CS23710 Write Up - Owen Garland - owg1

A note on NetBeans.

Unfortunately I made a bad decision to not use the Netbeans IDE, as I prefered to work with Vim. This made the development of the application a lot easier for me as I could write my own makefile and utilise a more powerful text editor. It also allowed me to develop on central directly, to ensure that my program would compile under the correct conditions at all times.

The specification clearly mentions that the project should be made in the Netbeans IDE however, so before submitting this assignment I planned to import my project into Netbeans so that it would be suitable for upload. Very frustratingly, and despite the help of three demonstrators and an Advisory session, we were unable to get the code to run in Netbeans due to a very odd issue.

This is particularly frustrating as my code does compile without errors or warnings and does not crash on central, when I use my plain standard makefile. However when I use the Netbeans Makefile I get a build issue that my functions have multiple definitions, it does not specify where the functions are being defined multiple times. Despite checking the definitions and header files multiple times across different platforms no amount of arrangement or configuration could seem to solve this issue.

Because of this I have uploaded my original project files which were created in Vim, as well as the Netbeans project folder. If you would like to run the application simply cd into the src folder and run the make command. This will then run gcc with the following arguments to compile the application.

gcc main.c -o main -Wall -g -std=c99 -lm libnavigation.a

The final argument can be adjusted to use the copy of the libnavigation file in your area, however I deemed it sensible to make a copy in the local folder so that I could run the project on different devices.

Once the program is compiled execute the “main” binary wtih ./main, you will then be presented with the options for running the application:

Usage:
  ./main --observer <observer_locations_file> --sighting <cetacean_file>
  ./main -o <observer_locations_file> -s <cetacean_file>
  ./main --help
  ./main --version

Options:
  -o FILE, --observer FILE   The file of observers information.
  -s FILE, --sighting FILE   The file of sightings information.
  -h --help   Show this screen.
  -v --version   Show version.

Legend:
  A = Averaged
  D = Dolphin
  P = Porpoise

You can then run ./main -s ../data/sightings_1.txt -o ../data/observers_1.txt to run the application using my local data files, or if running on central you can use the data files in your area instead of the local copies I have provided.

Design

My design for this assignment was fairly simple. I decided to define two main data structures that would act as node's in a linked list, and then one master structure that would simply contain the pointers to the root nodes of the other two structures.

First is the Observation structure. This contains the time that was read in from the observers file, in the time.h tm struct. This was the most sensible way of storing the time as it would allow for any future calculations to be performed on the time string with the most ease. This structure would then contain a pointer to the start of the observers linked list and the sightings linked list.

Next I had a Observer structure, this contains the data that is read in from the observers file and then a pointer to the next record in the text file / node in the linked list. This structure only had three fields, the user's ID and then a Location struct which stores the users location co-ordinates, and then a pointer to the next node in the linked list.

The main data structure was the Sighting struct. This contains the data that the program works on and outputs, it contains the data from the sightings file as well as the data that is computed by my program. The first element in a sighting node contains a pointer to an observer struct which contains information of the user who made that sighting. It then contains the data from the sightings file, the type of animal seen, the bearing and the range. Once the position of the animal has been calculated using the position of the observer and the bearing

and range of the sighting, the location of the animal is then stored in a Location struct inside of the sighting node.

To make the Sighting struct into a linked list I have also provided a next variable which stores a pointer to the next node in the list, and a prev variable which stores a pointer to the previous node in the list. This allows for the addition and removal of nodes from the linked list with relative ease.

I believe the main issue with my application was the algorithm I chose to use to determine the averages and calculate the pods. To find the average sighting of multiple duplicate sightings, first I take the first sighting in the list, then test if there are any other sightings within 0.02 of the first. For those sightings I then mark them as being duplicates with the first sighting.

