C-ENG-C - Programming 2024
Complete Competitor Package

Introduction:
Welcome to the C-Eng-C 2024 Programming Competition! This year's theme is the Age of Exploration, a time when sailing ships were all the rage and knowing where you were without landmarks (or land) started to become very important.

Problem Statement:
Narrative:
When sailing the high seas, knowing where on earth you are is critical. Even a few miles could mean the difference between a successful voyage and being dashed on the rocks. Unfortunately, GPS technology wasn't exactly peaking during the age of exploration. You'll need to find where you are the old fashioned way. What's worse, our imaginary sailors are all really sleepy, so they can't stay up late enough to navigate by the stars. That's where you come in.

Challenge:
Your task is to build a program that can determine the latitude and longitude of the ship. To find this, you will be given pictures of the stars at bow, stern, port, and starboard; the ship's heading; the date; and the local solar time in London (longitude 0).

You will be given three example cases and five test cases to help you design your program. For judging, your program will be tested against these as well as several unknown test cases. You can assume all test cases will be in the northern hemisphere, but the north star may not always be visible in frame.

Bonus Points:
While all test cases are in the northern hemisphere, there will be some bonus points awarded if you can make a program that also works in the southern hemisphere.

You are given the ship's true heading, and compass directions are shown in the star pictures, but if you can build a program that doesn't use either of these and instead determines heading on its own you will be awarded bonus points.

Additional Information:
The star pictures were generated using https://www.fourmilab.ch/cgi-bin/Yourhorizon. You can use this to generate more test cases if you want.

All dates are in 2024 for simplicity. All star images have a 90° field of view.

Longitudes East of the prime meridian are positive, and longitudes west of the prime meridian are negative.

Deliverables:

Code:

Competitors are expected to submit a final working version of their program. This final version must be able to run on the judge's computer. If additional resources are required for the program to work, these must be submitted as well. Basic instructions for using the program should also be submitted.

In addition to the final working program, competitors must submit the source code for the final version, along with a Git repository for the project. The final source code should be well commented. If other peoples' code is used, it should be properly cited in the source code (use IEEE citation format).

Presentation:

Competitors will give a 10 minute presentation on their project, followed by a short question period from the judges. In the presentation, competitors should explain and justify the choices they made in their project. Competitors should give an overview of the technical aspects of their project, including the big O of algorithms used, if applicable. The presentation must include citations for any external resources used in IEEE citation format. Slides must be submitted at the end of the allotted time.

Resources Provided: Teams will be provided with a workspace and a presentation space with a projector.

Resources Permitted: Competitors will need to bring a laptop or computer that can connect to the internet. Code can be written in any language. Competitors can use any documentation, research papers, libraries, or code of others in their application but it must be properly referenced in their presentation and code, as the design of others will not be evaluated as the design work of the team.

Use of generative AI is allowed but is discouraged. If you do choose to use generative AI, you must cite it in both your code and your presentation, and you must explain in your presentation why it was used, how it was used, and how it improved your project.

Judging Criteria:
Competitors will be assessed on:

1. Code Structure and Design
    1.1. Readability and Organisation
    1.2. Modularity and Industry Best-Practices
    1.3. Documentation
2. Solution Success
    2.1. Accurate Determination of Latitude
    2.2. Accurate Determination of Longitude
    2.3. Code Efficiency and Run Time
    2.4. BONUS: Working in the Southern Hemisphere
    2.5. BONUS: Determination of Heading
3. Presentation
    3.1. Confidence and Delivery
    3.2. Organization and Structure
    3.3. Communication of Ideas

Additional Points and Penalties:
5% penalty for each minute after submission deadline
20% penalty for incomplete or improper citation
Disqualification for plagiarism or improper use of generative AI

Competition Procedure:
Competitors will meet in the NI4030 at 8:00am for registration and then proceed to NI1020 for opening ceremonies. Delivery of the problem statement will be followed by a thirty minute question period. Following opening ceremonies, competitors will divide into their designated workrooms. Competitors will have until 16:30 to develop a solution and prepare their deliverables for presentation. Help from anyone outside of the competitors' teams is not permitted. Remaining time will be announced when teams have three hours, one hour, thirty minutes and ten minutes left of their allotted working time. At the end of the allotted time competitors must submit all deliverables using the link below. If the submission form doesn't work, deliverables can be emailed to programming@cengc.mycses.ca.

Submission Link: https://forms.gle/DBwsyTsV6fi78f3B9

Room Assignments:

Team Number	Team Leader	Room Number
1	Matteo Golin	NI3022
2	Finlay Maroney	NI3038
3	Nabeel Azard	NI1020
4	Angus Jull	NI5010

Complete Schedule of Competition Day:

08:00 - 08:30	Arrival and Registration
08:30 - 09:30	Opening Ceremonies
09:30 - 10:00	Question Period
10:00 - 12:00	Working Period
12:00 - 13:00	Lunch Available
13:00 - 16:30	Working Period
16:30	Deliverables Due
16:30 - 17:00	Break
17:00 -19:00	Presentations
19:00 - 19:30	Deliberation + Dinner

Contact Information:
For questions regarding the programming problem statement and deliverable requirements please contact Quentin Alexander @ programming@cengc.mycses.ca

For questions regarding the competition rules and regulations, please contact Nelly Amechi at competition.chair@cengc.mycses.ca, or Erika Langner at academic@cses.carleton.ca.