CNS4202-G6

GROUP PROJECT

Disaster Response Optimization in Kelantan: Real-time Evacuation Planning

Group Member:	Matric Number:
CH’NG JUN BIN	211221
CHIN WEN PING	212658
LIM CHIEW FUNG	212876

PERSONA

Name: Fatimah Aziz

Age: 76

Lived in: Kuala Krai, Tanah Merah

Challenges: Fatimah faced the daunting challenge of evacuating her family from their submerged home. The lack of proper evacuation routes and the chaos around her added to the difficulty.

Goals:

- Self-safety enhanced
- Get informed on the evacuation routes

Problem Statement

How can we design an optimal evacuation solution for Kelantan, which is prone to severe flooding during hurricane season, to minimize response time and ensure efficient and safe evacuations for all residents?

Solution

Our proposed solution aims to address the challenges of evacuation planning in Kelantan during the monsoon season. Our solution focuses on developing an optimal evacuation system that minimizes response time and ensures the efficient and safe evacuation of residents by showing them the routes.

IMPACT

Increased Safety

By identifying the safest and most efficient routes, the system **minimizes exposure to hazardous conditions** and ensures timely alerts and evacuation orders, **reducing the risk** of victims being trapped in rising floodwaters

Minimized Evacuation Time

Our system provide quick calculation of the **shortest and safest evacuation routes**, ensuring that victims reach shelters faster.

Reduced Stress and Anxiety

Providing **clear and concise evacuation instructions** helps reduce panic and confusion among victims.

