Problem Description

A core component of the OPT is the antenna motion simulator. This is a piece of code that simulates the motion of the array. We use this to estimate the length of an observation. Your task is to write a program in the language we have requested that can take a list of scans (observations of an astronomical source in the sky) and simulate the motion of an antenna as it observes those sources. This program should prepare a simulated observation log and estimate the total observation length.

Given:

- Calibration scans require 2 minutes on source
- Target scans require 5 minutes on source
- Variable scans take time proportional to the flux density of their source, according to this formula:

```
time on source (minutes) = -2 × (flux density) + 20.5
```

- A dish can rotate 40 degrees in one minute (change azimuth);
- A dish can raise or lower itself 20 degrees in one minute (change elevation);
- Assume that the antenna starts at 0 azimuth and 0 elevation before the first scan;
- The antenna can move in elevation and azimuth simultaneously and can spin clockwise and counter-clockwise freely.

Your input file format will contain the following fields, separated by spaces:

- scan type, a single character C, T or V;
- azimuth, degrees, a floating point number from 0.00 to 360.00;
- elevation, degrees, a floating point number from 0.00 to 90.00;
- flux density, Janskys, a floating point number from 0.5 to 10.0.

Your program should be robust against malformed input. Your program will take the name of the input file as its only command line argument. It will write the following information to a file, "observation.log":

- One line for each scan with the following format:

```
#1: <type> <total time> <slew time> <time on source>
```

- A one-line summary of the observation in the following format:

```
<total time> <total slew time> <total time on sources>
```

Take care to display time in fractional minutes and try to match the provided output samples.

Slew time is defined as time spent moving the dish, not observing the source.

Note: this program will also be evaluated for readability, maintainability and design. Correctness alone is not sufficient.

To submit your project, please tar or zip your source code and associated build files and send it to us via e-mail. While we prefer use of *GNU make*, you may use your choice of build system (provided it will work out of the box on a generic Red Hat Enterprise Linux v6 system).

In the e-mail, please include a short description of how to build and run your program and a rough estimate of how many hours you spent on this project.

It is intended that this project take 3 or 4 hours to complete.