

GREEDY HEURISTIC ALGORITHM

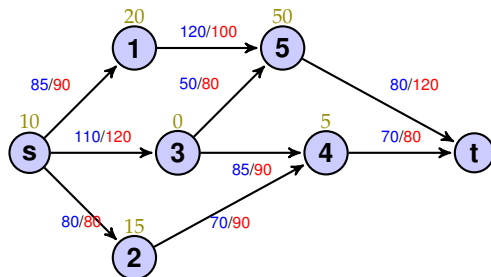
CONSEQUENCES OF THIS APPROACH:

- ▶ Charging stations are not prioritized
- ▶ Choices might get the vehicle “stuck”
- ▶ Not optimal

How do we fix this?

- ▶ Prioritize vertices with charging stations and lowest time
- ▶ Thus we are able to solve more graphs (robustness)
- ▶ Not ideal solution

EXAMPLE



Edge weights:

- ▶ distance (km)
- ▶ speed limit(km/hr)

Vertex weights:

- ▶ charging speed (kW)

Paths:

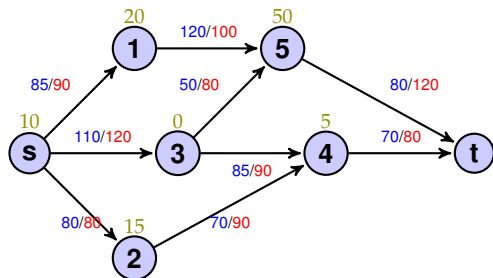
$\langle s, 1, 5, t \rangle$: 285km, 2.8hr

