KMÜ 255.21/22 Computer Programming Term Project

The project involves the simulation of a cockroach jumping pathway that accidentally dropped from the aspirator unit onto the center of a hot plate of a hamburger parlor. Due to hot plate temperature (220^{o}C) the bug jumps randomly anywhere being incapable of sensing the environment with its antenna. Being exposed to unusual temperature, the structure of its legs/feet limits the number of jumps. If it passes over the border of the hotplate then it survives with fried legs but if it cannot then it becomes a part of the food to be served! You are expected to come up with a program which simulates the random track of the bug and determines whether it survives. Then the program applies the simulation to 1000 bugs to have statistical values of average survival percent and average escape time of the survivors. Refer to your textbook and other java sources for the use of randomize function of Java. Every group (2-3students) must hand in a genuine program of their own. Having the same layout/results for plenty of groups will not be regarded as pure luck by the instructor! The project write-up must follow the outline below.

1. The pledge, stating that you (as a group) have neither received nor given any help while you prepare the project except team members. Projects without pledge will not be accepted.

2. A cover page including the project title, course name (specify your group, 21 or 22) and your name with ID number.

3. A letter of introduction addressing to the instructor summarizing the project done.

4. Introduction stating the pertinent information about the project.

5. The program. This part includes the assumptions-if any-, backbone of the program, the list of the complete code and the output received. Try to be specific and do not miss a single detail. If you run your program for different cases then give the output in subsections with appropriate relevant data.

6. Discussion. This section evaluates the validity of the results and comparison to each other. Trying other alternatives, using different initial conditions and number of samples will certainly upgrade your work.

7. Conclusion. Summarize the overall project and results.

8. References. Give the references used in the text if you referred to any.

9. Appendix. Attach any other versions of the program and excerpts from literature here.

Use passive voice for the sentences in the text. Using a word processor for write up is encouraged but a neat handwriting will also be sufficient. The computer outputs will be checked for copy-paste sentences, thus be creative!

The project is due on Final Exam

Description of the existing case

The project describes the simulation of a cockroach jumping pathway that accidentally dropped from the aspirator unit onto the center of a hot plate of a hamburger parlor. Due to hot plate temperature (220^{o}C) the bug jumps randomly anywhere being incapable of sensing the environment with its antenna. Therefore, the angle of the jump with respect to horizontal line is randomly created in the range [0^{o} -359^{o}]. Each jump takes exactly 1 second and forwards 3cm. Being exposed to this unusual temperature, the structure of its legs/feet limits the number of jumps to a maximum of 70. The dimensions of the hotplate are set to 100 cm by 60 cm. If it passes over the border of the

hotplate then it survives with fried legs but if it cannot then it becomes a part of the food to be served! You are expected to come up with a program which simulates the random track of the bug and determines whether it survives or not. Then the program applies the simulation to 1000 bugs in order to have statistical values of average survival percent and average escape time of the survivors.

How to simulate?

The first approach in the program is to determine if a single bug survives or not. In order to achieve this, you should write a sound code simulating the track of the bug. Please bear in your mind that you need to coordinate the hotplate and simulate the jumps in a randomly manner while keeping track of your bug's coordinates if the bug is out of bounds or not. Do not forget the maximum allowable jumps for each bug, 70. Certainly you need to have a time counter for the bugs that survived and also a number counter for the survivors. It is a good practice to use arrays to keep track of the changing values for each bug in question. The program should run 1000 times to simulate the fate of 1000 bugs! Please be aware of the fact that each simulation of the bug is independent of the others, thus be careful with the implementation of the random expression you will use.

Extensions

You can make extensions to your project to have a more realistic project such as diminishing jump distances as the time on the hotplate passes by, durability distribution (i.e. younger is more vulnerable), maximum endurable jump number, instant death upon strike for some members, different dimensions of the plate, the change of the survival percentages and average time on the plate with the bug number and the like. These extensions will be granted with extra points.

Rules of Team/Group Working

1. Each group member should participate in every phase of the project; code writing, discussion and project handling/writing. The performance and understanding of the project team members will be controlled. Thus no hitchhikers!

2. Discussions and project handling details are open to only group members. You may ask and consult to course assistant and instructor only! Do not attempt to use any facility to get the project done such as consulting computer engineers, professional programmers etc, who will certainly oversee the project. In this case, you will be violating your pledge, which is subject to rules of student discipline act for the cheating offense.

3. If you feel that you cannot work as a team in harmony with equal responsibility and effort please convey the problem to your course instructor when it first occurs. Any objection at the very late stage of the project or at the time of handing-in will not be accepted.

4. You can work as a group with members announced previously. Changing groups or acting as individuals under any circumstance will not be accepted.

Good Luck and cruise for a Good Work!