2022_“ShuWei Cup”

Problem B：Red VS. Blue

In modern war, both offensive and defensive sides need to introduce efficient war strategies to increase war threats and reduce losses. Only by forming a relatively stable and balanced war dynamics can the ultimate goal of reaching consensus be realized as soon as possible.

In view of the above war problems, consider the following simplification of the Red VS. Blue war problem: assuming that the Red and the Blue are engaged in the battle as shown in Figure 1, the two parties can only conduct the initial platoon in the position with the same color, and each node has its own attack difficulty. The more difficult the attack is, the larger the circle radius in Figure 1, you need to provide the optimal battle strategy for each party based on the actual number and characteristics of the two parties' military weapons.

The main fighting units on both sides are infantry, and the main weapons are light tanks with mobility and concealment, medium tanks with balanced firepower and mobility, heavy tanks with heavy armor and powerful firepower, self-propelled artillery with ultra-long-range striking ability and powerful fire support, strategic bombers (not too many units should be deployed to prevent bombing) and anti-aircraft artillery (each side can set up 10 anti-aircraft points). The Red has 1.25 million infantry, 500 drones, 180 heavy tanks, 300 medium tanks, 420 light tanks and 7000 self-propelled guns. The Blue has 1 million infantry, 300 drones, 340 heavy tanks, 570 medium tanks, 800 light tanks, and 14,000 self-propelled guns. See Attachment 2 for the specific parameters of the Red and the Blue weapons. Please solve the following three problems through appropriate simplified assumptions and mathematical modeling methods:

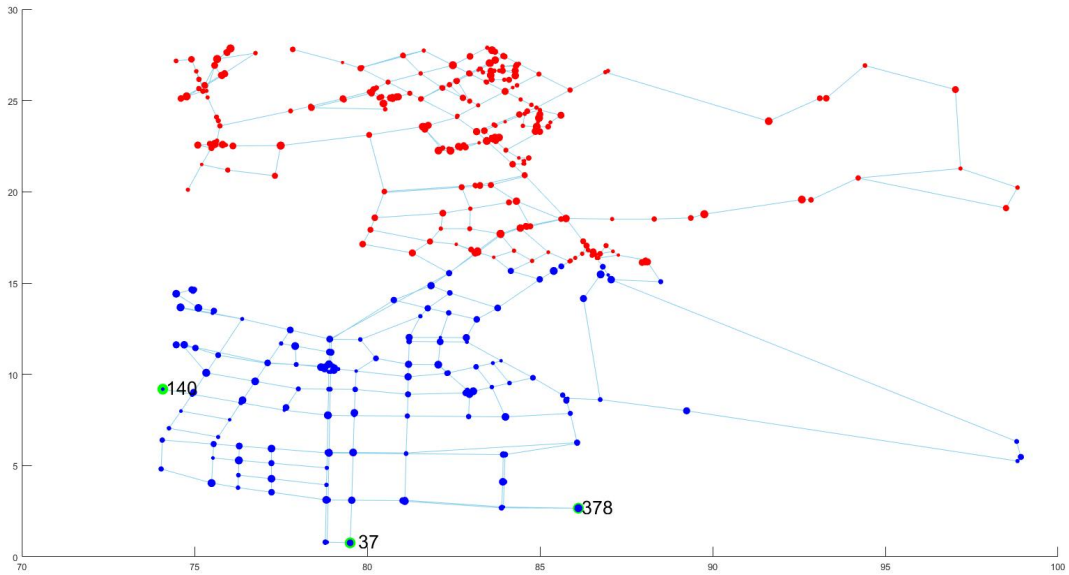

Figure 1 Assignable nodes for the Red and Blue

Question 1: Based on the data in Annex 1 and Annex 2, and considering the attack difficulty, march distance, weapon range and air defense deployment of each node, please work out the assigned positions and quantity scale of infantry, tanks, self-propelled artillery and air defense

artillery of both sides, as well as the optimal command positions and several alternative positions of both sides.

Question 2:

Based on the optimization results of question 1, you need to build the optimization model of medical supplies, military supplies and daily supplies distribution and supply for both the Red and Blue. At the same time, on the basis of fully considering the potential attack strategy from the other side, the key information such as the total number of workers and vehicles required in the non-supply mode is provided during the modeling. Finally, you need to provide the optimal supply plan of the Red and the Blue in the form of tables or graphs in the text.

Question 3:

In combination with the previous two questions and in the case of the Red attacking and the Blue defending, please propose the Red's better attack plan and the Blue's better retreat plan. Given that the retreat node of the Blue is [37,140,378], what are the different overall retreat plans of the Blue in the case of good communication and communication interruption?