Manjesh Prasad

Homework #3

WHAT IS THE PROBLEM?

We need to get all men and women to the other side of the river without violating certain constraints

WHAT ARE THE CONSTRAINTS?

- Women cannot outweigh the men on one side
- The women cannot be on one side of the river with other men without the husband present, because the husband will get “Jealous”
- The boat can hold, at most, 2 people
- Women cannot travel to the other side of the river on a single boat unless it’s with their husband

Potential problems that can erupt, and how to resolve them/ avoid them

- **We cannot pair a woman without their husband on the same boat, to avoid potential jealousy**
  - If a woman does get paired/ left alone with other men, then the husband will get jealous and “problems” will occur
  - In order to avoid this, we need to have women sail each other to the other side of the river, or with their husbands.
- **What will happen if there exists a man within a group of women.**
  - There will be no problem with this because there is female support within the entire group.
- **What will happen if the women outweigh the men on one side.**
  - If the women outweigh the men on one side, then one woman needs to get on the boat and go to the other side regardless of their husbands.
- **Is there a certain situation where we can put more than 2 people in a single boat?**
  - **NO**
- **Is it okay to say a woman can be on the same side as the other men as long as their husband is on the same side as them?**
  - Yes, as long as their husband is on the same side as their wives.

- **What will happen if there exists a woman in a group of other men without their husbands.**
  - The jealous husband will not be happy and there will be a problem that will occur
  - In order to resolve this issue, the husband must be there in presence of other men that is within the group in order to not allow their wives to be alone.

EVERY PEOPLE IN THIS PROBLEM

- **State:**
  - There exist 2 positions that each people can be in separated by the river:
    - The left side of the river, and the right side
- **Initial State:**
  - Everyone exists on one side of the river
- **Actions:**
  - Each person can take the boat (which can withhold 2 people maximum) and travel through the river to the other side.
    - There will exist some constraints that will prevent mobility freely
      - The “Jealous Husband Problem” is the main
- **Transition model:**
  - The person can move left or right on the river if the boat is on their side.
    - Which is safe to say that nobody knows how to swim or is equipped with any alternatives that will allow them to get to the other side of the river.
- **Goal test:**
  - Everyone is on the other side of the river, without breaking any of the constraints listed.
    - If a constraint is violated, we do not have a solution and need to have alternative solutions.

THE BOAT

- **State:**
  - The boat exists on the side of the river where the people originally stated in.
    - I.G, everyone is on the right side of the river initially, the boat exists on the right side of the river.
  - THE BOAT CAN ONLY HOLD 2 PEOPLE MAXIMUM
  - THE BOAT CANNOT USE OTHER DIRECTIONS TO TRAVEL

