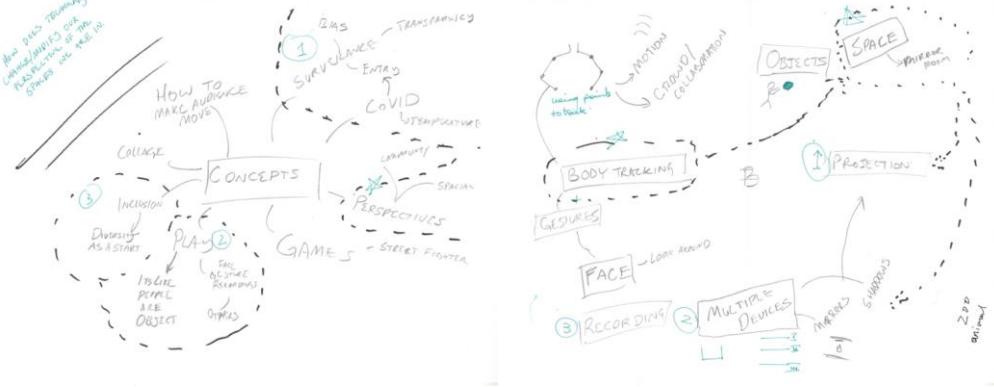


Crowded

(Team: Tyler betty, Yueming Gao, Purvi Agarwal)

Ideation and Mind mapping:



During the brainstorming process, we discovered that we came from different countries yet shared similar experiences in Covid. We discussed the increased usage of cameras in public spaces to check temperatures and heatmap of people. The relation of space, camera, and bacteria/viruses seemed like a common point of connection for us as a group. With a few initial ideas to explore:

- Humans on the screen can become furniture when positioned in a certain way.
- Make any space an interactive petting zoo.
- Surveillance and covid with increased usage of webcams in the world.

Driving Question for Inquiry:

- **How does technology change/modify our perspective of the space we're in?**
- Perspective of space means being able to see 2 versions of the same person in common space. How is the person different in the same space is enabled through technology.

Inspiration and Research works:

Covid IR Heat Cameras:



During the covid times, the webcam was used to detect the temperature. We found it an interesting use case as per the requirements in the pandemic.

China Kitchen CCTV Feeds:



In China, some restaurants tend to have camera in the kitchen, and it is projected in the restaurants for the customer to see the cleanliness as well as hygiene of the restaurants.





Rafael Lazano Hemmer:

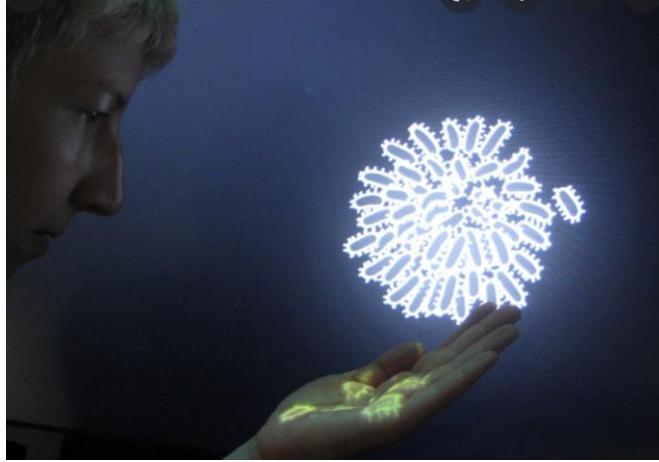
- **About Artist:** Rafael Lazano Hemmer was born in Mexico City in 1967. In 1989 he received a B.Sc. in Physical Chemistry from Concordia University in Montréal, Canada. Media artist working at the intersection of architecture and performance art. He creates platforms for public participation using technologies such as robotic lights, digital fountains, computerized surveillance, media walls, and telematic networks. Inspired by phantasmagoria, carnival, and animatronics, his light and shadow works are "antimonuments for alien agency".
- **Zoom Pavilion project:** Zoom Pavilion is an interactive installation that consists of immersive projection on three walls, fed by 12 computerized surveillance systems trained on the public. The piece uses face recognition algorithms to detect the presence of participants and record their spatial relationship within the exhibition space.https://www.lozano-hemmer.com/zoom_pavilion.php
- **Connection to our project** – We are inspired using space and the effect of surveillance. We were intrigued by how big spacial interactions and artwork changes the feel as well as experience. The interaction of cameras and the use of large projection in a confined room has been a great intersection point of exploration. We will be exploring both these elements in the project.



