Paint Gallery

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Problem

- We need to find a way to quantify the security of an art exhibit for different wall configurations and determine whether the layout of the exhibit in Figure 1 or Figure 2 is more secure
- Use the method of evaluation to arrange the portable walls in their optimal configuration

Information

- There are 50 paintings
- Each painting must be separated from adjacent paintings by 1 meter of empty wall space
- Paintings must be 2 meters from the entrances and connecting walls
- Portable walls can be attached to walls at acute angles
- Parallel walls cannot be less than 5 meters apart
- Portable walls are available in 5 meter sections

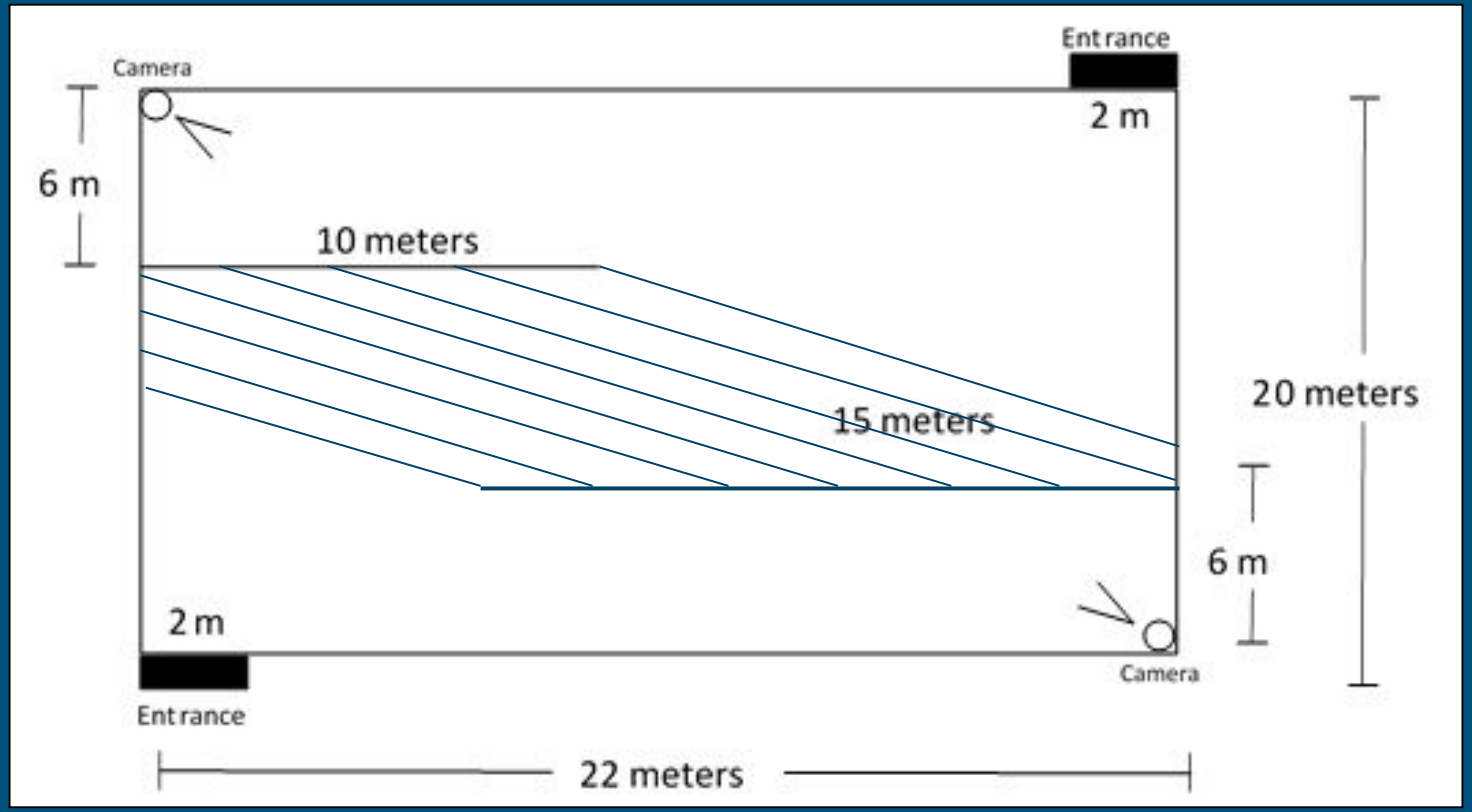
Information (cont.)

