Algorithm Practice

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Travelling Salesman Problem (TSP)

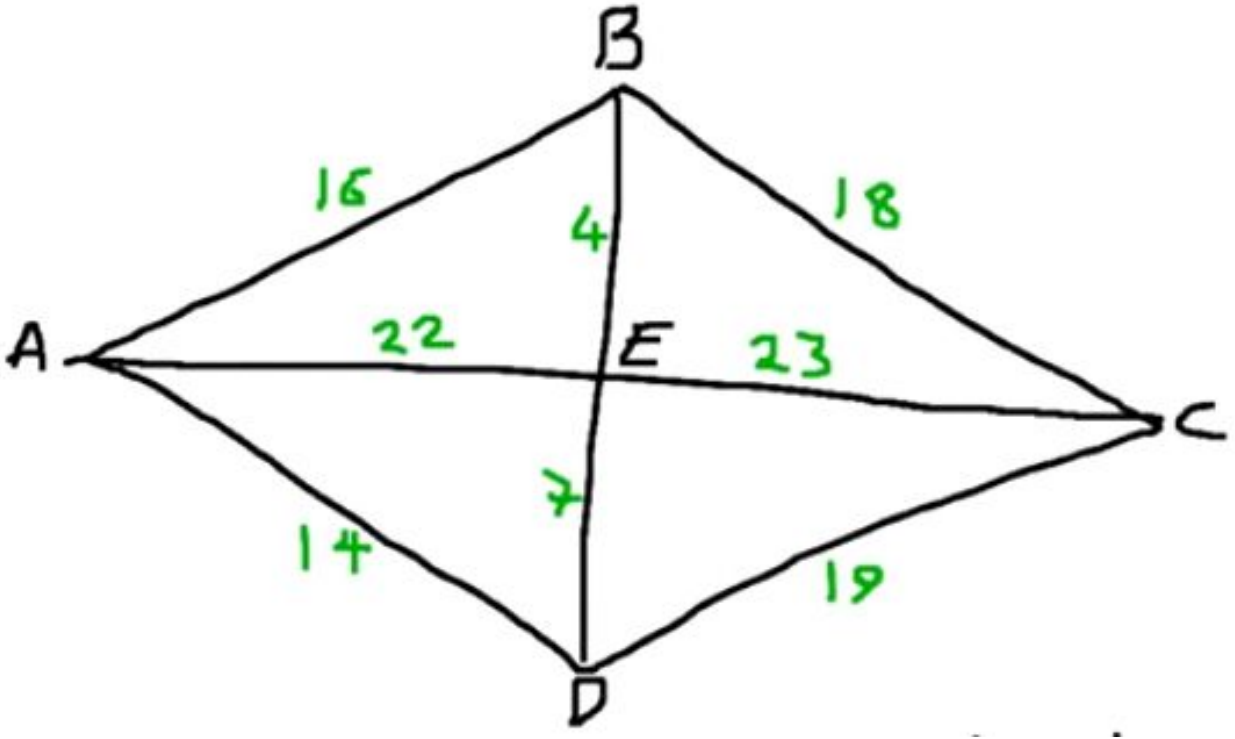
Few Example Algorithms

1. QR Algorithms For Computing Eigenvalues
2. JPEG Compression Algorithm
3. Google's Ranking Algorithm

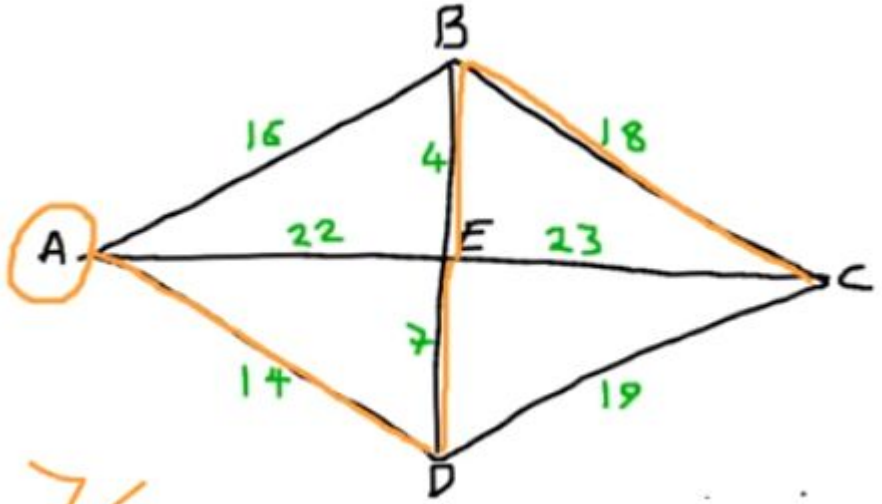
Travelling Salesman Problem (TSP):

