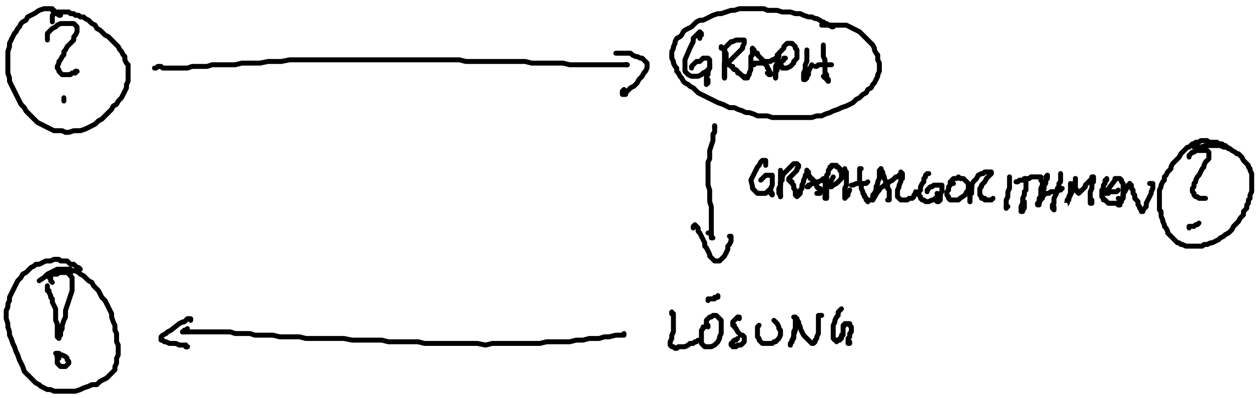
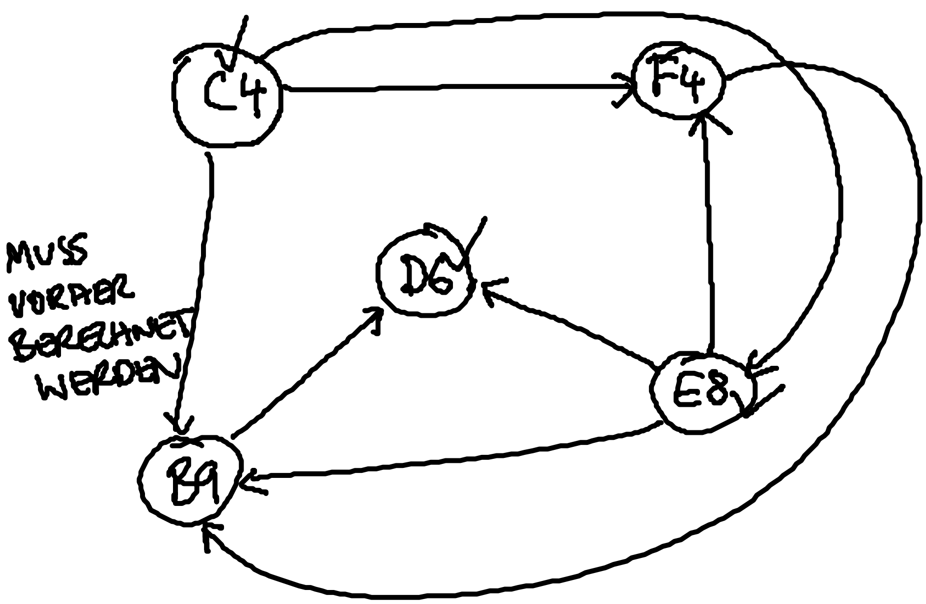
ALGODAT 2.6.2016

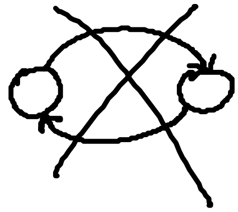
ANWENDUNG INFORMATIK





REIHENFOLGE

C_4 E_8 F_4 B_9 D_6 $\longrightarrow$



1) WATCH 2) SHIRT 3) TIE

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

4b) UNDERSHORTS

$\boxed{\text{AUFWAND}}$

- WORST
- BEST
- AVERAGE

~~PLATZ~~

ZEIT

GRÖSSE EINGABE : n

$n \to \infty$ ZEITAUFWAND ?