- Viewing angle of the 2 fixed cameras is 30°
- The camera takes 20 seconds to complete 1 cycle
- Outer walls are 4 meters tall, Portable walls are 3 meters tall
- Water colors can be placed on both sides of the portable wall

General Assumptions

- Camera moves at a constant velocity
- The dimensions of the paintings are 1m x 1m
- Paintings have no restrictions from being near the edge of portable wall

Figure 1


Entrance
Camera
2 m
6 m
10 meters
15 meters
20 meters
6 m
2 m
Camera
Entrance
22 meters

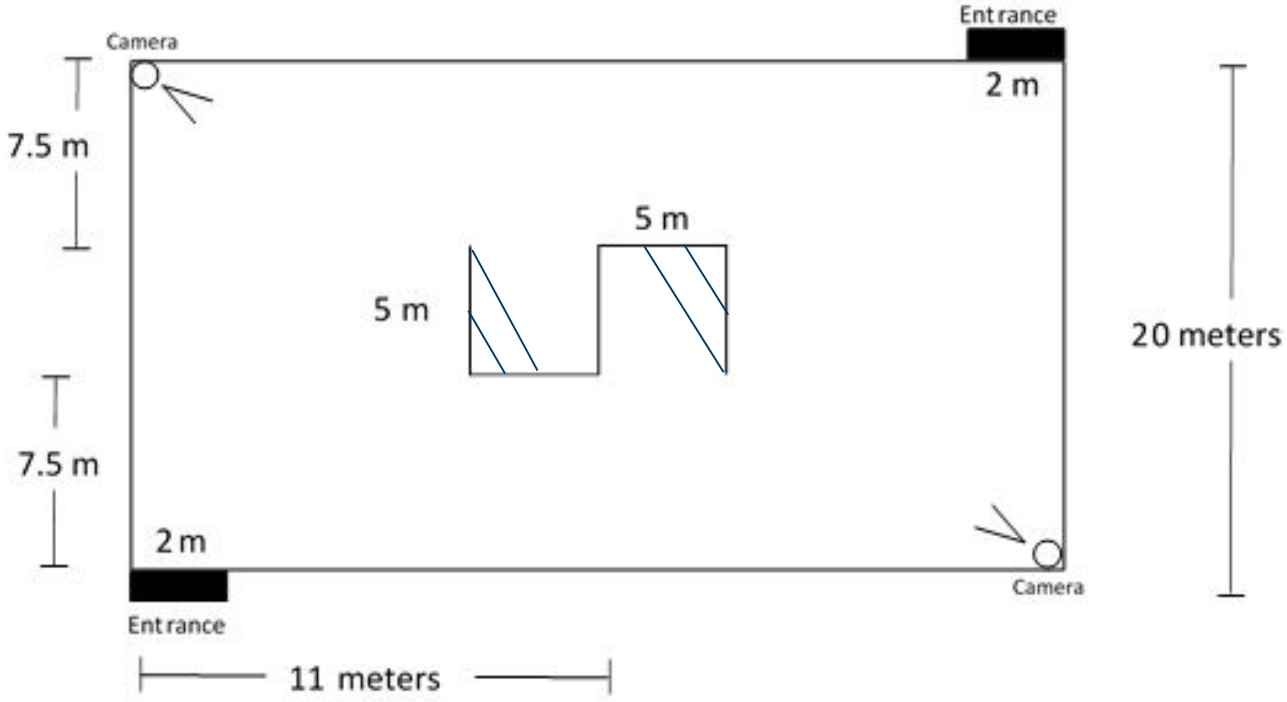
Analyzation

- 20 m and 22 m walls each have 16 m of space
  - Can fit 8 paintings in 16 m
- Total paintings on primary walls - 32
- 10 m portable wall
  - Can fit 5 paintings on each side of the wall
    - Add 5 paintings onto the side of the portable wall facing the upper left camera
    - Add 3 paintings onto the opposite side of the portable wall
- 15 m portable wall
  - Can fit 7 paintings
    - Add 7 paintings onto the side of the portable wall facing the bottom right camera
    - Add 3 paintings onto the opposite side of the portable wall

Analyzation (cont.)

- Each door is observed once every 20 seconds
- At any given time 5.4 - 58.1% of the room is being observed.
- Calculated by dividing area observed by total area.
- There is a large blind spot (27.6% of the room is never observed)
- A thief could take any one of the paintings in the blind spot and could easily make it to the door in the twenty seconds.

