Gram Power (India) Pvt. Ltd.
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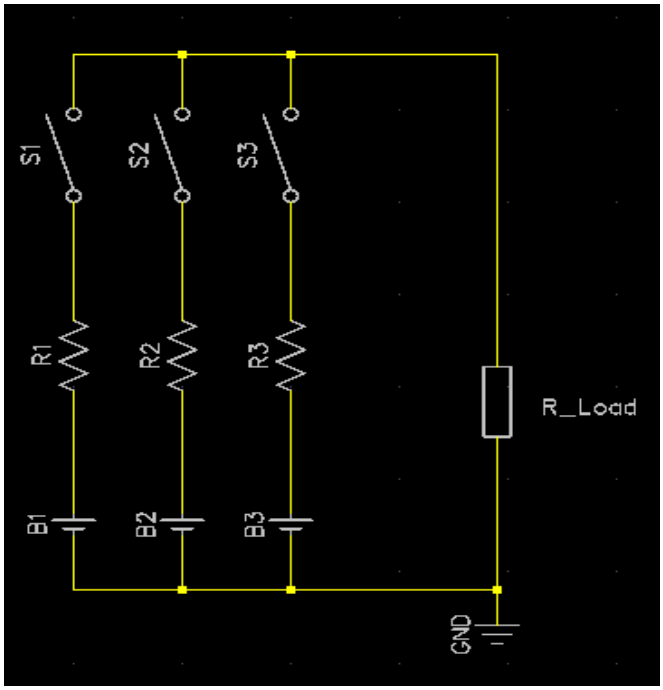
Gram Power Technical Test

Programming Assignment

Today, batteries are the backbone technology of all the Portable electronic devices around us. For optimal operation of a battery pack, the cells constituting the battery pack should all be around the same voltage. Usually, such battery packs have a charge cycle and a discharge cycle. In this assignment, you are required to implement a battery balancing algorithm during the discharge cycle.

The algorithm needs to switch the switches S1, S2, and S3 on/off at appropriate timings such that the voltage of the B1, B2, B3 remains roughly the same throughout the duration of operation of the battery. (B1, B2, B3 are the cells which constitute the battery pack)



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Implementation Guidelines

You are required to implement a simulator which would have roughly the following API

```
bat-sim $ set initial voltage: 10.2, 12.8, 11.3
bat-sim $ set load: 100
bat-sim $ start simulation
bat-sim $ get voltage
B1: 10.2
B2: 12.8
B3: 11.3
bat-sim $ get switch state
S1: OFF
S2: ON
S3: ON
bat-sim $ get voltage
B1: 10.2
B2: 12.6
B3: 11.2
```

Once the simulator is started using the “start simulation” command, the simulator should take autonomous decisions on turning the switches on and off (basically, the battery balancing algorithm should start running once the start simulation command is executed)

The simulator would provide an API for

1. setting the initial value of the cell voltages
2. setting the values of R1, R2, R3 and R_Load
3. getting the voltages of the system
4. getting current being sourced by each cell
5. getting the state of all switches

After a few seconds/minutes, the voltage of all cells should at roughly converge. Once the value of all cells are approximately the same, the cells should keep serving the load till the voltage of the cells reach a lower limit (say 8V).

You may assume that the cells are Lithium Ion cells, and you are free to approximate the discharge curve of the cell with a two-step linear model, as long as you state all your assumptions.

Implementation Guidelines

Pay special attention to the following software engineering principles:

1. The implementation should be thoroughly documented using **Doxygen** (or similar tools)
2. A separate design document explaining your assumptions and algorithm should be submitted
3. Maintain the software in a version controlled repository (preferably **git**). The final zip file that you submit, should have the meta data (.git) folder which would allow us to look through your commits and branches. Using a version control system is not strictly necessary but is definitely a plus.
4. Maintain a consistent casing for variables, functions, casing.
5. Implement a **Makefile** to compile the program.
6. The code should be runnable on a UNIX machine.

--All the Best!--