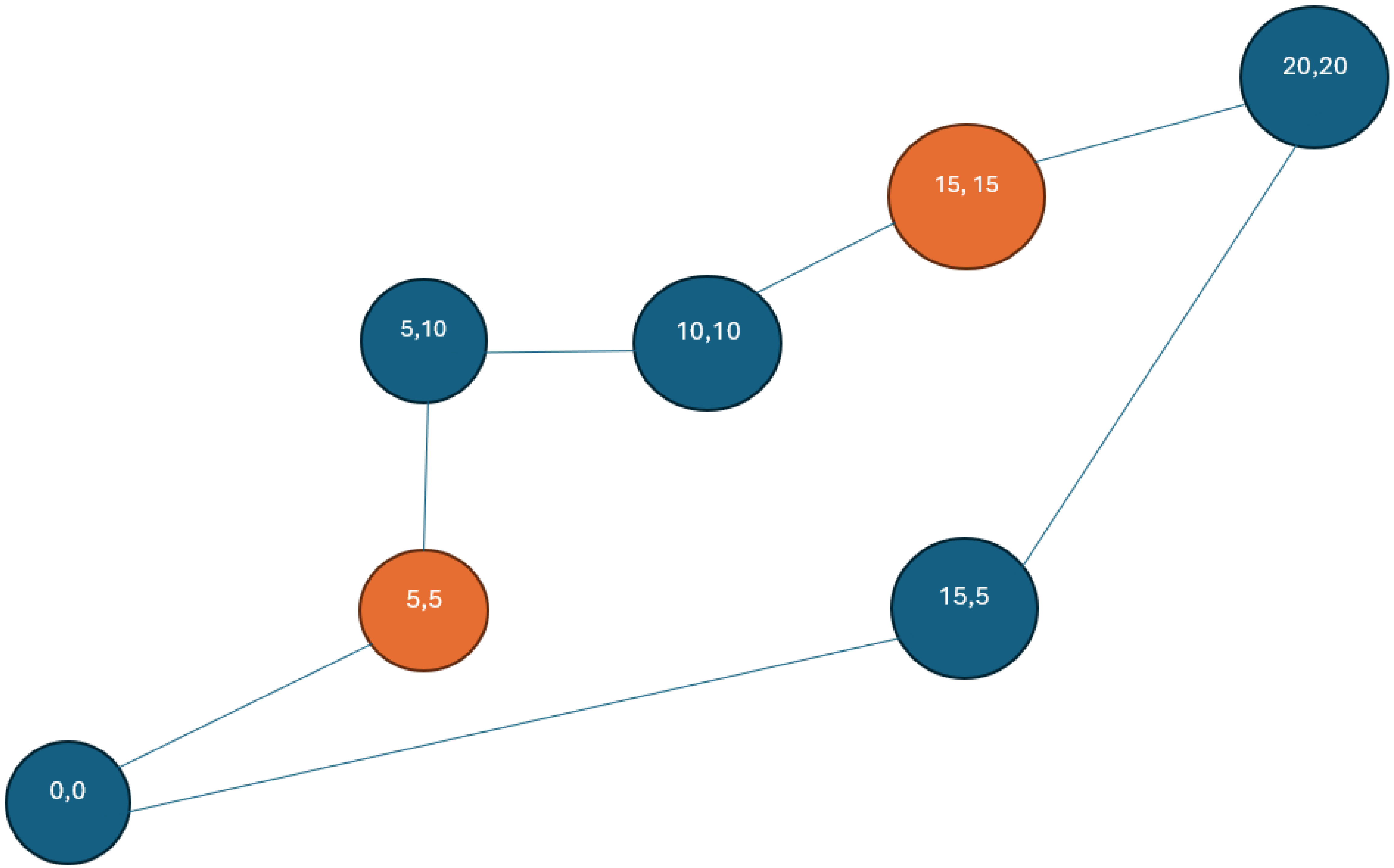
Algorithm Comparison

Algorithm	Strengths	Weakness
Sorting	It is useful for ordering evacuation points based on proximity or urgency.	Insufficient for dynamic route optimization.
Divide and Conquer (DAC)	Breaks down large problems into smaller subproblems.	May not consider global optimality in route planning.
Dynamic Programming (DP)	Ideal for problems with overlapping subproblems and optimal substructure.	Computationally expensive and requires careful problem formulation.
Greedy Algorithms	Efficient for making real-time decisions and simple to implement.	May not always yield the globally optimal solution.
Graph Algorithms	Suitable for representing evacuation routes and networks.	Requires modifications to handle multiple objectives and real-time constraints.

Greedy Algorithm

The greedy algorithm is ideal for real-time evacuation planning due to its **simplicity and efficiency**. It quickly calculates routes by making the **best choice** at each step, crucial during emergencies. While not always globally optimal, it often **provides near-optimal, practical solutions** for safe and quick evacuations.

Illustration of Evacuation Planning Map



Algorithm Analysis & Output

Output:

```
Route from (5, 5) to (0, 0) takes 14 time units.
Route from (5, 5) to (10, 10) takes 17 time units.
Route from (5, 5) to (20, 20) takes 31 time units.
Route from (5, 5) to (5, 10) takes 13 time units.
Route from (5, 5) to (15, 5) takes 11 time units.
Chosen Route from (5, 5) to (15, 5) takes 11 time units.

Route from (15, 15) to (0, 0) takes 30 time units.
Route from (15, 15) to (10, 10) takes 14 time units.
Route from (15, 15) to (20, 20) takes 14 time units.
Route from (15, 15) to (5, 10) takes 17 time units.
Route from (15, 15) to (15, 5) takes 10 time units.
Chosen Route from (15, 15) to (15, 5) takes 10 time units.
```

Correctness:

The Greedy algorithm efficiently determines the best evacuation routes based on real-time conditions. It ensures that residents are evacuated to the nearest shelters quickly and safely.