Figure 2

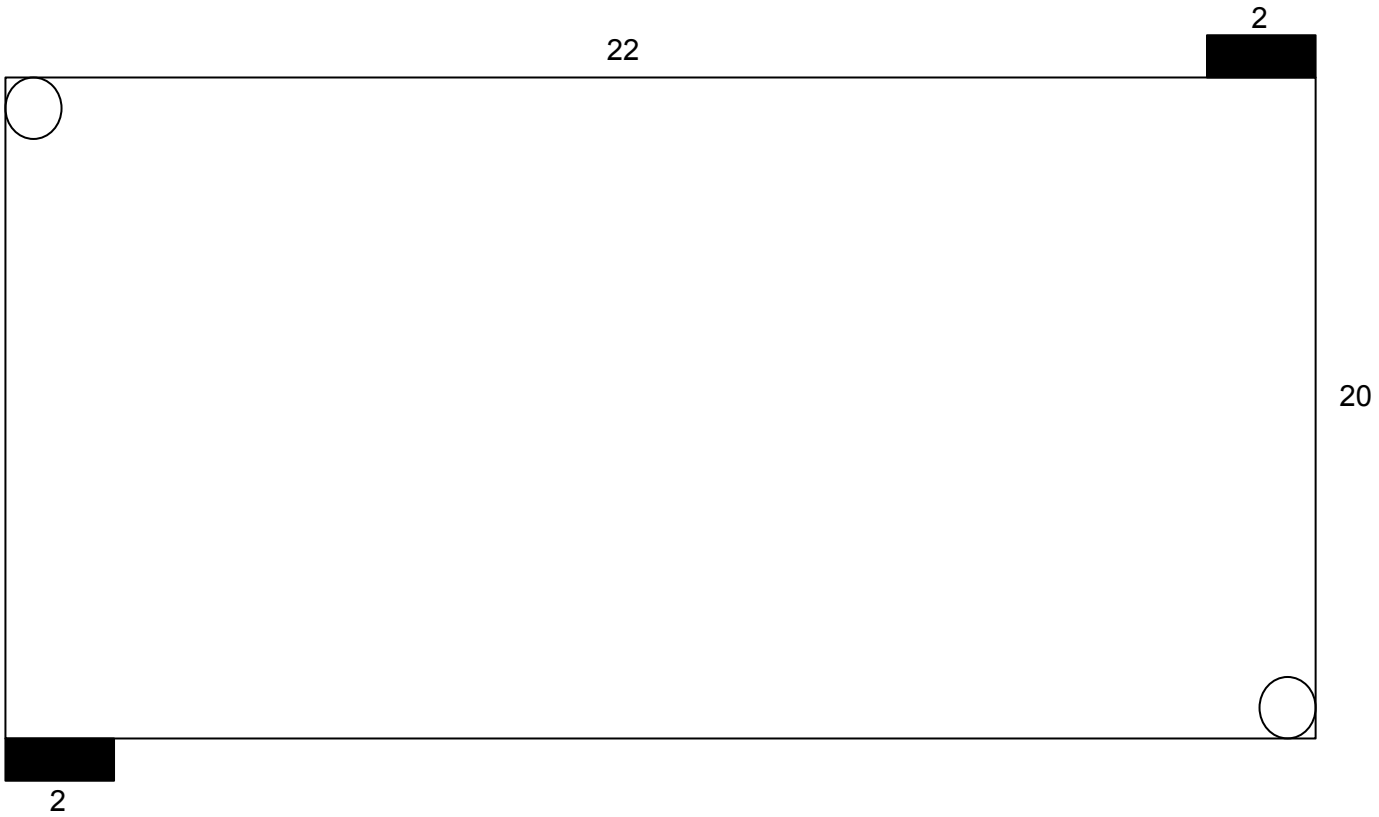

Entrance
Camera
2 m
7.5 m
5 m
5 m
20 meters
7.5 m
2 m
Camera
Entrance
11 meters

Analyzation

- 20 m and 22 m walls each have 16 m of space
  - Can fit 8 paintings in 16 m
- Total paintings on primary walls - 32
- 5 m portable walls 5 portable walls
  - Each wall can fit 2 paintings
  - Total 20 paintings
  - 4 paintings in blind spots
- At any given time, 31.8 - 52.5% of the room is being observed.
- 4.6% of the room is never observed.