Given a set of cities and distance between every pair of cities, the problem is to find the shortest possible route that visits every city exactly once and returns to the starting point.

A = Riga



Approach 1 - Nearest Neighbour Algorithm



A D E B C → A
14 7 4 18 33 = 76

Optimal solution

KNN Algorithm

Distance functions

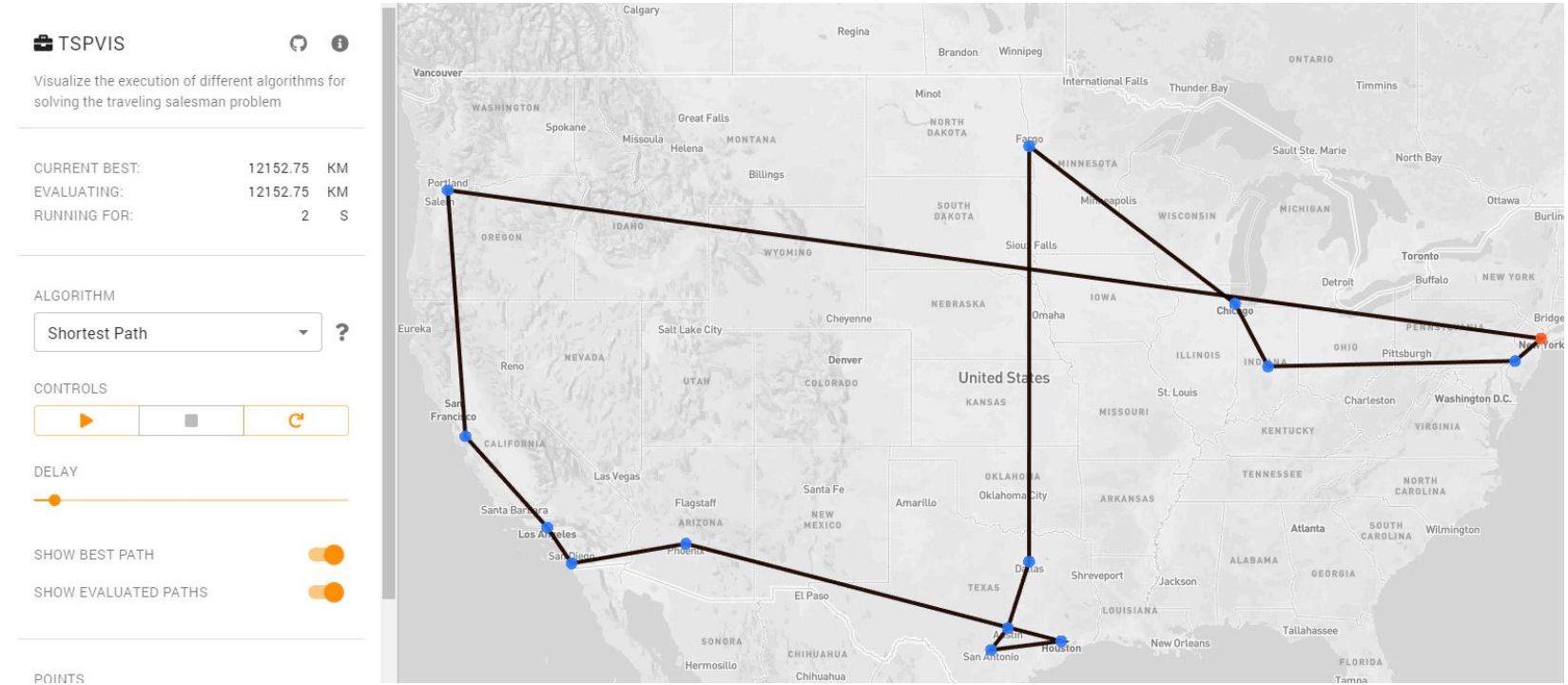
Euclidean $\sqrt{\sum_{i=1}^{k}(x_i - y_i)^2}$

