CS 311, Assignment 0 - Report

MV Karthik (200010030),M SriRam(200020028)

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1 Abstract

The report explains how approaches used to achieve the motive of infiltrator to defend its border against another country using different parameters like width, probability of Sensors being ON, etc.

2 Assumptions & Trivial Parameters

The length can be infinitely long as given in problem statement.As the length doesn't matter here we are not considering length (L).

From the challenge description, the sensor is switched **ON**, if we receive **Heads** in the coin toss, which in turn depends upon the array/spectrum of probabilities we are considering. We will take a particular or random fixed P value for which if the probability of coin heads is less

$$0 < p < 1$$

it will turned ON else turned OFF

WLOG, the time taken by the infiltrator to reach DC from AC will increase if width is increased. Here we also taking W and doing some iterations like 50 for a value of P and W and we are averaging the time for pair of values (P,W)

The infiltrator only moves ahead from AC to DC and no step backwards it taken. With a time span of every 10 secs, a coin is tossed and based on ON/OFF the infiltrator will move forward (i.e value of W will increase from 0 to specified W value which indicates he reached successfully) Max time taken for each iteration we limited it to 1 crore.

3 Approach & Code

We are finding the time taken to cross from one end to another end using probability of sensor being turned ON/OFF.

For values of P & W, we tried all cross combinations i.e. for a given P, we tried all $W's$ with it and finding time taken by doing average of 50 iterations for a pair (P,W) with the help of python script.

4 Code, Compilation & Execution

We have created 4 main files of codes which are as follows:

- Main.java
- Clock.java
- Cell.java

- Infiltrator.java

The command line executions are:
>> *javac .*java*
>> *java Main* $< P > < W >$
Where P and W are Probability and Width respectively. We made a python file script.py to give P and W values accordingly to draw graph

5 Graph

Here to get the relation between probability,time to width we drew two type of 2d graphs.

5.1 Variable Probability

In the figure 1 , here we are taking variable probability in $X - axis$ and time in $Y - axis$ for constant values of width i.e W=100,150,200,250

- X-Axis: Probability
- Y-Axis: Time

From this graph relation between probability and time taken is nearly exponential increasing in nature.

5.2 Variable Width

Similarly In the figure 2, here we are taking variable Width in $X - axis$ and time in $Y - axis$ for constant values of Probability i.e P=0.2,0.5,0.8

- X-Axis: Width
- Y-Axis: Time

The graph just depicts and proves the deductions which we made about variations of time with change in probabilities and widths.

6 Deductions

- **Effect due to variation in width**
  As the parameter 'w' (width) was increased, the time taken by the infiltrator to cross from DC to AC also increased linearly. The reason behind that is that, the infiltrator will have to cover more distance with increasing value of width.
- **Effect due to variation of probability of sensors being ON**
  As the probability of sensors being ON increased, the time taken by the infiltrator to cross also increases exponentially. The reason behind that is that, as the probability of sensors being ON increases, the infiltrator's options to proceed towards DC diminishes and hence time required will increase.

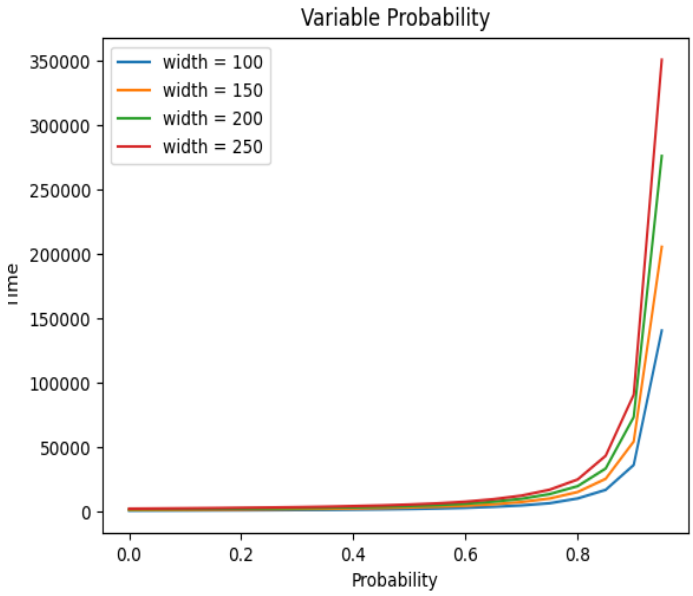

Figure 1: Variation of Probability,for constant Widths and output Average Time

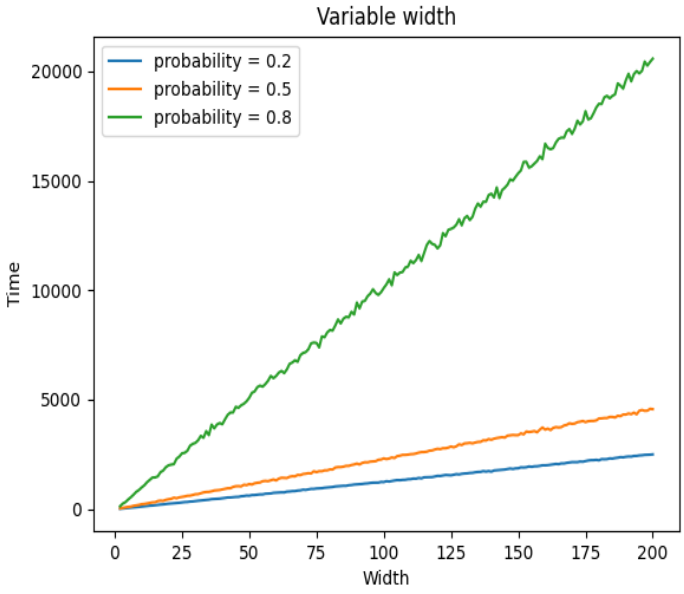

Figure 2: Variation of Width, for constant probability and output Average Time