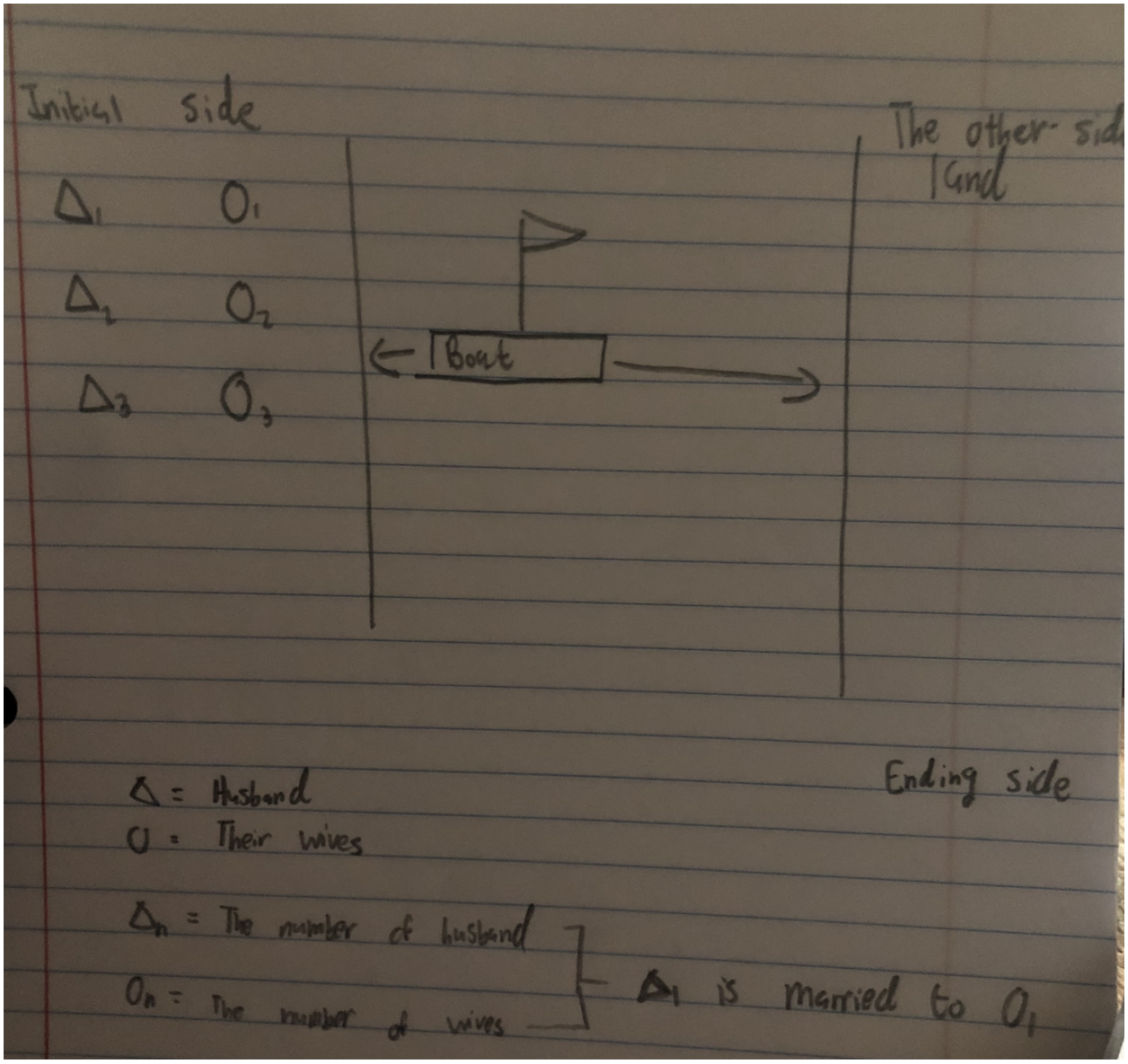
        - I.E UP, DOWN, DIAGONAL, CIRCLES, RECTANGLES
- **Actions:**
    - The boat can only travel left and right to the river.
        - It cannot go out of the river and on land.
- T**ransition model:**
    - If the boat is being used:
        - A person is on the boat and navigating it
            - The boat cannot float by itself.
        - If the boat needs to be used, only the people who exist on that one side of the river can operate it.
- **Goal test:**
    - The boat does its job and transports everyone to the other side of the river.

WOMEN:

- **State:**
    - There exist 3 women that are initially on the same side of the river as the men.
- **Actions:**
    - The women can use the boat and travel to the other side of the river.
        - There will be some constraints for them to mobilize to the other side of the river.
            - They cannot travel by other men that are not their husbands on the same boat.
                - This will violate the jealous husband rule
            - They cannot exist a larger sum of women on one side of the river than the men
    - The wives can travel with another woman to the other side of the river using the boat.
- **Transition model:**
    - Everyone starts off on one side of the river, and the ending goal is to be on the other side of the river.
        - Assuming that nobody can swim, they need to use the boat to travel in between the entire river.
    - **Goal test:**
        - All the women are with their husbands on the other side of the river.

❖ How to solve the problem:

- ➢ $H_1H_2H_3W_1W_2$ W_3B R Is the initial State
  - ■ H_i = Husband, W_i = Wives, B = Boat, R = River
- ➢ Initially, everyone starts off at the same place, and the boat is on their side of the river.
- ➢ W_2W_3 moves to the other side of the river
  - ■ $H_1H_2H_3W_1$ R B W_2 W_3
- ➢ W_3 will exit the boat and will stay put, while W_2will go back to the initial place
  - ■ $H_1H_2H_3W_1$ B W_2 R W_3
- ➢ W_1W_2 will go on the boat and will float to the other side of the river.
- ➢
  - ■ $H_1H_2H_3$ R B W_1 W_2 W_3
    - The number of men and women that are in either side of the river is the same. This supports the rule that no spouse will be accompanied by another man.
- ➢ W_1 will float back to the initial side of the river, and then H_2 and H_3 will load onto the boat.
  - ■ W_1H_1 B H_2H_3 R W_2 W_3
- ➢ H_2H_3 will be on the other side of the river and H_3 will be united with W_3
  - ■ W_1 H_1 R B H_2 W_2 H_3 W_3
- ➢ W_3 will go on the boat and will float to the other side of the river
- ➢ W_1H_1 B W_3 R H_2 W_2 H_3
- ➢ W_3 will get off the boat and W_1H_1 will float to the other side of the river.
  - ■ W_3 R W_1 H_1 B W_2 H_2 H_3
- ➢ H_3 will take the boat and will pick up W_3 and go to the other side of the river.
  - ■ R B W_3 H_3 W_1 H_1 W_2 H_2



