Geometry means Visualization
Bring Geometric concepts in CS
Of course, Geometrical
> Graph A PERSPECTIVE

Sum of deg = 2|E| → even

Geometric → Graph
Graph → Geometric

INPUT → ALGO → OUTPUT

Undirected graph → BFS → Use of the fact that graph is connected → Undirected graph
OUTPUT: {A, B, C, D, E}

Directed graph → Reachability → Use of the fact that graph is connected
INPUT → ALGO → OUTPUT
{A, B, C, D, E}

B L A C K B O X

P1. Hospital

Solved → N "Idea"

For every city, shortest dist from city end up to hospital

G'

Sol #1 (bruteforce)

Case #1: A
Dijkstra(G, "A") → [5 6]
A B C D E F
min → 5

Case #2: B
Dij(G, "B") → [0 0]
A B C D E F
min → 0

⋮

Case #N

N Dijkstra

Sol #2 "understand"

1. Add "D"
2. "D" → hospital
3. Dij(G', "D") → [ ]

1 Dijkstra

Sol #3 ... Framework

K = 1

1 Dijk

{A → D = E → A, B → D = E → B, C → D = E → C}

Dij(G, "E")
[0 0 0 0 0]
A B C D E

P2. Hot & cold

2 min
"Solved - N"
"Idea"

G

2

Spath
src → tan
→ → ✗
→ → ✗
→ → → ✓

Solution

x' → y' → z' →

- doubled nodes
- src → A, D → tan
- BFS(G', "src") tan −2

G'

RECIPE

1. Smell test ....?
2. CONSTRAINT VARIABLES
   P vs BFS/Dijkstra
   alt edge in your path
3. G has constraints —construction→ G' No constraints
4. G' → BFS/Dijkstra

- modify Algo / const graph
- const Algo / modify graph

1. Hand Debug
2. Header Antifail
3. & verify

P3. Parade Walk

DIV2D
DIV2E

Solved - N idea

shortest parade walk?

Parade:
→ start any city
× end any city
: roads travelled EXACTLY K

G

K	ans
1	2km
2	7km
3	14km
4	16 km
⋮	

K = 2

G'

L1 L2 L3

0 edges e1 1 edge e2 2 edges

Dij(G', src) tan

K = 3

L1 L2 L3 L4

e1 e2 e3

K copies — 1 Dij
≅
1 copy — K Dij

Chocolate Problem

24 hrs → WA

construction

Hall of ~~FAMS~~