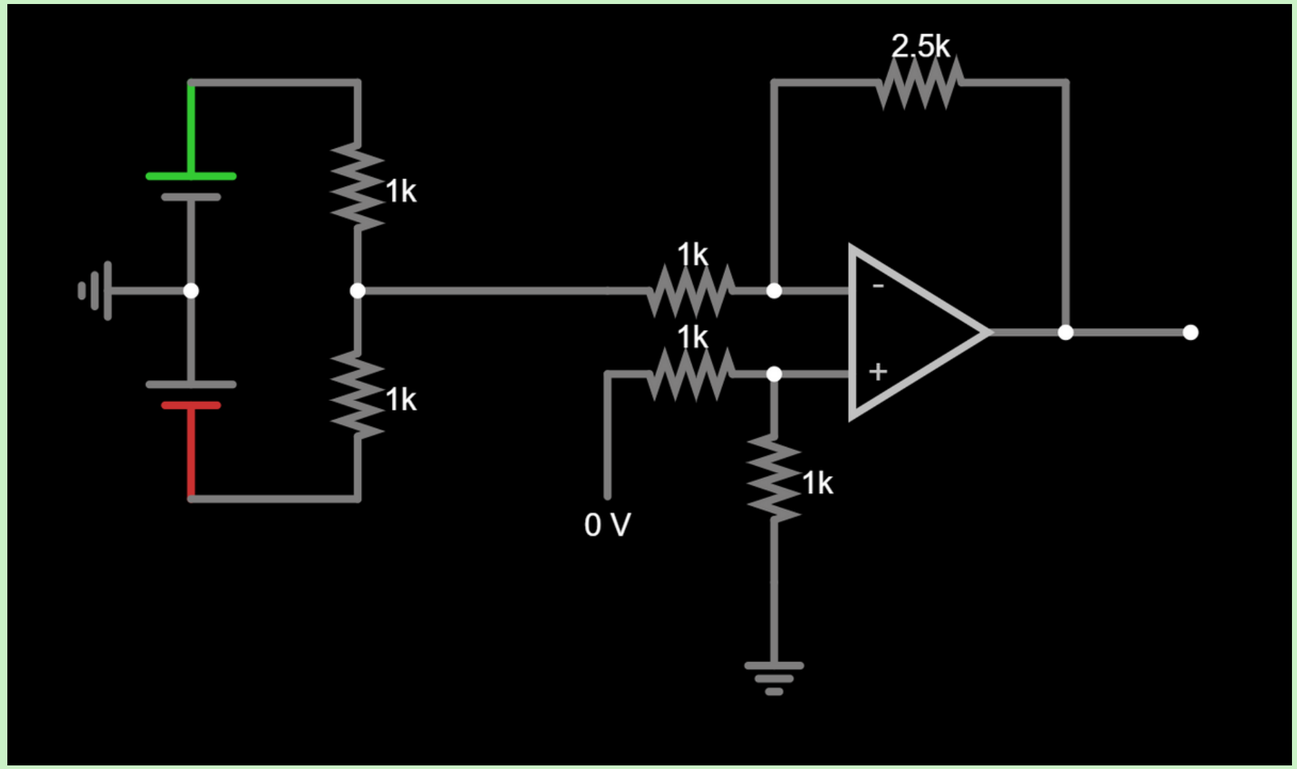
These are the sensors that we use to measure the amount of light falling on the solar panel. These need to be accurate and have a low response time.

Options Available	
LDR	**Photodiode**
We can create a potential divider by using two series LDR. So we might get a voltage value as the output of the sensing part. So, we can give it as a input to our op-amp comparator.	Here we'll get a current which is propotinal to the sensing input. So we can't input this to our op-amp.
Response time is relatively high which makes it quite slow.	Response time is relatively less than that of the LDR.

Which and How many ?	LDR - 2
Placement	On 2 opposite edges(which are parallel to the axis of rotation) of the solar panel.
5 mm, 12 mm or 20 mm	Yet to be decided

Differential Amplifier

We use a differential amplifier to get the difference between the set-point of our choice and sensed output from the sensors. We use the 2 LDRs in a potential divider circuit and we get the voltage in the point in the middle of the 2 LDRs. As it is easier to make the set point zero, we design the potential divider circuit in such a manner where, if the resistance of the 2 LDRs are equal, the voltage of the point in the middle of the 2 sensors become zero.



