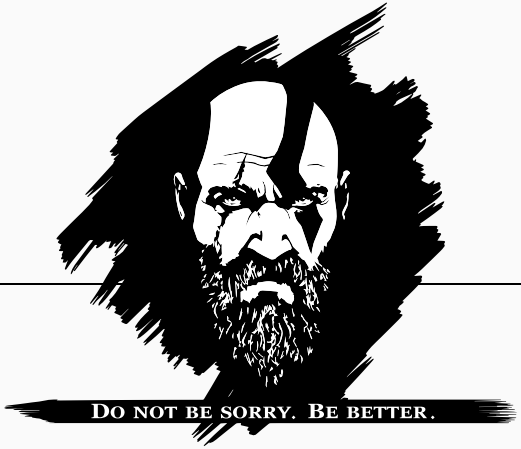
Formula One - Presentation

ACU 2019 Team



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Definitions

Definition

Wikipedia

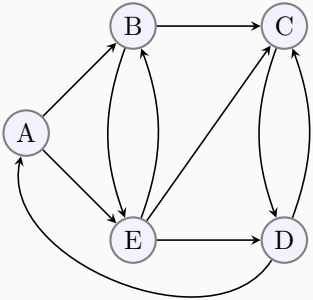
Dijkstra's algorithm is an algorithm for finding the shortest paths between nodes in a graph, which may represent, for example, road networks. It was conceived by computer scientist Edsger W. Dijkstra in 1956 and published three years later.

Graphs reminders

About graphs

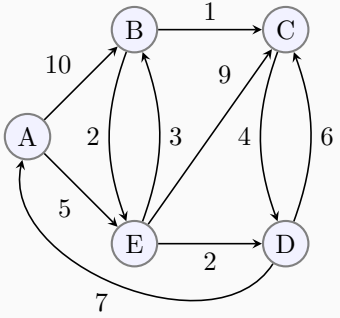
- Set of nodes
- Set of edges linking the nodes
- Edges can be directed

Example: graph

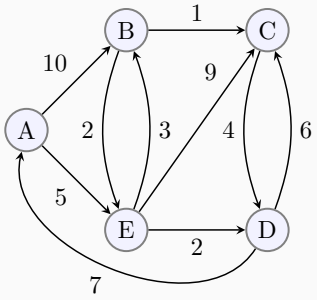


Example: weighted graph

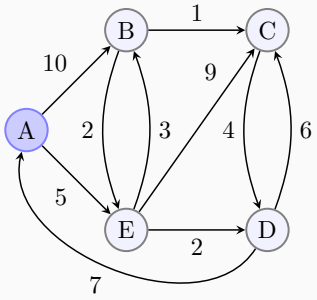
Edges can have weights that are used for specific computations.



Dijkstra example



Vertex	Marked	Cost	Parent
A	F	0	-
B	F	-	-
C	F	-	-
D	F	-	-
E	F	-	-



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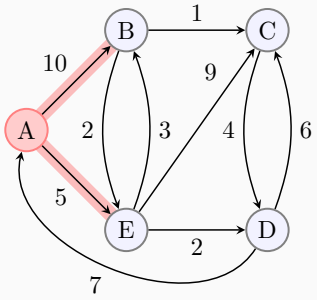
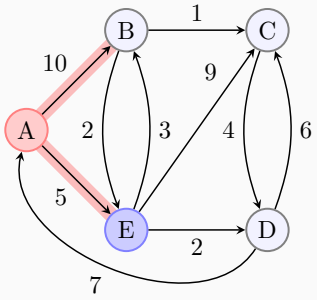


Vertex	Marked	Cost	Parent
A	T	0	-
B	F	10	A
C	F	-	-
D	F	-	-
E	F	5	A



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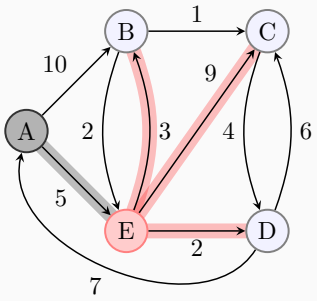
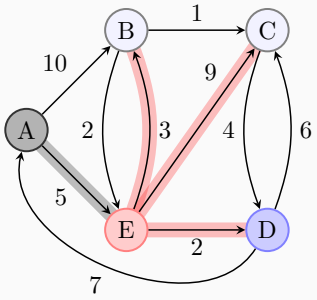


Vertex	Marked	Cost	Parent
A	T	0	-
B	F	8	E
C	F	14	E
D	F	7	E
E	T	5	A



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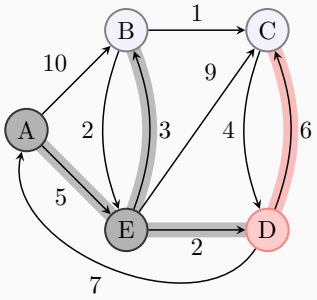

Vertex	Marked	Cost	Parent
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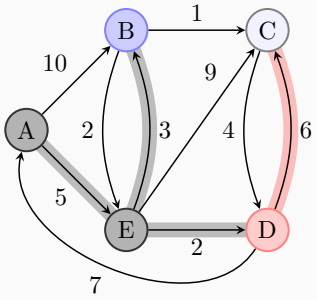
B	F	8	E
C	F	13	D
D	T	7	E
E	T	5	A



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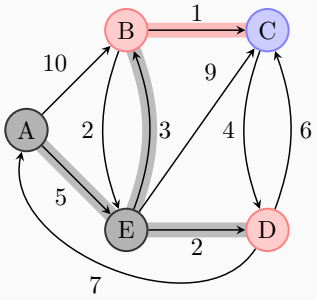
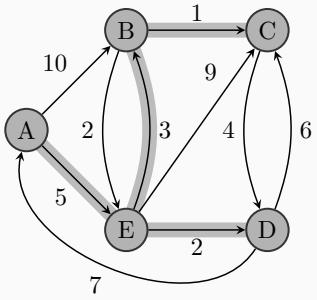


Vertex	Marked	Cost	Parent
A	T	0	-
B	T	8	E
C	F	9	B
D	T	7	E
E	T	5	A



Vertex	Marked	Cost	Parent
A	T	0	-
B	T	8	E
C	T	9	B
D	T	7	E
E	T	5	A

Use-case and tips

Use-case in Formula One

- Your map grid is your graph.
- Find the right weight for grass and road.
- Find the shortest path to the finish line.
- Drive your car along this path

Examples

- Simulations showing Dijkstra's algorithm in action are available here: https://www.cs.usfca.edu/~galles/visualization/Dijkstra.html.

Conclusion

Going further

There are many pathfinding algorithms. You are free to implement whichever you want but make sure it is adapted to your needs.

Shortest path algorithms

- Dijkstra
- Bellman-Ford
- Floyd-Warshall
- ...

Pathfinding

- A*
- Sample
- ...

Any questions?