$G = (V, E)$

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

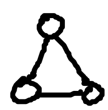
\# KNOTEN

\# KANTEN PRO KNOTEN

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

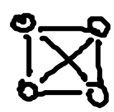
FÜR VOLLSTÄNDIGE GRAPHEN

"WORST CASE"



K_3

K_2



K_4

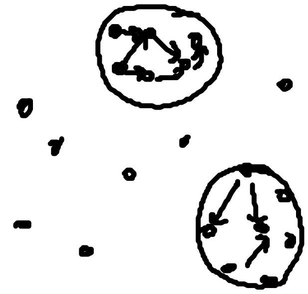
K_1

AUFWAND VON TOPOLOGICAL SORT (DFS) $\in O(n!)$?

$\sim (|V| + |E|) \in O(|V|^2)$ $\qquad \boxed{\in O(|V|+|E|)}$ OFFIZIELL

$n \to \infty$?

"PROPORTIONAL"



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

$g(n) = n^2$

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

n_0? $\qquad c$?

$= 100$ ✓ $\qquad 2$ ✓

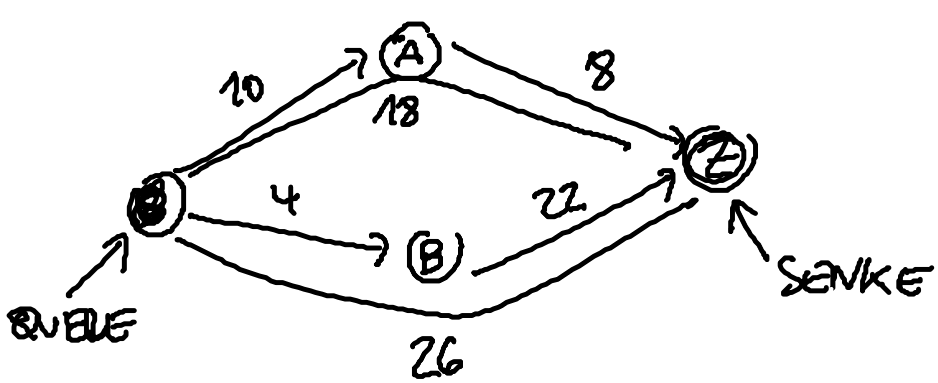
$|E| \le |V|^2$

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

for $\underline{O(n)}$

$O(n^2)$

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



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

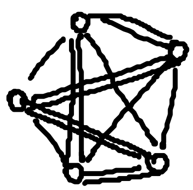
BELLMAN-FORD $O(|V| \cdot |E|) \rightarrow O(|V| \cdot |V|) = O(|V|^2)$

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

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 $Z_0 \hat{=}$ KEINEN ZWISCHENKNOTEN

START

ZIEL

$SP(i, j, k)$

MENGE Z DER KNOTEN DIE WIR ALS "ZWISCHENKNOTEN" ZULASSEN

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

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

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

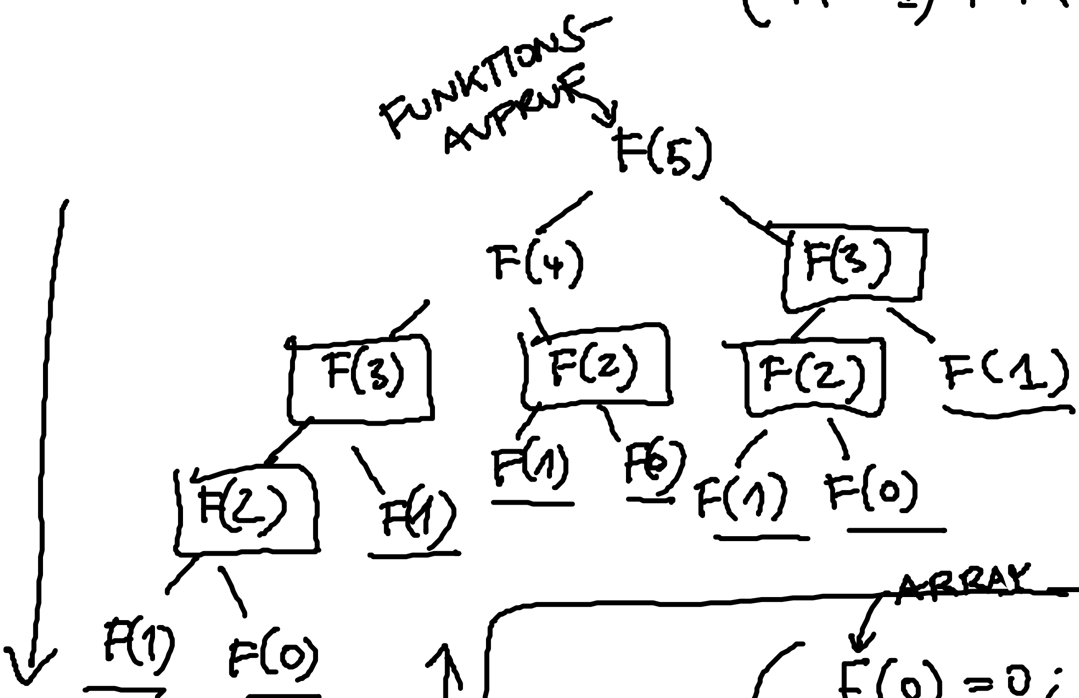
K	1	2	3	4	…
1					
2					
3					
4					
⋮					