Manhattan $\sum_{i=1}^{k}|x_i - y_i|$

Minkowski $\left(\sum_{i=1}^{k}(|x_i - y_i|)^q\right)^{1/q}$

KNN algorithm infromation https://www.saedsayad.com/k_nearest_neighbors.htm

https://tspvis.com/



How does the algorithm of Google predict traffic works?

Ref: https://patents.google.com/patent/US8103435

https://www.youtube.com/watch?v=k5eL_al_m7Q&feature=emb_title

Home task write a algorithm for travel salesman problem

Few Example Algorithms

QR Algorithms For Computing Eigenvalues

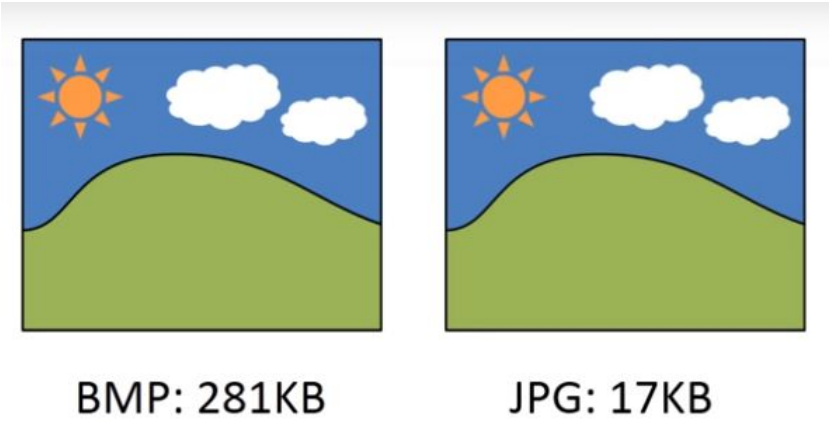
$$\mathbf{A} \cdot \mathbf{v}_1 = \lambda_1 \cdot \mathbf{v}_1$$

$$(\mathbf{A} - \lambda_1) \cdot \mathbf{v}_1 = 0$$

$$\begin{bmatrix} -\lambda_1 & 1 \\ -2 & -3-\lambda_1 \end{bmatrix} \cdot \mathbf{v}_1 = 0$$

$$\begin{bmatrix} 1 & 1 \\ -2 & -2 \end{bmatrix} \cdot \mathbf{v}_1 = \begin{bmatrix} 1 & 1 \\ -2 & -2 \end{bmatrix} \cdot \begin{bmatrix} v_{1,1} \\ v_{1,2} \end{bmatrix} = 0$$

JPEG Compression Algorithm



JPEG Compression algorithm has five main basic steps.

1. RGB color space to YCbCr color space Conversion
2. Preprocessing for DCT (Discrete Cosine Transformation) transformation
3. DCT Transformation
4. Coefficient Quantization
5. Lossless Encoding

Google's Ranking Algorithm (PageRank) Could Be the Most Widely Used Algorithm

The PageRank algorithm is given by the following formula:-

$$PR(A) = (1-d) + d\,(PR(T1)/C(T1) + \ldots + PR(Tn)/C(Tn))$$

Where:-

- PR(A) is the PageRank of page A,
- PR(Ti) is the PageRank of pages Ti which link to page A,
- C(Ti) is the number of outbound links on page Ti and;
- d is a damping factor which can be set between 0 and 1.

Think algorithm before writing program

Algorithm for going to the market to purchase a pen.

1. Get dressed to go the market.
2. Check your wallet for money.
3. If there is no money in the wallet, replenish it.
4. Go to the shop.
5. Ask for your favorite brand of pen.
6. If pen is not available, go to step 7 else go to step 10
7. Give money to the shopkeeper.
8. Keep the purchased pen safely.
9. Go back home.
10. Ask for any other brand of pen.
11. Go to Step 7.

Home task - Write a program to purchase a pen