

Assignment 7

Models of Biological Self-Organization

Write a report on the tasks given below. Upload *pdf* file.

Task 1 (30)

Modify *Firefly0s.nlogo* (from the Models library) to stop when all the fireflies have synchronized. To do this, add the following line of code at the beginning of the “go” procedure:

```
if all? turtles [color = yellow] [stop]
```

Now you can see how different parameter values affect the time it takes for all the fireflies to synchronize. Use the Behavior Space tool to investigate how this *time-to-synchronize* is affected by varying the number of fireflies, the *flash-length*, and the *cycle-length*. Can you form hypotheses to explain the results you see?

Task 2 (45)

Open *Flocking.nlogo* model from the Models Library. Analyze it!

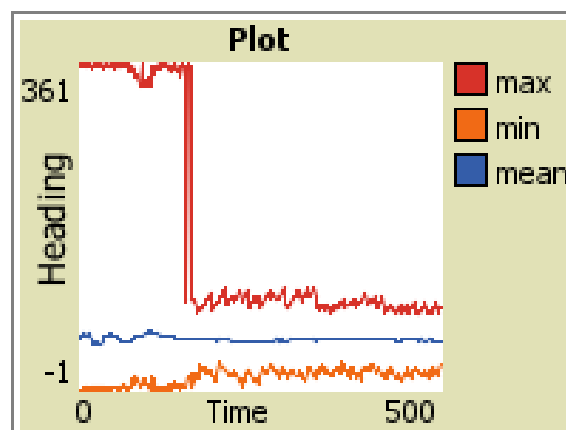
Show that you can independently understand the model, formulate the problem, form hypotheses, conduct experiments, describe findings.

Write detailed report on analysis of this model.

Hints: (maybe you will need something to measure or somehow estimate the direction of movement of the birds) you can use **circular (angular) mean**

```
to-report circular-mean
  let sum-of-sin sum map sin [heading] of turtles
  let sum-of-cos sum map cos [heading] of turtles
  report atan sum-of-sin sum-of-cos
end

plot max [heading] of turtles
plot min [heading] of turtles
plot circular-mean
```



(this will not work well if the circular mean of the angles is around 0/360)

```
to-report circular-mean-to-zero [h]
  report ((h - circular-mean - 180) mod 360) - 180
end

plot max map circular-mean-to-zero [heading] of turtles
plot min map circular-mean-to-zero [heading] of turtles
```

