8.21. Analysis of Dijkstra's Algorithm

Finally, let us look at the running time of Dijkstra's algorithm. We first note that building the priority queue takes $O(V)$ time since we initially add every vertex in the graph to the priority queue. Once the queue is constructed the `while` loop is executed once for every vertex since vertices are all added at the beginning and only removed after that. Within that loop each call to `delMin` , takes $O(\log V)$ time. Taken together that part of the loop and the calls to delMin take $O(V \log(V))$. The `for` loop is executed once for each edge in the graph, and within the `for` loop the call to `decreaseKey` takes time $O(E \log(V))$. So the combined running time is $O((V + E) \log(V))$.

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