$\langle s, 3, 4, t \rangle$: 265km, 2.7hr

$\langle s, 3, 5, t \rangle$: 240km, 2.2hr

$\langle s, 2, 4, t \rangle$: 220km, 2.7hr

EXAMPLE

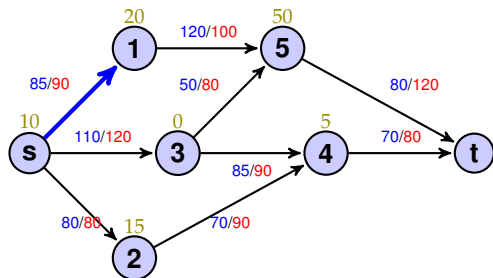


$Q = \{s\}$

Best: s

	π	time	bat
s		0	50
1			
2			
3			
4			
5			
t			

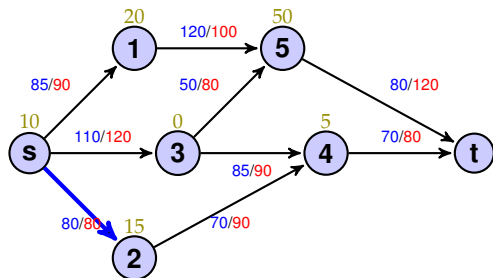
EXAMPLE



Driving: 90km/hr: 0.94 hr
 Charge and drive: Same

	π	time	bat
s		0	50
1	s	0.9	27.1
2			
3			
4			
5			
t			

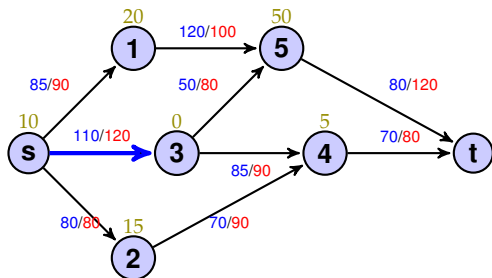
EXAMPLE



Driving: 80km/hr: 1hr
 Charge and drive: Same

	π	time	bat
s		0	50
1	s	0.9	27.1
2	s	1	30.4
3			
4			
5			
t			

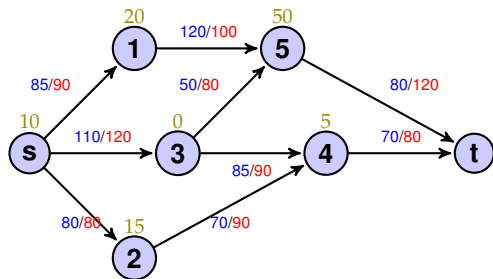
EXAMPLE



Driving: 120km/hr: 0.92hr
 Charge and drive: Same

	π	time	bat
s		0	50
1	s	0.9	27.1
2	s	1	30.4
3	s	0.9	9.8
4			
5			
t			

EXAMPLE

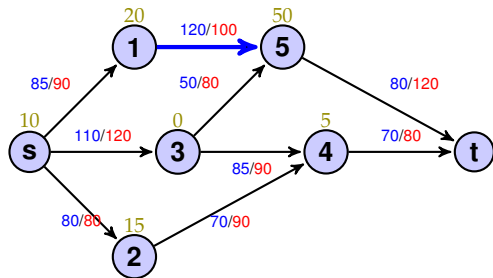


$Q = \{1, 3, 2\}$

Best: 1

	π	time	bat
s		0	50
1	s	0.9	27.1
2	s	1	30.4
3	s	0.9	9.8
4			
5			
t			

EXAMPLE

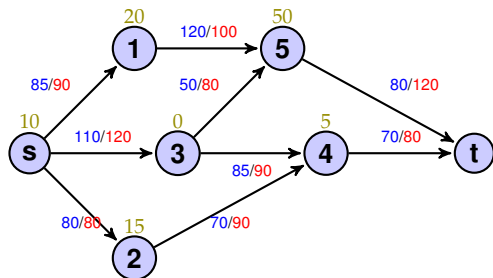


Driving: 71.1km/hr: 1.7 hr

Charge and drive: 88.1km/hr: 1.6 hr

	π	time	bat
s		0	50
1	s	0.9	27.1
2	s	1	30.4
3	s	0.9	9.8
4			
5	1	2.5	0
t			

EXAMPLE

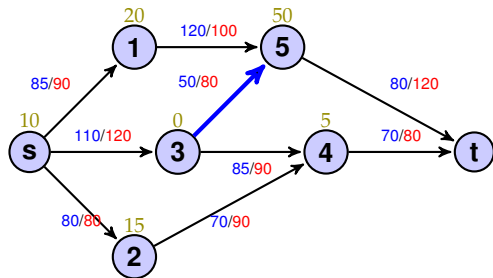


$Q = \{3, 2, 5\}$

Best: 3

	π	time	bat
s		0	50
1	s	0.9	27.1
2	s	1	30.4
3	s	0.9	9.8
4			
5	1	2.5	0
t			

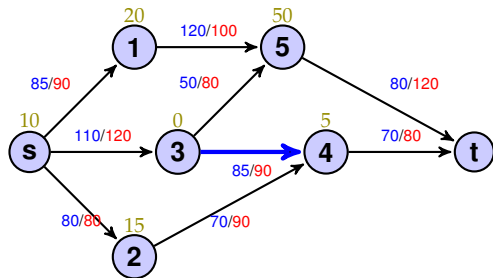
EXAMPLE



Driving: Not possible!
 Charge and drive: Not possible!

	π	time	bat
s		0	50
1	s	0.9	27.1
2	s	1	30.4
3	s	0.9	9.8
4			
5	1	2.5	0
t			

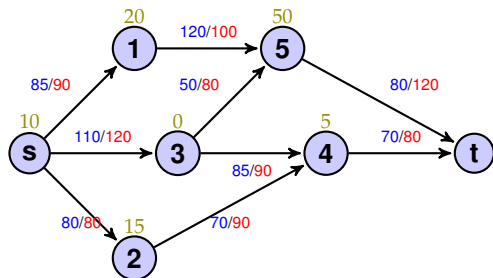
EXAMPLE



Driving: Not possible
 Charge and drive: Not possible!