Δ_1 O_1

Δ_2 O_2

Δ_3 O_3

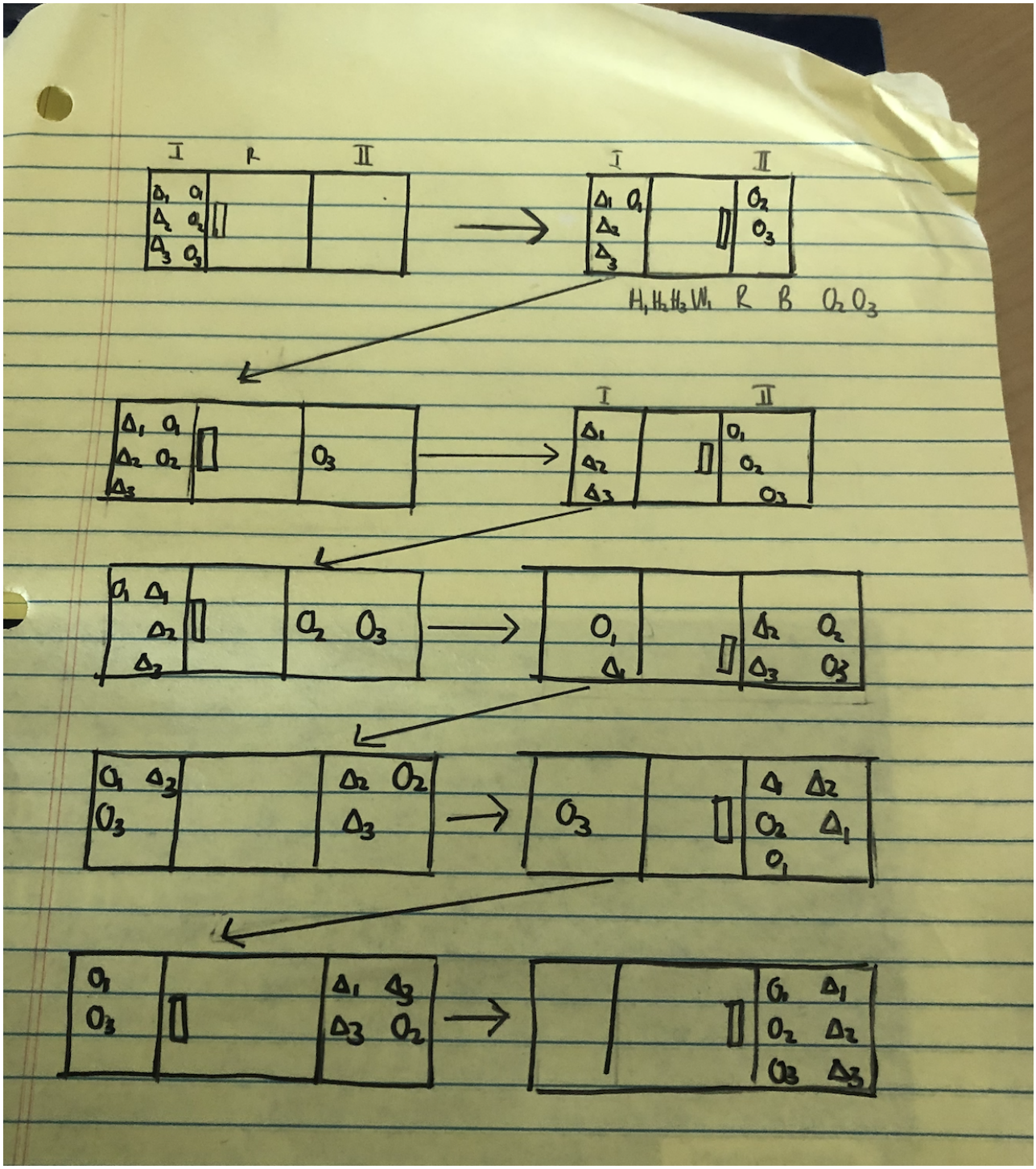
Δ = Husband

O = Their wives

Δ_n = The number of husband

O_n = The number of wives

Δ_1 is married to O_1


I
II
$H_1 H_2 H_3 W_1$ R B $O_2 O_3$