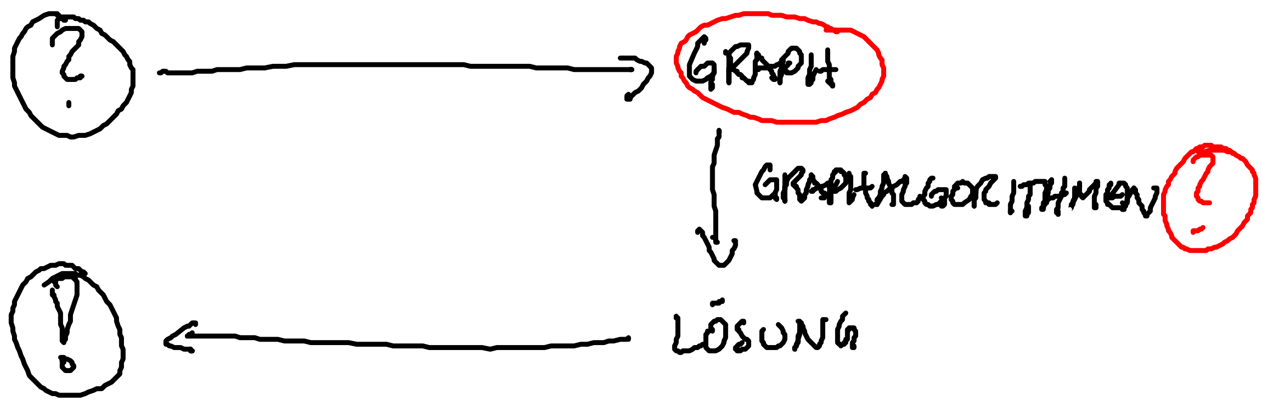
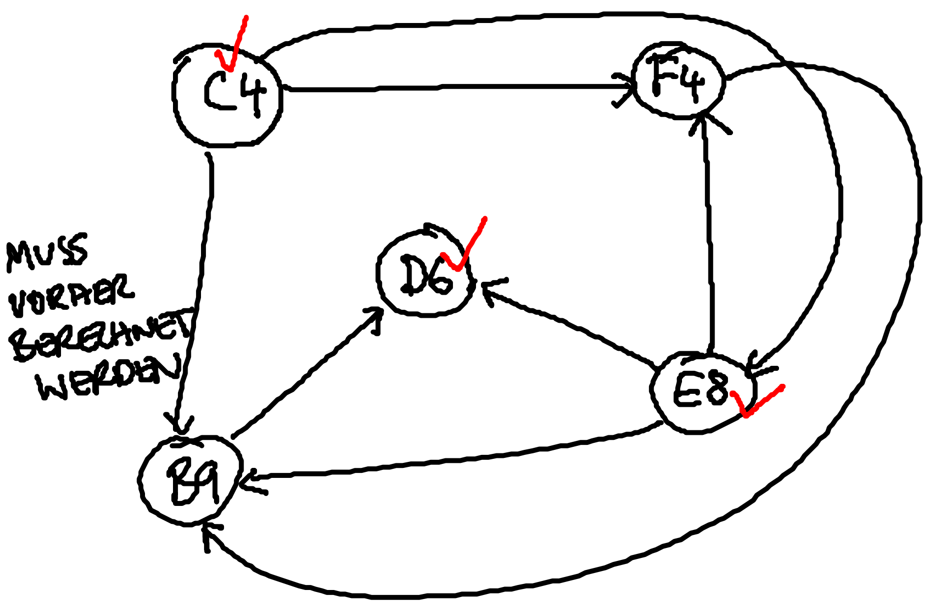
ALGODAT 2.6.2016

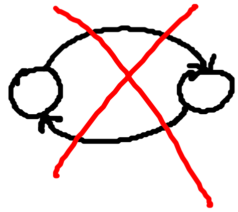
ANWENDUNG INFORMATIK





REIHENFOLGE

C_4 E_8 F_4 B_9 D_6



1) WATCH 2) SHIRT 3) TIE

4) SOCKS 5) PANTS 6) SHOES 7) BELT 8) JACKET

4b) UNDERSHORTS

AUFWAND
- PLATZ
- ZEIT

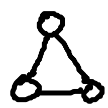
WORST
BEST
AVERAGE

GRÖSSE EINGABE : n

$n \to \infty$ ZEITAUFWAND ?

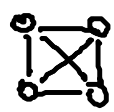
$G = (V, E)$

"n" : $|V|$, $|E|$



K_3

K_2



K_4

K_1

KNOTEN

KANTEN PRO KNOTEN

$$\frac{|V| \cdot (|V|-1)}{2}$$

FÜR VOLLSTÄNDIGE GRAPHEN

"WORST CASE"

AUFWAND VON TOPOLOGICAL SORT (DFS)

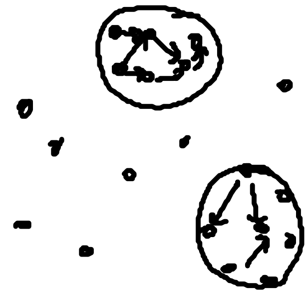
$\in O(n!)$?