$SP(2,4,K)$ $\Rightarrow$

K+1	1	2	3	4	…
1					
2					
3					
⋮					

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

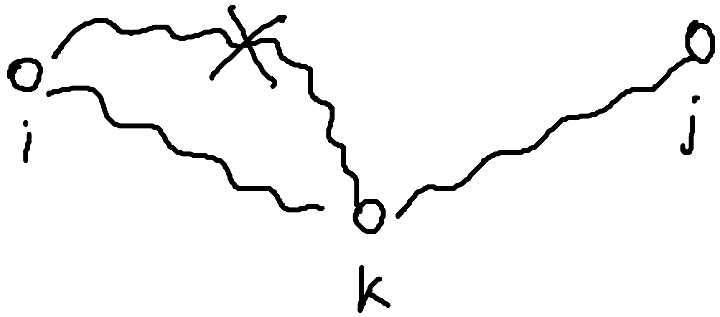
$O(n)$

```
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 GESAMTPROBLEMS

KÜRZESTE PFAD $i \to j$



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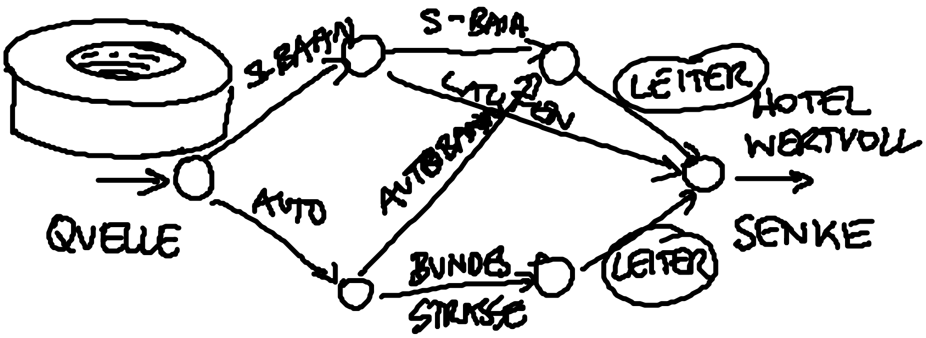
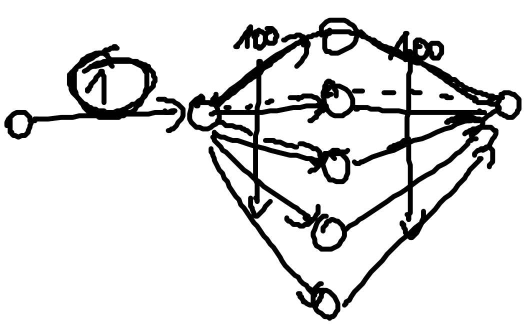
b) FLÜSSE IN GRAPHEN



WAS IST DER MAXIMALE FLUSS IN DEM GRAPHEN?

FRAGE: SIND PFADE EINDEUTIG?



$|F| = 1$

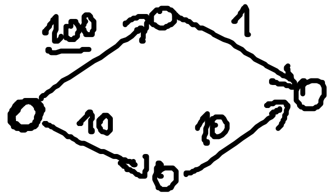
WIE IMPLEMENTIEREN WIR "FINDPATH" IM FORD-FULK.

- DFS $O(|E| f)$

EDMONDS-KARP

- BFS $O(|V| |E|^2)$

HAUSAUFGABE


100
1
10
10