Harsh:

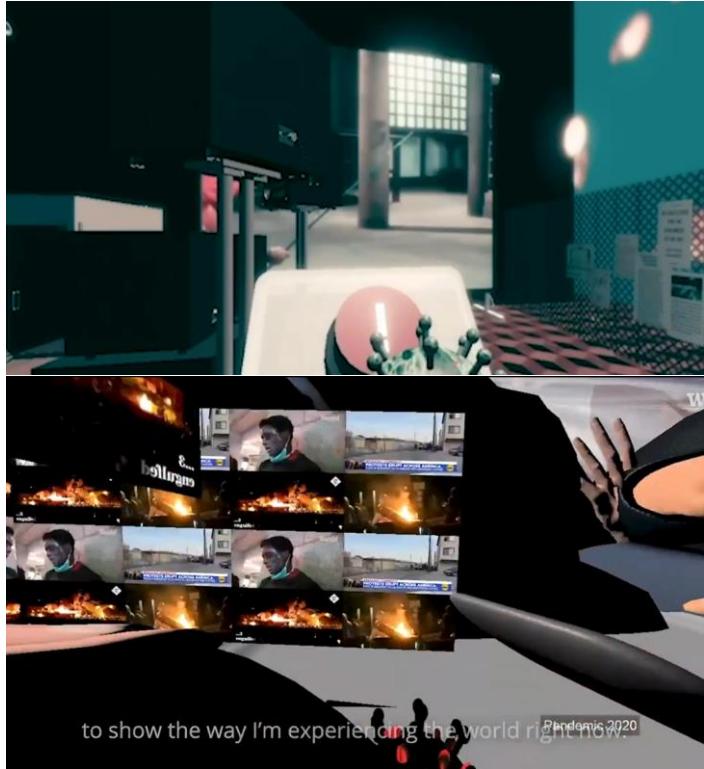
- **About creator:** He is a CMU student working on interesting interaction with code and stimulation.
- **Wolly-Willy:** It is an experimental project using posenet and facial point to manipulate the particles with the movement.[harsh-Body – 60212: INTERACTIVITY & COMPUTATION \(cmuems.com\)](http://harsh-Body – 60212: INTERACTIVITY & COMPUTATION (cmuems.com))
- **Connection to our project:** The particle behaviour, of tracking and following point on the face, gives a creepy, overwhelming feeling.





Chris Sugrue:

- **About Artist:** Chris Sugrue is an artist, designer and programmer. She develops creative digital works including interactive installations, audiovisual performances and algorithmic animations.
- **Delicate Boundaries:** As digital technologies have become embedded in everyday life, the line between the virtual and real is increasingly blurred. Delicate Boundaries playfully explores our expectations and understanding of interfaces and interactivity.<http://csugrue.com/delicateboundaries/>
- **Connection to our project:** The concept of mixed realities and the interaction of digital and physical with the idea of touch and movement would be possible space of exploration. It also shows how simple shapes and simple movements, and going beyond the screen can give a sense of living things.



Chanhee Choi:

- **About Artist:** Chanhee Choi is a multidisciplinary interactive artist and Ph.D. candidate in the UW Digital Arts and Experimental Media department.
- **Digital Game - Pandemic:** Choi has created a virtual environment that players move through as a coronavirus cell, guided by the arrows on their keyboard. They see glimpses of the real-world pandemic with its quarantines, protests, economic crises and loneliness. <https://www.washington.edu/news/2020/09/24/video-art-game-looks-at-the-pandemic-through-an-artists-eye/>
- **Connection to Our Project:** This game shows the effects of the Covid-19 pandemic in our world. User plays a role – a virus of Covid-19, and player will see something happened in the different parts. It inspired us to define 3 stages in our project. The first stage is people are not infected. The second is people are infected. The final stage is people get sick.

“Crowded” - Design Concepts:

- The pandemic changed how we interact with spaces regarding cameras and our feeling towards being monitored continuously in public spaces. In the pandemic, a lot of data and footage has been collected of people through cameras, heatmaps and virus tests which are tracking everyone's movements and health. Survival and health took a center stage than the breaching of continuous privacy and data collection in public spaces. People were comfortable being monitored for the everyone's safety but the concept of being monitored has not been a comfortable feeling for people.]
 - In this project, we simulate what it would be like to track people's microbes and their related health. Doing so gives the audience the opportunity to experience the feeling of being seen and observed and their role in the environment interacting with the particles.
- Driving Questions:
- How does the webcam change/modify our perspective of space with bacteria /virus?
 - How has covid changed our viewpoint of being test/measured/scanned by cameras in the public spaces with high frequency to ensure healthy and safety of the people?
 - How do people feel when they are enclosed in a space with breathing out particles and witness it?

