

## Floyd-Warshall and Review

Data Structures and Algorithms

Floyd-Warshall Algorithm
shortestPaths(G):
let d[][] be a $|\mathrm{V}| \mathrm{x}|\mathrm{V}|$ matrix
$d[i][j]=w(i, j)$ or infinity if no edge $(w(i, i)=0$ for all $i)$
[for $k=0 \ldots|\mathrm{~V}|-1$ :
for $\mathrm{i}=0 \ldots|\mathrm{~V}|-1$ : detour through some new vortex, $k$
for $j=0 \ldots|V|-1: \mathbb{L}$ use the pith we already have
if $(\mathrm{d}[\mathrm{i}][\mathrm{k}]+\mathrm{d}[\mathrm{k}][j]<\mathrm{d}[\mathrm{i}][j])$ :
$d[i][j]=d[i][k]+d[k][j]$
return d


Example

if $(d[i][k]+d[k][j]<d[i j[j)$ :
$d[i j[j]=d[i][k]+d[k[j]$

| $k=0$ | $j$ |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | 0 | 1 | 2 | 3 |  |
| + | 0 | 0 | 2 | 4 | $\infty$ |
|  | 2 | 0 | 1 | 3 |  |
|  | 2 | 4 | 1 | 0 | 2 |
|  | 3 | $\infty$ | 3 | 2 | 0 |

Path Reconstruction

$$
i f(\underbrace{d[d i[i[j]):}_{([i][k]+d[k][j]}
$$


$2+\{0,0,1\}$ $\infty, 2,3$

$$
0-3-1=-2^{2}
$$

## Path Reconstruction

shortestPaths(G):
let d[][] be a $|\mathrm{V}| \mathrm{x}|\mathrm{V}|$ matrix

$$
\begin{aligned}
& \text { let patn[IT] be a } \mathrm{V} \mid \times \mathrm{V} \text { | matnix initialized to -1s } \\
& \mathrm{d}[\mathrm{i}][\mathrm{j}]=\mathrm{w}(1, \mathrm{~J}) \text { or infinity if no edge }(\mathrm{w}(\mathrm{i}, \mathrm{i})=0 \text { for all i) }
\end{aligned}
$$

```
for k=0 ... |V| - 1:
    for i = 0 ... |V| - 1:
        for j = 0 ... |V| - 1:
            if (d[i][k] + d[k][j] < d[i][j] ):
                d[i][j] = d[i][k] + d[k][j]
                path[i][j]=k // ALT: next[i][j] = next[i][k]
return d
```


## Announcements

## Poll for Kendra Yourtee - https://tinyurl.com/yay8m24s

Final on Friday - One sheet of notes

- Will be shorter than the midterm!


## Review - Wednesday in class and Thursday in Section

Final Review HW due on Wednesday

- No late days - we will be posting solutions as soon as the dropbox closes.

Course Feedback Survey: https://uw.iasystem.org/survey/195884
Super useful for me - this was my first time teaching, and I would really appreciate constructive feedback:
what I did well, what I did poorly, and how the class could have been improved.
$\beta$ - Review

MST (Kruskal, Union By Height + Path C.)

$B-\varnothing, E y, A \neq, C f, D E$