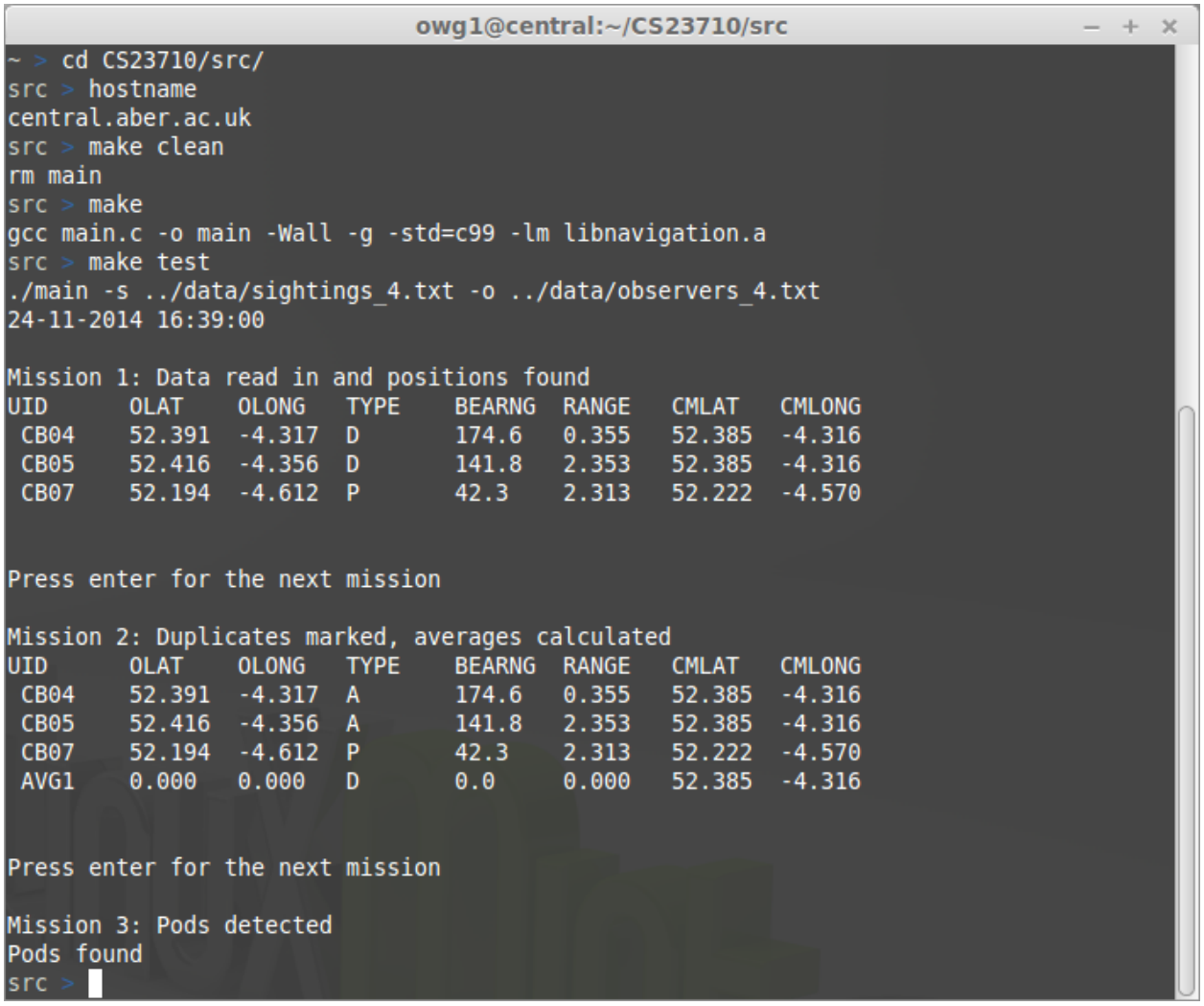
The issue is that once the sighting is marked it doesn't get considered for averaging again. This means that if there were three sightings in a row only the first two would get averaged and, as the third wasn't in range of the first sighting only the second sighting, it would not get added to the average. I used this same algorithm for the calculation of the pods which means that the calculation of the pods is also flawed.

