Assignment 1 **159.240** **Due: Friday 28 November 2014**

Eagle Flight Simulation

Your task is to simulate the flight of foraging eagles.

- Use the startup code on Stream.
- The code currently does Brownian motion, where all the particles just move randomly on uniform random numbers in [-3,3].
- The code uses `rand()`, you should replace this with another random number generator (RNG) such as the one in the slides.
- You need to change these random numbers from a uniform distribution to an Exponential distribution by using the formula:

$$r\prime = -\ln(r)/0.3$$

- Remember that the `log()` function in C++ is the same as ln().

Notes

- The startup code is actually a Win32 program, and it works with gcc.
- You should modify `UpdateAgents()`, as well as introduce another RNG somewhere in the code.

Because the coordinates are integers, you must beware of computational errors, particularly truncation errors. These can bias your particles in a particular direction. Using `round()` on your exponential deviates will help this problem. You should aim to have the eagles moving without showing a clear bias in one direction.

Also remember that the formula above will only give you positive numbers. This means that your particles will only move towards the bottom right corner before disappearing. You need to figure out a way to give the exponential deviates a random sign. Tip: Make 2 uniform random floats, and use these to make 2 random booleans for directions.

It is lots of fun to play with the parameters in the code. Particularly `g_agentCount`. Make it interesting!

Marking

The assignment is worth 10 marks, and these will be awarded for:

- Correct exponential deviates (3)
- Avoiding truncation errors (3)
- An overall lack of bias in movement (particles don't go off in the same direction) (2)
- Replacing the use of the terrible `rand()` LCG with another RNG, such as the one in the slides (2)

Submitting

Please submit your .cpp source file via Stream. You are welcome to develop your assignment on a home computer, but you **must** ensure that your program works in the labs.

If you have any questions about this assignment, please email the lecturer.

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