Figure 2 was a more secure design

Configuration 1


2
22
20
2

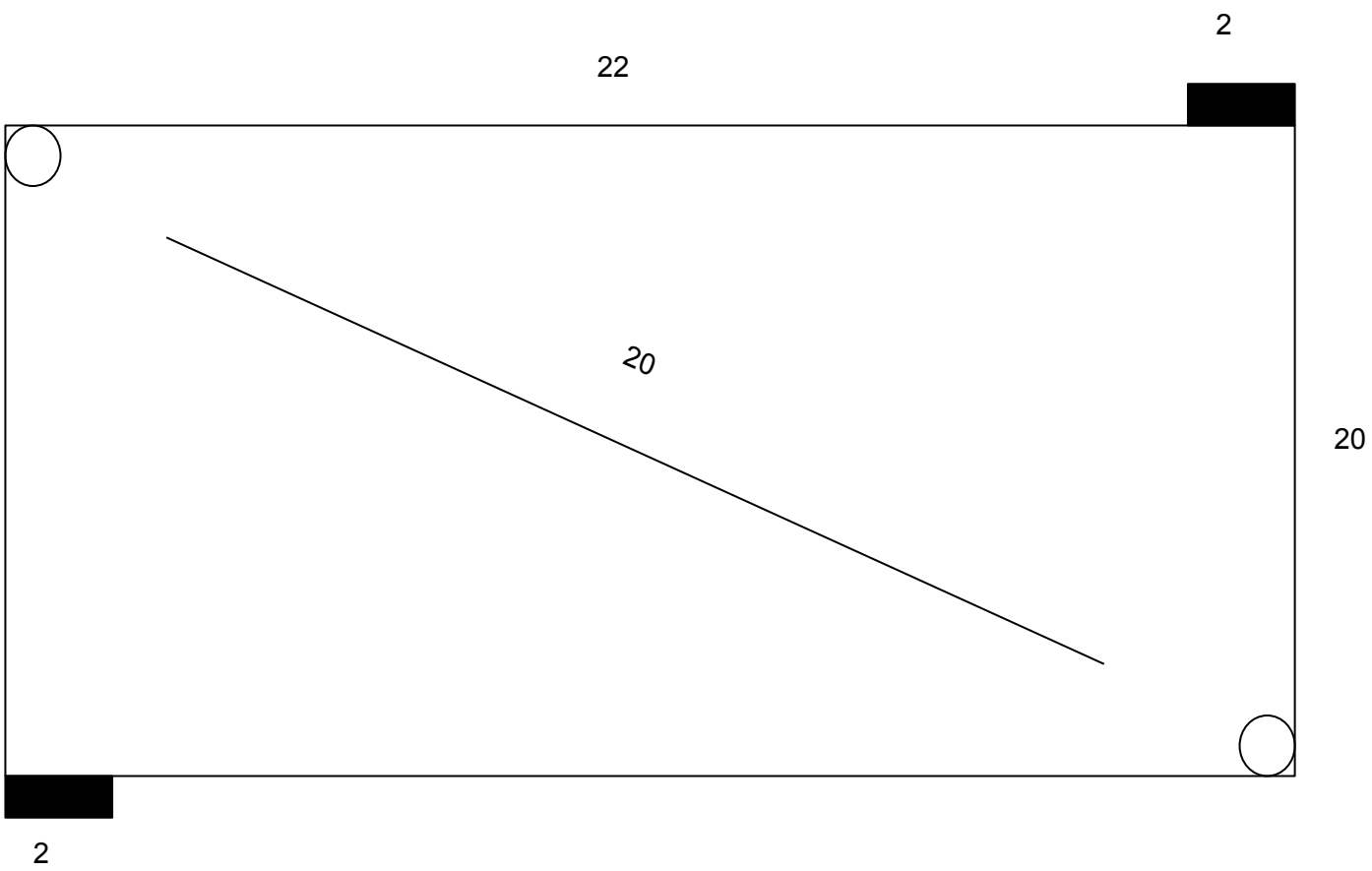
Solution

- Assumptions
  - Can Stack 2 paintings on top of each other
- No Portable walls
- 20 m and 22 m walls each have 16 m of space
  - Can fit 8 paintings in 16 m
  - If stack paintings, can fit 16 paintings in 16 m
  - Can fit 64 paintings on all 4 walls, so 50 will fit

Analysis

- No blind spots.
- Each door is observed once every 10 seconds
- View changes entirely every 6 ⅔ seconds
- No walls blocking the cameras
- Not the most convenient but very secure.

Configuration 2


2
22
20
20
2

Solution

- On 20m and 22m walls fit 8 paintings
  - 32 paintings on outside wall, need portable wall space for 18 more
- One long section of portable wall
  - Use 4 sections of 5m wall to create one 20m section of portable wall positioned diagonally across the room (ends towards cameras)
  - Can fit 9 paintings on each side of the wall, 1.5m from the ends
  - Leave 4.87m at the corners to move around the wall
- Analysis
  - No blind spots for the camera
  - Time between seeing is either 10 seconds (diagonal wall, and 20 m) or 7 ½ seconds (22m)

The End