If I had more time I would have created a better averaging algorithm and a function which calculates the average position of a linked list of sightings. This would then allow me to create an average position of a pod, and then calculate the distances between pods a lot better. I would also like to fix a few bugs that I didn't have time to solve, for example while calculating the pods I removed all of the duplicates (Those sightings marked as 'A' type), however when it came to searching through the list they hadn't been removed so I ended up having to do a check for the type before continuing with the pod calculation.

As the application is a command line application, I thought it would be sensible to provide a command line interface to run the application and specify arguments. To create this I used the docopt library to automatically generate a header file which would allow me to create a fully functional command line interface from just the usage information. This has made the application easy to use and has made it scriptable with very little effort. Just to be clear I did not write any of the files included in the docopt folder, except the usage string stored in usage.doc.

Screenshots

Below is a screenshot of the build process for my application, not using Netbeans IDE. As you can see the program compiles on central with no errors or warnings and runs without issue.

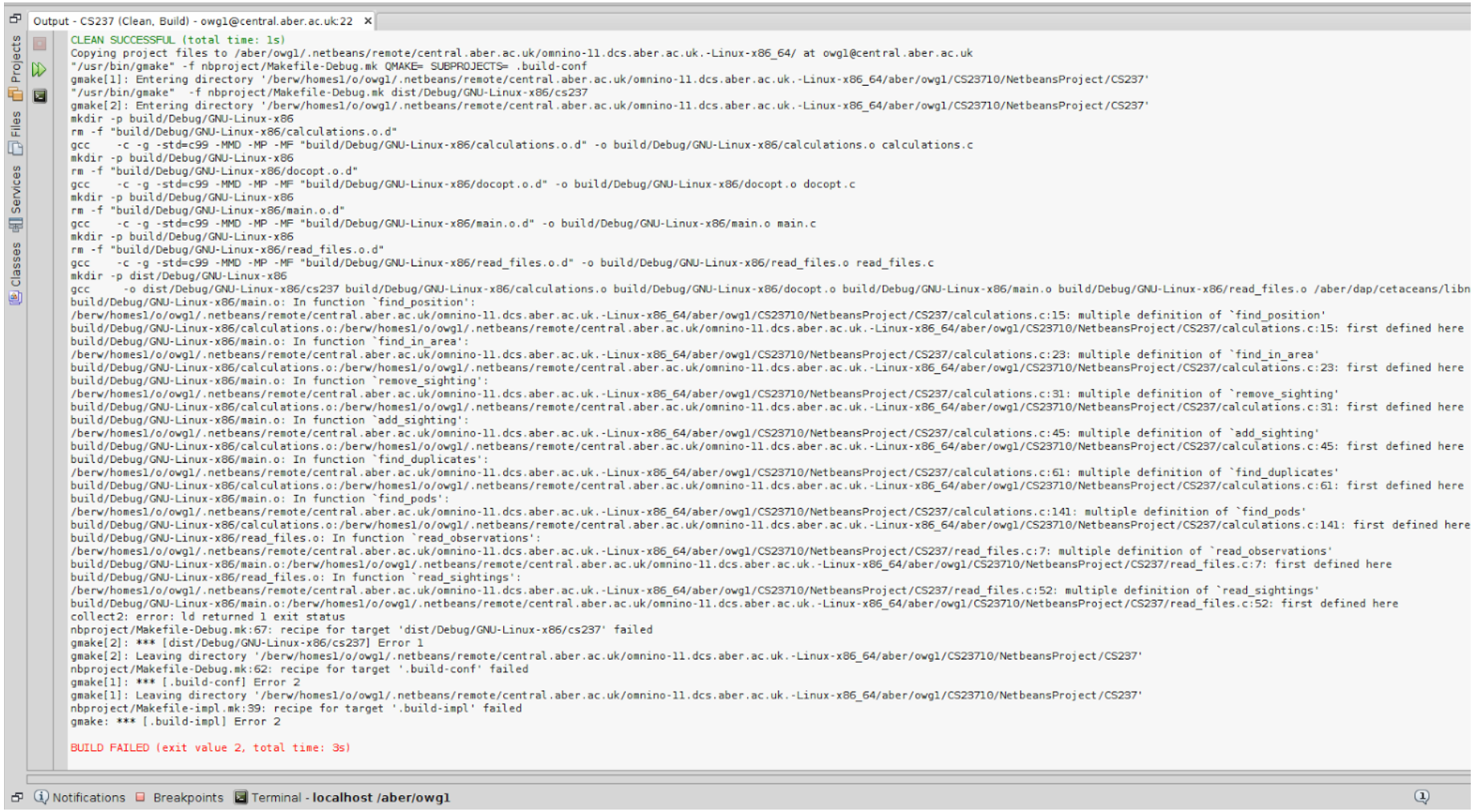


Unfortunately the same cannot be said for the Netbeans project, I have set the remote build host correctly, added the libraries in the correct order, commented out all of the references to the docopt library and hardcoded the datafiles to use.

The screenshots output is very hard to read so here is an example of the error that I am receiving.

build/Debug/GNU-Linux-x86/main.o: In function `find_position':
/berw/homes1/o/owg1/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/aber/owg1/CS23710/NetbeansProject/CS237/calculations.c:15: multiple definition of `find_position'

build/Debug/GNU-Linux-x86/calculations.o:/berw/homes1/o/owg1/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/aber/owg1/CS23710/NetbeansProject/CS237/calculations.c:15: first defined here