$\sim (|V| + |E|) \in O(|V|^2)$

$\boxed{\in O(|V|+|E|)}$ OFFIZIELL

$n \to \infty$?

"PROPORTIONAL"



$f(n) = n + n^2$

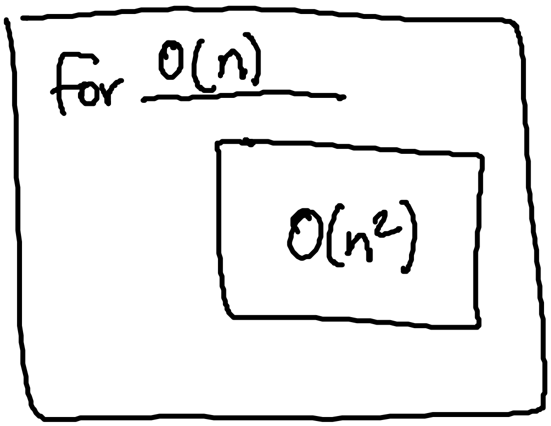
$g(n) = n^2$

$\boxed{f(n) \in O(g(n))}$?

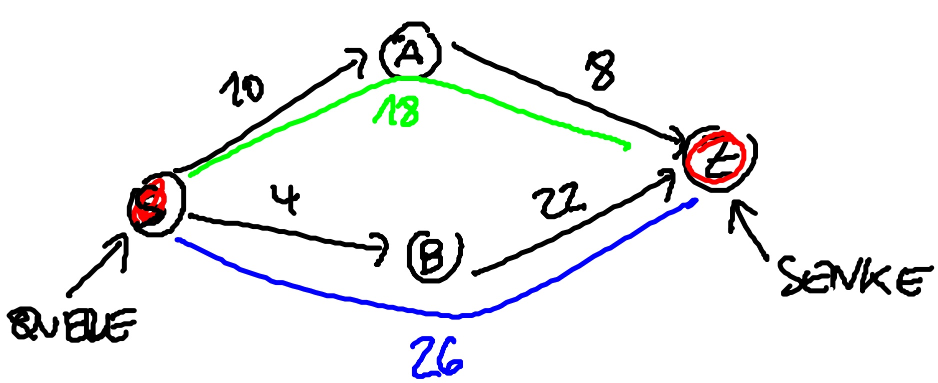
n_0 ? $= 100$ ✓ c ? 2 ✓

$|E| \le |V|^2$

$T_{BFS} \approx \underline{|V|} + |V|^2$



$O(n) \cdot O(n^2) = O(n^3)$



9. JUNI 2016 ALGO DAT

a) SINGLE-SOURCE SHORTEST PATH

b) FLOW IN GRAPHS

SINGLE-SOURCE SHORTEST PATH VOLL VERNÜPFTER GRAPH $O(|V|^2 + \dots)$

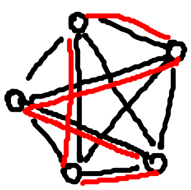
DIJKSTRA $O(|E| + |V| \log |V|) \rightarrow O(\cancel{|E|} + |V| \log |V|$

BELLMAN-FORD $O(|V| \cdot |E|) \rightarrow O(|V| \cdot |V|) = O(|V|^2)$

$\boxed{|V| = |E|}$ $\rightarrow O(|V|^2 \cdot |V|) = O(|V|^3)$

WIE GUT SIND DIE EIGENTLICH?

K_n = VOLL VERNÜPFTE GRAPH MIT n KNOTEN

K_5 

$$\#\text{PFADE} = \sum_{k=1}^{n} \underbrace{\#\text{PFADE DURCH } k \text{ KNOTEN}}_{P_k}$$

$$\sum \begin{cases} P_1 = n \\ P_2 = n(n-1) \\ P_3 = n(n-1)(n-2) \\ \vdots \\ P_n = n! \end{cases}$$

ZIEMLICH GUT!

