**Finding the Way**

***Make Dijkstra’s Algorithm Easier to Understand***

by BatViz (Rui & Umang)

Have you ever heard about Dijkstra’s Algorithm? Do you know how Dijkstra’s Algorithm can be used to solve problems in our daily life? Now thinking back to a busy morning when you and your family members are all in a hurry and need to go to different places at a certain time, how did you and your family members decide the most efficient way to share the ride? Dijkstra’s Algorithm can help you find the answer.

**Jack’s Family Needs Some Help**

Now, let’s work together to help Jack’s family make their busy morning easier.

Jack is an elementary school student, and he lives with his Mom, Dad, and Grandpa. On a Tuesday morning, Jack needs to go to school as usual. His Dad needs to go to the office for an important meeting. His Mom is planning to go to the supermarket to buy some fresh vegetables to cook lunch. His Grandpa has a doctor appointment in the nearby hospital. They decide to leave the house together and share the ride. What is the fastest way for them to arrive at their destinations and how many cars do they need at minimum?

To solve this problem, we need to find the shortest paths between home and different destinations, and Dijkstra’s Algorithm can help us find the answer. Let’s use the directed edge-weighted graph at right as the map to solve this problem. You can click on the icon buttons below to find out where are the destinations located.

(Interaction 1: click on the icons below 🡪 corresponding icons on the graph change color from black to green)

**Learn the Concept & Solve the Problem**

Dijkstra’s Algorithm is an algorithm for finding the shortest paths between nodes in a graph (Wikipedia). The starting node is called initial node, and the end node is called destination node. The algorithm first marks all nodes in the graph unvisited. Then, it picks the unvisited node with the lowest distance, calculates the distance through it to each unvisited neighbor, and updates the neighbor’s distance if smaller. Mark visited when done with neighbors. Finally, when the destination node has been marked visited, the algorithm stops and the shortest path is found.

Let’s work on the problem step by step:

**Step 1:**

Let’s set Home as our initial node and mark all nodes in the graph unvisited.

As you can see through the highlighting part of the graph,