

# High Level Design (HLD) Document

## Art Walking, Anew

### 1. Introduction

#### The Problem

A new 24-hour gallery wing is opening in the Louvre Museum in Paris. The gallery will start with three pieces of art. A random number of people (0-4) will enter the gallery every time step. However, the curator is unsure how many pieces to put into the museum and he doesn't want too many guests to be unhappy. He wants to know how many pieces he can fit in the gallery before the number of unhappy guests is too high, or until the model runs for 30 days.

#### Your Assignment

The curator has hired you and your software engineer to help them maximize foot traffic in the space while maximizing the number of art pieces they can display in the gallery. The guests will enter the gallery from the right and move around randomly trying to view over 50% of the works of art. Guests will keep track of what pieces of art they have viewed. When a guest is next to a piece of art they will stop moving for a random number of time steps (1-5). Once a guest has viewed over 50% of the pieces of art in the gallery, he/she will head directly to the exit out of contentment and wonder (happy). Each guest will have a "crowd tolerance" for how many people are in the room. A guest's tolerance will be a random number (5-25) giving to them upon entering the gallery. Guests will count how many times they cannot move because someone is in their way. When the guest count number equals their tolerance number, the guest will head directly to the exit out of frustration (unhappy). The curator will count how many people leave happy and unhappy. Every 24 hours the curator will add one new piece of art to the gallery. The curator will keep adding new pieces until the number of unhappy guest is 80%, or the model runs for 30 days, whichever happens first. Create a model to determine how many pieces the curator can fit in the gallery before the number of unhappy guests is too high, or until the model runs for 30 days.

## 2. Subject Matter Experts Agreement List

Name	Title/Role	Mandatory Reviewer (Y/N)	Approved
<i>Apprentice name</i>	Developer	Y	
<i>Phil List</i>	Supervisor	Y	
<i>Amalan Iyengar</i>	Intern-apprentice wrangler	Y	
<i>Mentor</i>	Mentor	Y	

## 3. Requirements

### SEE DEPICTION BELOW FOR ALL SPACING DETAILS

Your goal is to fit the maximum number of art pieces into the museum without creating too many unhappy guests, and all before 30 days are up. Find out how, many pieces of art is the right amount.

#### Guest:

1. They enter the gallery from the right
2. They move randomly in the gallery
3. They try to view (be next to) over 50% of the pieces
4. When they are next to a piece of art (within two blocks), they will not move for 30-150 seconds (1-5 time steps)
5. When they have viewed over 50% of the pieces of the art in the gallery, they will exit "happy"
6. They will each have a "crowd tolerance," which relates to the number of people in the room
7. "Crowd tolerance" will be a random value between 5-25 and will be assigned when they enter the gallery
8. They will count how many times they cannot move (because of too many people)
9. When "crowd tolerance" equals the number of times that they cant move (because of too many people), they will leave "unhappy"

#### Curator:

1. They will count how many guests leave "happy" versus "unhappy"
2. Every 24 hours (2880 time steps), they will add one new piece of art to the gallery
3. An animation of the curator placing the art is not necessary, the art can simply appear
4. They will keep adding art every 24 hours until 80% of all the guests leaving are "unhappy" OR until 30 days (86400 time steps) have passed, whichever happens first

## 4. Timeline

This is due within five days of receipt of the task (that would be Friday, June 20 for those receiving this Monday, June 16). It is better to complete this sooner, so that you can begin implementing an HLD that one of your classmates has written.