FLOYD-WARSHALL $O(|V|^3)$

k=0	1	2	3	4	...
1	0	∞	∞		
2		⋱		w(2,4)	
3	w(3,1)		⋱	∞	
4		∞		0	
⋮					

← FÜR $Z_0 \triangleq$ KEINEN ZWISCHENKNOTEN

START

ZIEL

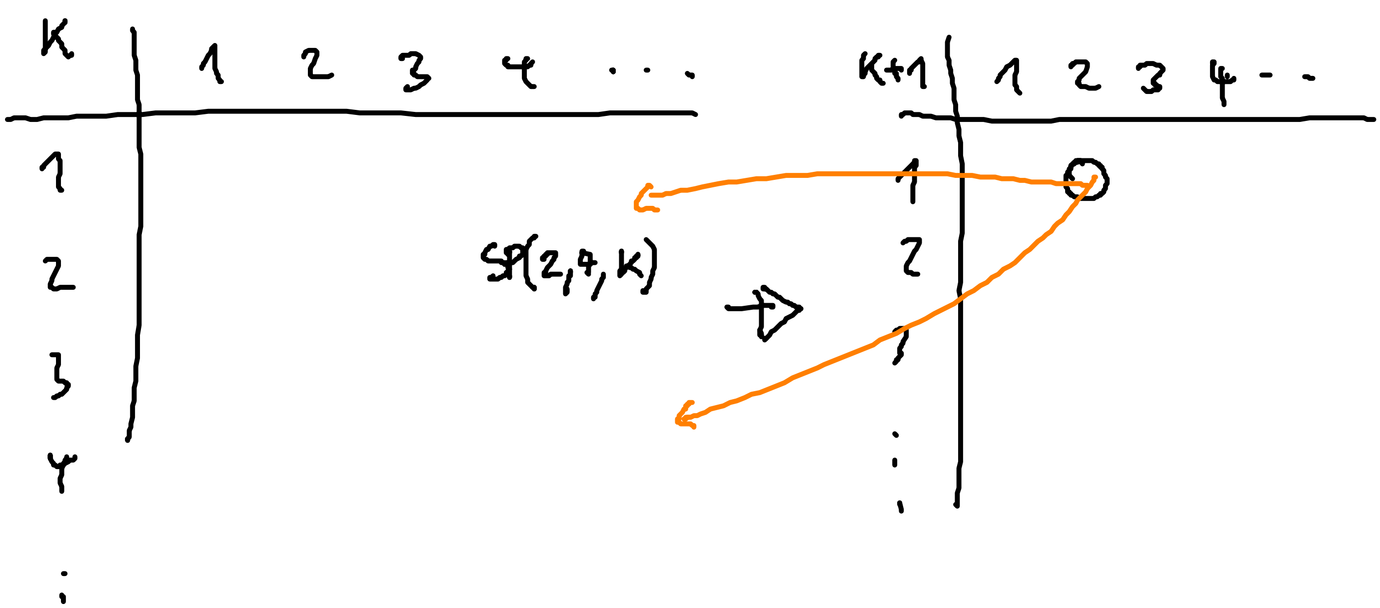
$$SP(i, j, k)$$

MENGE Z DER KNOTEN DIE WIR ALS „ZWISCHENKNOTEN" ZULASSEN

$$Z_k = \{v_1, \dots, v_k\}$$

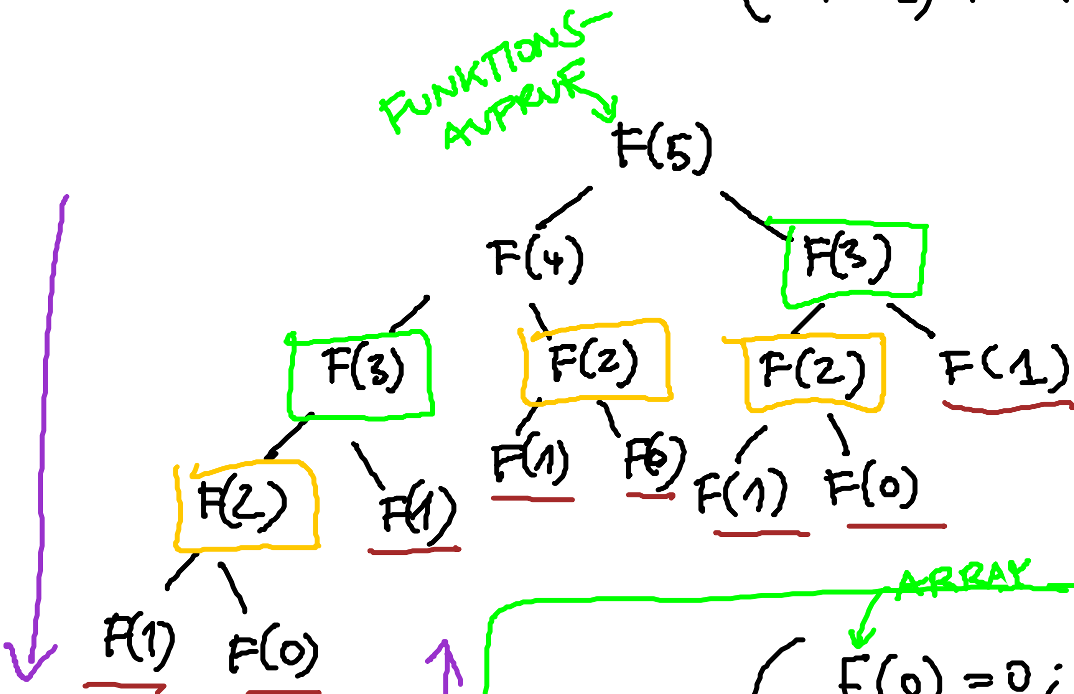
$$SP(i,j,0) = w(i,j)$$

$$\boxed{SP(i,j,k+1) = \min \begin{cases} SP(i,j,k) \\ SP(i,k+1,k) + SP(k+1,j,k) \end{cases}}$$



AUSFLUG

$$F(n) = \begin{cases} 0 & n=0 \\ 1 & n=1 \\ F(n-1) + F(n-2) & \text{SONST} \end{cases}$$



REKURSIVER BAUM

$O(c^n)$

ARRAY

$O(n)$

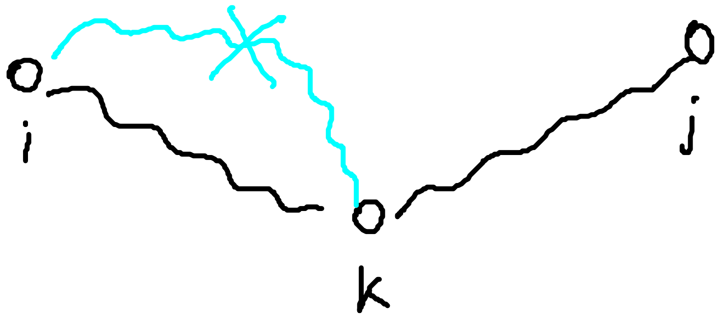
```