Output - CS237 (Clean, Build) - owgl@central.aber.ac.uk:22
Projects
Files
Services
Classes
CLEAN SUCCESSFUL (total time: 1s)
Copying project files to /aber/owgl/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/ at owgl@central.aber.ac.uk
"/usr/bin/gmake" -f nbproject/Makefile-Debug.mk QMAKE= SUBPROJECTS= .build-conf
gmake[1]: Entering directory '/berw/homes1/o/owgl/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/aber/owgl/CS23710/NetbeansProject/CS237'
"/usr/bin/gmake" -f nbproject/Makefile-Debug.mk dist/Debug/GNU-Linux-x86/cs237
gmake[2]: Entering directory '/berw/homes1/o/owgl/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/aber/owgl/CS23710/NetbeansProject/CS237'
mkdir -p build/Debug/GNU-Linux-x86
rm -f "build/Debug/GNU-Linux-x86/calculations.o.d"
gcc -c -g -std=c99 -MMD -MP -MF "build/Debug/GNU-Linux-x86/calculations.o.d" -o build/Debug/GNU-Linux-x86/calculations.o calculations.c
mkdir -p build/Debug/GNU-Linux-x86
rm -f "build/Debug/GNU-Linux-x86/docopt.o.d"
gcc -c -g -std=c99 -MMD -MP -MF "build/Debug/GNU-Linux-x86/docopt.o.d" -o build/Debug/GNU-Linux-x86/docopt.o docopt.c
mkdir -p build/Debug/GNU-Linux-x86
rm -f "build/Debug/GNU-Linux-x86/main.o.d"
gcc -c -g -std=c99 -MMD -MP -MF "build/Debug/GNU-Linux-x86/main.o.d" -o build/Debug/GNU-Linux-x86/main.o main.c
mkdir -p build/Debug/GNU-Linux-x86
rm -f "build/Debug/GNU-Linux-x86/read_files.o.d"
gcc -c -g -std=c99 -MMD -MP -MF "build/Debug/GNU-Linux-x86/read_files.o.d" -o build/Debug/GNU-Linux-x86/read_files.o read_files.c
mkdir -p dist/Debug/GNU-Linux-x86
gcc -o dist/Debug/GNU-Linux-x86/cs237 build/Debug/GNU-Linux-x86/calculations.o build/Debug/GNU-Linux-x86/docopt.o build/Debug/GNU-Linux-x86/main.o build/Debug/GNU-Linux-x86/read_files.o /aber/dap/cetaceans/libn
build/Debug/GNU-Linux-x86/main.o: In function `find_position':
/berw/homes1/o/owgl/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/aber/owgl/CS23710/NetbeansProject/CS237/calculations.c:15: multiple definition of `find_position'
build/Debug/GNU-Linux-x86/calculations.o:/berw/homes1/o/owgl/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/aber/owgl/CS23710/NetbeansProject/CS237/calculations.c:15: first defined here
build/Debug/GNU-Linux-x86/main.o: In function `find_in_area':
/berw/homes1/o/owgl/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/aber/owgl/CS23710/NetbeansProject/CS237/calculations.c:23: multiple definition of `find_in_area'
build/Debug/GNU-Linux-x86/calculations.o:/berw/homes1/o/owgl/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/aber/owgl/CS23710/NetbeansProject/CS237/calculations.c:23: first defined here
build/Debug/GNU-Linux-x86/main.o: In function `remove_sighting':
/berw/homes1/o/owgl/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/aber/owgl/CS23710/NetbeansProject/CS237/calculations.c:31: multiple definition of `remove_sighting'
build/Debug/GNU-Linux-x86/calculations.o:/berw/homes1/o/owgl/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/aber/owgl/CS23710/NetbeansProject/CS237/calculations.c:31: first defined here
