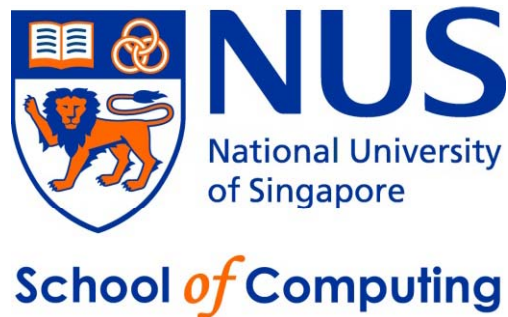


CS2020 – Data Structures and Algorithms Accelerated

Recitation Week08 – Flood Fill

stevenhalim@gmail.com



Flood Fill on Implicit Graph

- Task: identify the numbers on the dices given a “picture”/screenshot of dices 😊
 - Problem name: **The die is cast**
 - <http://uva.onlinejudge.org/external/6/657.html>
- Menu for this recitation
 - Introduction of **Implicit Graph**
 - Review: DFS/BFS for finding Connected Component (CC)
 - Introducing “Flood Fill” Technique (actually just finding CC)
 - Java solution: UVa657.java

Implicit Graph

- Implicit graph: the graph is not specified explicitly, you do not have to store them in a graph DS (AdjList/Matrix/EdgeList), but the graph is there, inside the given problem, e.g. 2-D grid

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```
.....
.....
.....*.....
...*****.....
...*X***...**X***...
...*****...***X**...
...***X*...****...
...*****.....*.....
.....
.....***.....*****
.....**X*****...*X**X*...
.....*****.....*****
.....****X**.....*X**X*...
.....***.....*****
.....
```

Can you spot a graph here?

There are other “implicit graphs” in real life, can you think of more examples?

FYI, we will see more next week 😊

Finding CC (Review)

- Remember this?

```
CC ← 0
for all v in V
    visited[v] ← 0
for all v in V
    if visited[v] == 0
        DFSrec(v)
        CC ← CC + 1
```

Flood Fill (Idea)

- Demo using Microsoft Paint
(or any drawing software)

Flood Fill (Simple Version)

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We can easily? find 4 connected components here (4 dices)

[illegible]

Flood Fill (Full Version)

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The image shows a 20x20 grid of dots. Two patterns of asterisks are displayed. The left pattern is a 5x5 square of asterisks with 'X' marks at (2,2), (4,4), (3,3), and (3,5). The right pattern is a 5x5 square of asterisks with 'X' marks at (2,2), (4,4), (3,3), and (3,5). A red diamond shape is drawn around the right pattern.

Now this problem has “two layers” ...

Now only concentrate on each dice
(those bordered with ‘’)

- Once we hit an 'X' inside a dice '*', we have to only count that 'X' and any other adjacent 'X' as one component ...

Do this for each dice

Demo on white board

(too hard to draw the animation here)

Let's examine the Java code after this
UVa 657.java