Time Complexity:

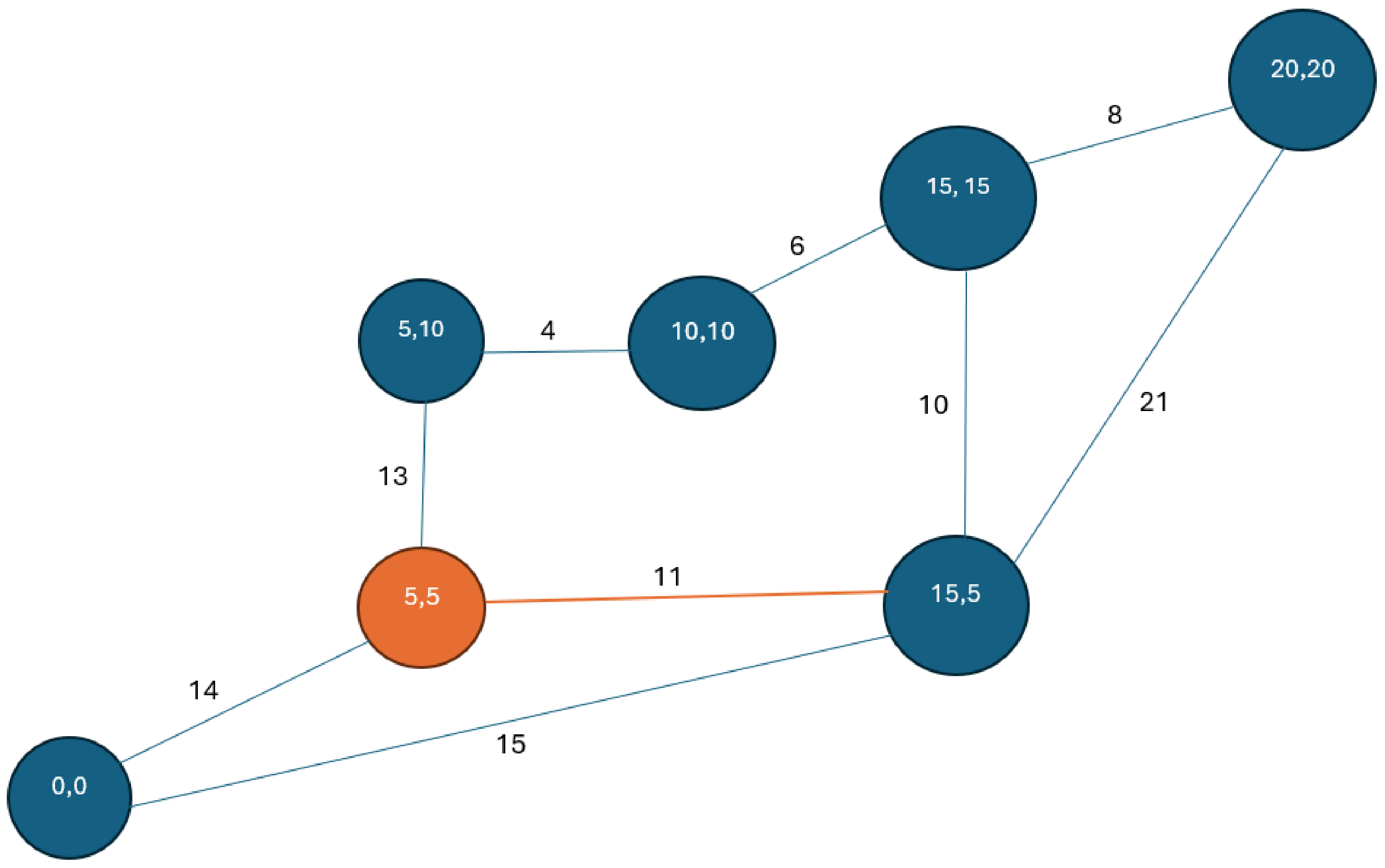
Best Case:
O(m log m) for finding the nearest shelter, where m is the number of shelters

Average Case:
O(m log m)

