CISC 105 Spring 2006 Project 2

Due Monday, April 10th at midnight

on MyCourses, paper in my office the next day.

This project is about using parallel one-dimensional arrays and functions to extract information from a data set, and reading data from a file.

Check this directory periodically for updates. When I get questions from students that I think are of interest to the whole class I will put them in an FAQ file in this project's directory.

Trains

All the data for a single train is listed in consecutive lines. For a given train, the time is always increasing, i.e. the earliest train will always come first. However, as in the data file, times do not increase for all trains, just individual trains. Here is some sample data, though you should make your own for testing purposes:

train	station	time
1	101	0100
1	102	0200
2	102	0300
2	104	1500
3	101	0130
3	104	1530
3	103	1800

You may assume the following:

- The train number is an integer 1 - 100
- The station number is an integer from 100 - 1000
- Time is and integer from 0000 to 2359.

1. (30 pts) Write a main function with three integer arrays of size 30. The first array will hold train numbers, the second will hold station numbers, and the third will hold times (see the data file for example data). Each row in the data file has one piece of data for each array, so that the first line has the train number 1, which goes into index 0 of the train number array; the station number 101, which goes into index 0 of the station array; and the time 0100 which goes into index 0 of the time array. Now we can get all the first row data by looking at index 0 of each array.

   Read section 8.1 of your H&K text to see how to initialize an array in its declaration. This way you can put values into each of the three arrays without having to have code to red the data file. Initialize each array to the same values found in the data file (so the train number array would contain 1,1,2,2,3,3,3. How can you tell if your initialization is working correctly?) Then use assignment to place 999 in the train number array after the last valid datum.

2. (10 pts) Write a function called printData that takes all three arrays as parameters (see your notes or H&K 8.5). It will stop printing when it reaches the index that has train number 999 in the train number array (what kind of loop will this be?). Here is the prototype for printData (your array names may be different):

```
void printData(int trains[], int stations[], int times[]);
```

3. (10 pts) Add a menu with a switch statement to your program. Right now the only thing in your menu will be the print option, but as you add each function below to your program, also add it to your menu.

4. (10 pts) Write a void function that takes four parameters: your three arrays and the current time (that means that the calling function will pass in the time entered by the user). The function's job is to tell the user the next train that will stop at a station after a certain time. To accomplish this, the function will ask the user to pick a station number. It will then traverse the station array looking for that number. If it finds it, it will check the time array to see if the time is the closest time so far (hint: this is like finding a min from a set of numbers). Once it determines the next train, it will give the train number and time to the user.

   If it does not find such a time and train, it will print "There are no more trains at that station today." Here is the prototype:

```
void nextTrainAtStation(int trains[],
                        int stations[],
                        int times[],
                        int currTime);
```

   If you have a hard time seeing how to perform this task, sit down with the data, and look at it one line at a time and see how you solve the task.

5. (20 pts) Alter main() so that it will read the data file into the arrays declared in main. Have the user enter the number of data lines expected in the file. Read that many lines using fscanf and put each data field in the appropriate array. Then in the train number array, put the number 999 in the array in the place immediately following the data (Why? How will you use this?).

6. (5 pts) Copy, rename, and modify the function from 4 so that it tells the next station at which a certain number train will stop. If the train has no more stops after that time, have your program say so.

7. (10 pts) Now write a function called readData that reads your data into the arrays so that the file reading code can be taken out of main(). It will need to take four parameters: the number of data lines and the three arrays as parameters. Move your file information into this function and have it perform all I/O operations. Be sure that it closes the file when it is done before returning to main(). This function does not need to be in your menu.

8. (5 pts) Write a function that tells how many stops a certain train will make after a certain time:

```
There are 2 number 3 trains after 1300. They are
3 at station 104 at time 1530
3 at station 103 at time 1800
```

Submission

Design and test your program carefully using data that you make up. Check the calculations! Monday before the project is due you will be given test data and a project submission sheet. You must show that your program performs correctly for all test data, and you must complete the **submission sheet** and turn it in with your project's **paper copy** (when?). Of course, code for your program must be submitted to **MyCourses** along with your script file.