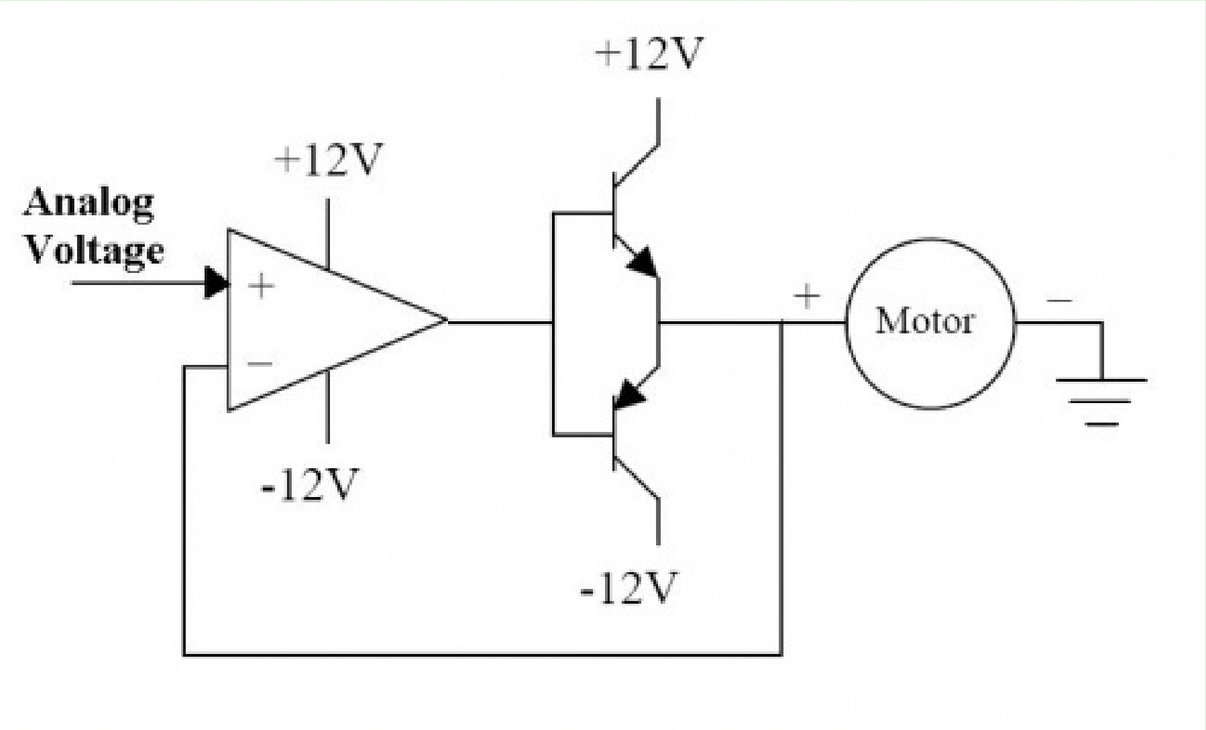
PID Controller

First of all we had to decide whether all the 3 parts of a PID controller is required for this design.

Propotional part	This part is a must.
Integral part	The proportional part cannot lower the difference than some value.
Derivative part	Overshooting might be an issue. Therefore this was needed.

Linear Amplifier

The output current from the PID controller is not enough to drive a dc motor. Therefore the current needed to be amplified while the voltage output of the PID controller remained the same.



Motor

As we are required to present a design with maximum efficiency, we had to consider the available options for a motor.

Options Available		
DC	**Servo**	**Stepper**
An analog signal is enough to drive the motor. A current and a voltage of a considerable amount is required.	PWM	PWM
Not quite efficient	Efficient	Efficient
Fast, Continuous Rotation, High RPM	Fast, High torque, Accurate rotation within a limited angle	Slow, Precise rotation (Accuracy is better than servo motors)

Our decision is to use a DC motor	The operating voltage of the DC motor is yet to be decided. (Roughly 10 V)	Less complexity of driving the motor, since PWM is not used.

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Thank You!