F(0) = 0;                      O(1)
F(1) = 1;                      O(1)
For (i = 2; i ≤ n; i++)        O(n)
    F(i) = F(i-1) + F(i-2)
return F(n)
```

DYNAMISCHE PROGRAMMIERUNG

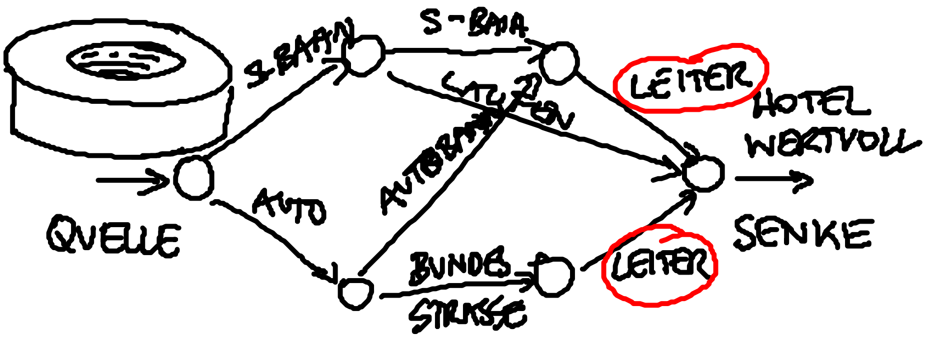
✓ · WIEDERKEHRENDE UNTERPROBLEME

✓ · LÖSUNG DES UNTERPROBLEMS MUSS TEIL DER LÖSUNG DES GESAMT PROBLEMS

〰 KÜRZESTE PFAD $i \to j$

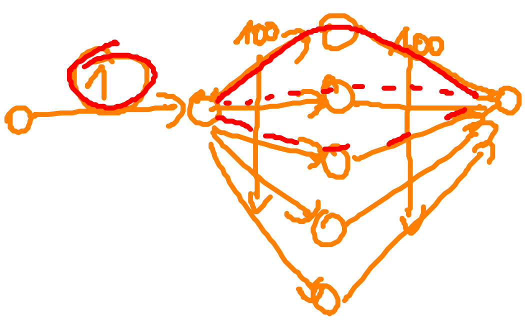


b) FLÜSSE IN GRAPHEN



WAS IST DER MAXIMALE FLUSS IN DEM GRAPHEN?

FRAGE: SIND PFADE EINDEUTIG?



$|F| = 1$

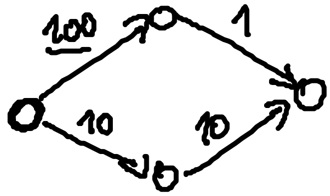
WIE IMPLEMENTIEREN WIR "FINDPATH" IM FORD-FULK.

- DFS $\quad O(|E|\, f)$

EDMONDS-KARP

- BFS $\quad O(|V|\, |E|^2)$

HAUSAUFGABE



100
1
10
10