## 5. Desired Behavior / Components

### Guest Schedule (happening at any one time step):

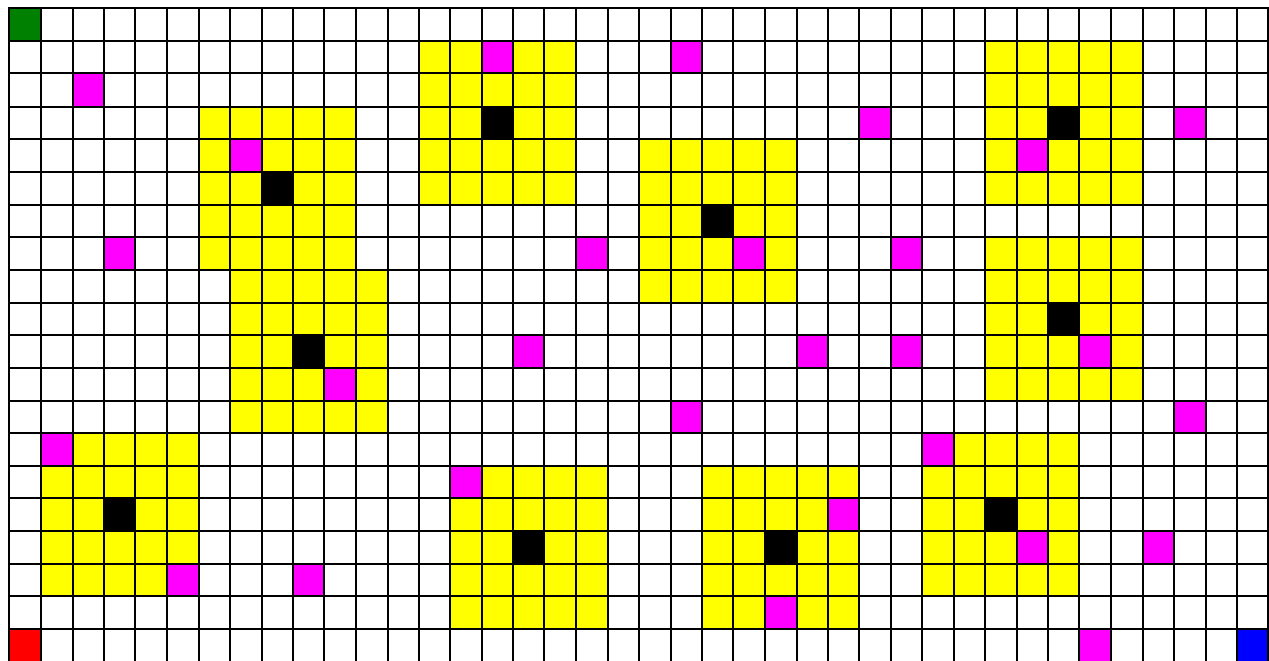
1. View surroundings
2. Check if next to (within two blocks of) art
  - a. If “next to” art, move to step 3
  - b. If not “next to” art, move on to step 5
3. Record the viewing of that specific art piece
4. Check if the number of art pieces viewed by you equals half of the total art pieces
  - a. If the number of art pieces viewed by you equals half of the total art pieces, then move on to step 9
  - b. If the number of art pieces viewed by you does not equal half of the total art pieces, then move to step 5
5. Attempt to move (randomly)
  - a. If they moved, then move on to step 8
  - b. If they didn’t move, then move to step 6
6. Record that you didn’t move
7. Check if number of times that you didn’t move equals “crowd tolerance”
  - a. If number of times that you didn’t move equals “crowd tolerance,” then leave
  - b. If number of times that you didn’t move doesn’t equal “crowd tolerance,” then move on to step 8
8. Repeat steps 1 through 9
9. Leave

### Curator Schedule (happens every single time a guest leaves):

1. Check if guest was “happy”
  - a. If guest was “happy,” then move on to step 3
  - b. If guest was “unhappy,” then record that information and move on to step 2
2. Check if total number of “unhappy” guests (who have left) equals 80% of total guests who have entered since beginning of program

- a. If total number of “unhappy” guests (who have left) equals 80% of total guests who have entered since beginning of program, then end program
- b. If total number of “unhappy” guests (who have left) does not equal 80% of total guests who have entered since beginning of program, then move to step 3
3. Check if 30 days (86400 time steps) have passed
  - a. If 30 days have passed, then end program
  - b. If 30 days have not passed, then move on to step 4
4. Check if it has been 24 hours (2880 time steps) since you last put up art
  - a. If it has been 24 hours (2880 time steps) since you last put up art, then put up art and move on to step 5
  - b. If it has not been 24 hours (2880 time steps) since you last put up art, then move on to step 5
5. Repeat steps 1-4

### Baseline: Map of Gallery



- = Entrance
- = Exit
- = Guest
- = Curator
- = Art
- = “Next To” Space

Above is a **potential** depiction of what the map of the gallery could look like.

### **Details**

1. One Time Step = 30 Seconds
2. Gallery Size = 20x40 blocks
3. The People, Entrance, Exit, and Art Work = 1x1 block
4. The gallery starts with three pieces of art
5. Each time step 0-4 guests will enter the gallery

## **6. Conclusion**

The goal of this activity is to help a museum curator determine how many pieces of art he/she should keep in his/her gallery. This model utilizes “agents” to give a hopefully accurate representation of what the gallery might look like on any given day. From that view, we should be able to see how the guests react to changed conditions (amount of art) and then change those conditions more to receive the optimal conditions to create the best environment. Of course, this model is purely hypothetical.