build/Debug/GNU-Linux-x86/main.o: In function `add_sighting':
/berw/homes1/o/owgl/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/aber/owgl/CS23710/NetbeansProject/CS237/calculations.c:45: multiple definition of `add_sighting'
build/Debug/GNU-Linux-x86/calculations.o:/berw/homes1/o/owgl/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/aber/owgl/CS23710/NetbeansProject/CS237/calculations.c:45: first defined here
build/Debug/GNU-Linux-x86/main.o: In function `find_duplicates':
/berw/homes1/o/owgl/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/aber/owgl/CS23710/NetbeansProject/CS237/calculations.c:61: multiple definition of `find_duplicates'
build/Debug/GNU-Linux-x86/calculations.o:/berw/homes1/o/owgl/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/aber/owgl/CS23710/NetbeansProject/CS237/calculations.c:61: first defined here
build/Debug/GNU-Linux-x86/main.o: In function `find_pods':
/berw/homes1/o/owgl/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/aber/owgl/CS23710/NetbeansProject/CS237/calculations.c:141: multiple definition of `find_pods'
build/Debug/GNU-Linux-x86/calculations.o:/berw/homes1/o/owgl/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/aber/owgl/CS23710/NetbeansProject/CS237/calculations.c:141: first defined here
build/Debug/GNU-Linux-x86/read_files.o: In function `read_observations':
/berw/homes1/o/owgl/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/aber/owgl/CS23710/NetbeansProject/CS237/read_files.c:7: multiple definition of `read_observations'
build/Debug/GNU-Linux-x86/main.o:/berw/homes1/o/owgl/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/aber/owgl/CS23710/NetbeansProject/CS237/read_files.c:7: first defined here
build/Debug/GNU-Linux-x86/read_files.o: In function `read_sightings':
/berw/homes1/o/owgl/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/aber/owgl/CS23710/NetbeansProject/CS237/read_files.c:52: multiple definition of `read_sightings'
build/Debug/GNU-Linux-x86/main.o:/berw/homes1/o/owgl/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/aber/owgl/CS23710/NetbeansProject/CS237/read_files.c:52: first defined here
collect2: error: ld returned 1 exit status
nbproject/Makefile-Debug.mk:67: recipe for target 'dist/Debug/GNU-Linux-x86/cs237' failed
gmake[2]: *** [dist/Debug/GNU-Linux-x86/cs237] Error 1
gmake[2]: Leaving directory '/berw/homes1/o/owgl/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/aber/owgl/CS23710/NetbeansProject/CS237'
nbproject/Makefile-Debug.mk:62: recipe for target '.build-conf' failed
gmake[1]: *** [.build-conf] Error 2
gmake[1]: Leaving directory '/berw/homes1/o/owgl/.netbeans/remote/central.aber.ac.uk/omnino-11.dcs.aber.ac.uk.-Linux-x86_64/aber/owgl/CS23710/NetbeansProject/CS237'
nbproject/Makefile-impl.mk:39: recipe for target '.build-impl' failed
gmake: *** [.build-impl] Error 2
BUILD FAILED (exit value 2, total time: 3s)
Notifications
Breakpoints
Terminal - localhost /aber/owgl