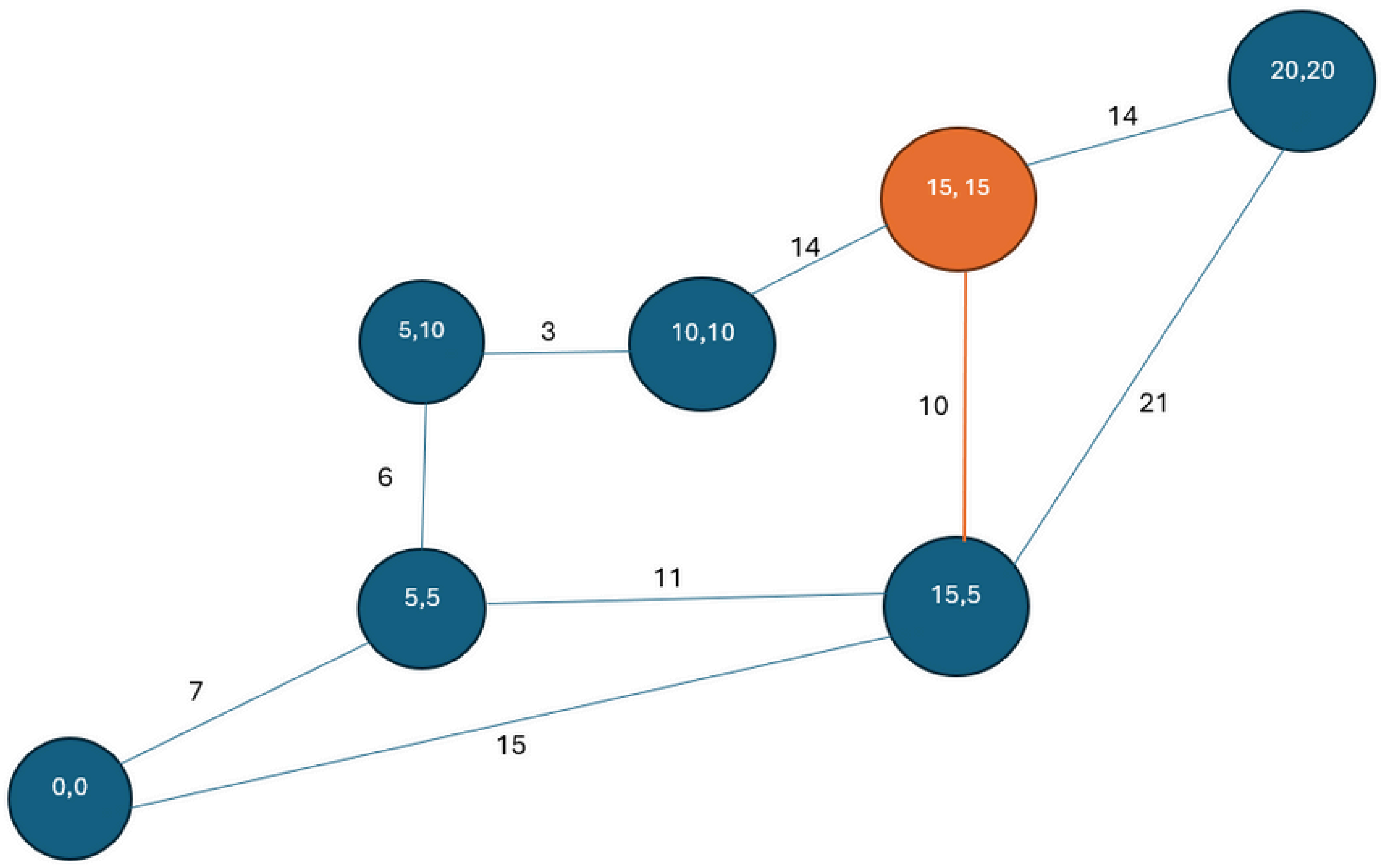
Worst Case:
O(m log m)

Program Demonstration

When affected area is (5,5):



When affected area is (15,15):



THANK YOU