# Online on xv6 - Scheduler

Section: A1 Time: 50 minutes

Your task is to implement the preemptive SJF scheduling algorithm in xv6. The scheduler should run the process with the shortest remaining job length, and it will preempt a currently running process if a newly runnable process has a shorter remaining time. This means you need to modify the scheduler in proc.c to scan for the job with the least remaining time and switch to it accordingly.

You are provided a user program `testloop.c`. The job length of this program is its iteration count provided as its argument. For all other jobs, the **default length** is **10**. You will add fields in the proc structure for keeping track of the job lengths.

**Sample Input:**

```
testloop 120 &; testloop 110 &; testloop 100 &; ls
```

**Sample Output:**

```
Process 5: Starting 120 iterations at time 35
Process 8: Starting 110 iterations at time 36
Process 11: Starting 100 iterations at time 37
<output of ls, omitted for brevity>
Process 11: Finished at time 167
Process 8: Finished at time 216
Process 5: Finished at time 265
```

**Hints:**

Set CPUS := 1 in the Makefile. You must provide the input in the shell one by one (not all at once).

Observe the execution order: when a new job becomes runnable, the scheduler compares its remaining time with that of the currently running process. If the new job has a shorter remaining time, it preempts the current process. Since `ls` is the shortest job (default 10), it immediately starts running and completes its execution. After that, the next shortest job (PID=11) completes, and then the next one (PID=8), and so on.

The remaining job length must be updated from within the kernel, not from user space. To do this, you may modify the usertrap() function in trap.c. You can insert logic there to decrement the process's remaining time on each timer interrupt. If the remaining time reaches 0, don't wait for the process to finish, terminate it by calling exit(0). **Don't update the remaining time for processes with PID 1 and 2.**

## Submission:

```
git add --all
git diff HEAD > ../2005010.patch
```