	π	time	bat
s		0	50
1	s	0.9	27.1
2	s	1	30.4
3	s	0.9	9.8
4			
5	1	2.5	0
t			

EXAMPLE

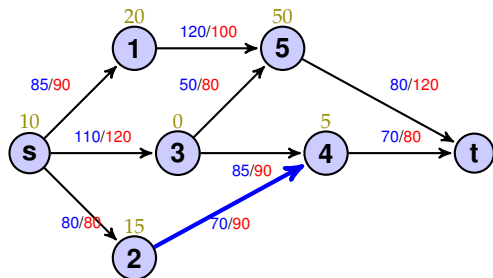


$Q = \{2, 5\}$

Best: 2

	π	time	bat
s		0	50
1	s	0.9	27.1
2	s	1	30.4
3	s	0.9	9.8
4			
5	1	2.5	0
t			

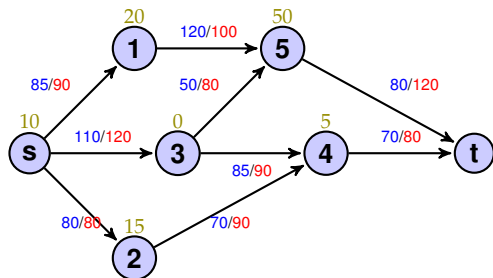
EXAMPLE



Driving: 90km/hr: 0.8hr
 Charge and drive: Same

	π	time	bat
s		0	50
1	s	0.9	27.1
2	s	1	30.4
3	s	0.9	9.8
4	2	1.8	11.6
5	1	2.5	0
t			

EXAMPLE

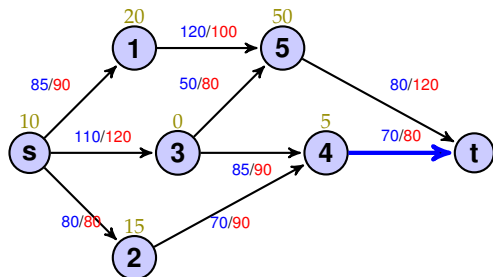


$Q = \{5, 4\}$

Best: 4

	π	time	bat
s		0	50
1	s	0.9	27.1
2	s	1	30.4
3	s	0.9	9.8
4	2	1.8	11.6
5	1	2.5	0
t			

EXAMPLE



Driving: Not possible

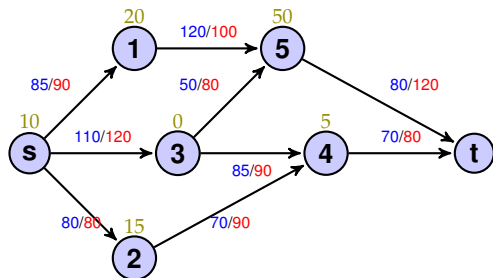
Charge and drive: 58.6km/hr:

1.2hr

Uses previous charging station of 15kW!

	π	time	bat
s		0	50
1	s	0.9	27.1
2	s	1	30.4
3	s	0.9	9.8
4	2	1.8	11.6
5	1	2.5	0
t	4	3	0

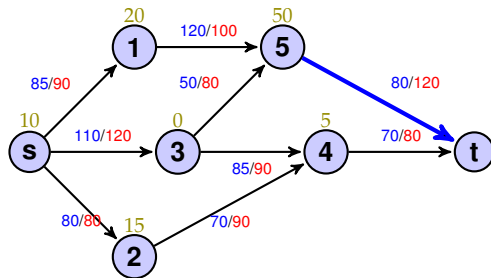
EXAMPLE



$Q = \{5\}$
Best: 5

	π	time	bat
s		0	50
1	s	0.9	27.1
2	s	1	30.4
3	s	0.9	9.8
4	2	1.8	11.6
5	1	2.5	0
t	4	3	0

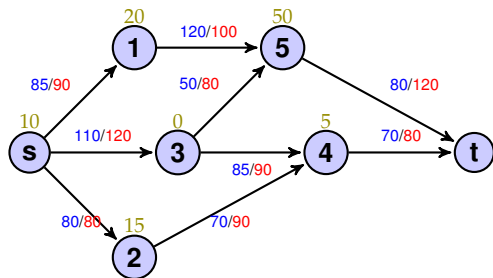
EXAMPLE



Driving: Not possible
 Charge and drive: 120km/hr:
 1.2hr

	π	time	bat
s		0	50
1	s	0.9	27.1
2	s	1	30.4
3	s	0.9	9.8
4	2	1.8	11.6
5	1	2.5	0
t	4	3	0

EXAMPLE



Conclusion

- Greedy path: $\langle s, 2, 4, t \rangle$, 3 hours
- Optimal path: $\langle s, 3, 5, t \rangle$, 2.8 hours

	π	time	bat
s		0	50
1	s	0.9	27.1
2	s	1	30.4
3	s	0.9	9.8
4	2	1.8	11.6
5	1	2.5	0
t	4	3	0