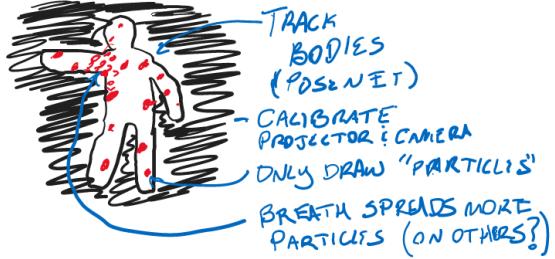
Commented [TB1]: should this say "the concept of being monitored has NOT been a comfortable feeling for people."?

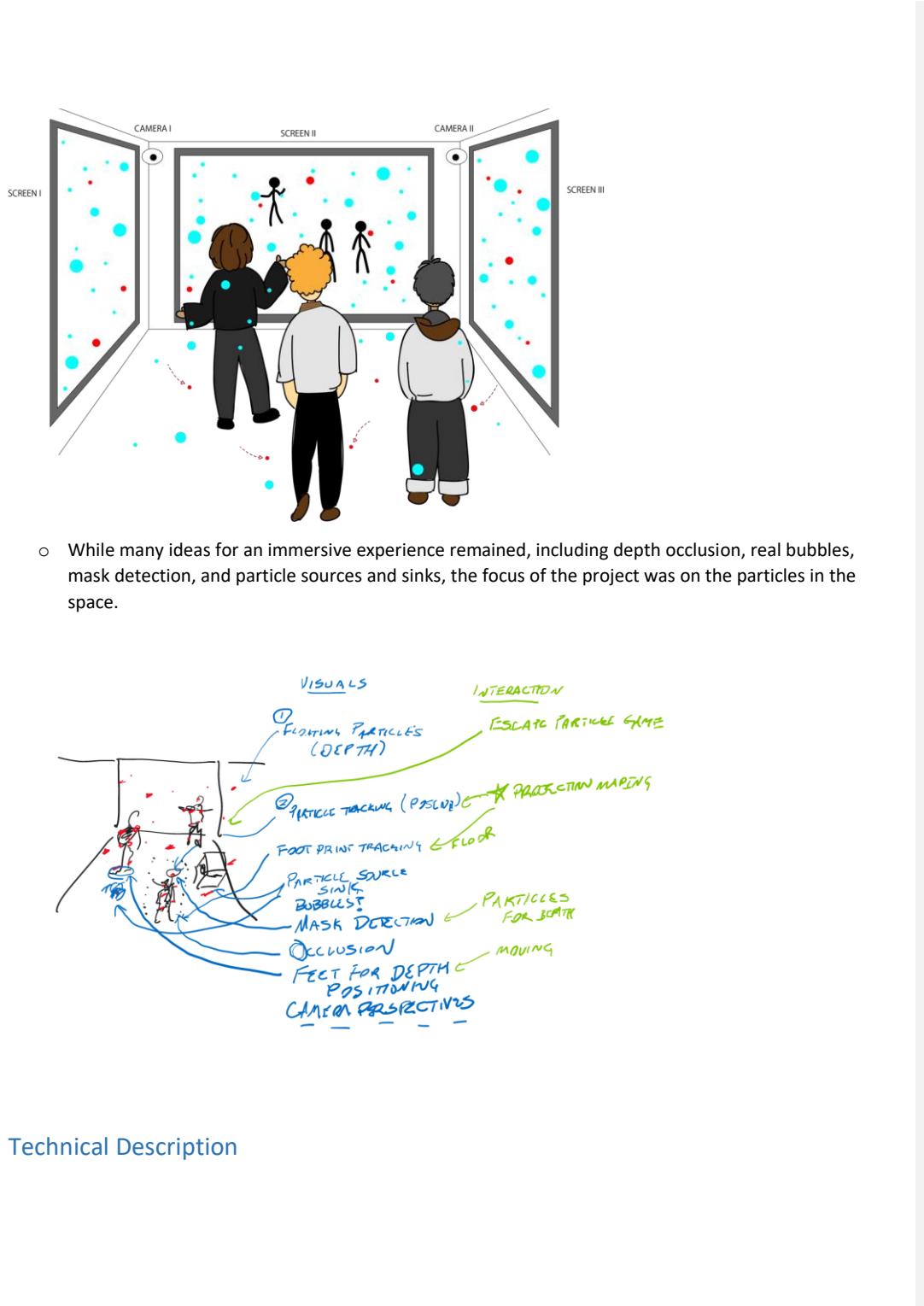
Commented [PA2R1]: yes I agree

Technical Exploration

- One possibility was using a projector to place particles on participants bodies (like in Chris Sugrue's work). We found the lag in movement and the poor contrast in a lit room not effective enough to explore this further, being left with only a reflected image of participants, showing the particles in the image.

PROJECTION MAPPING



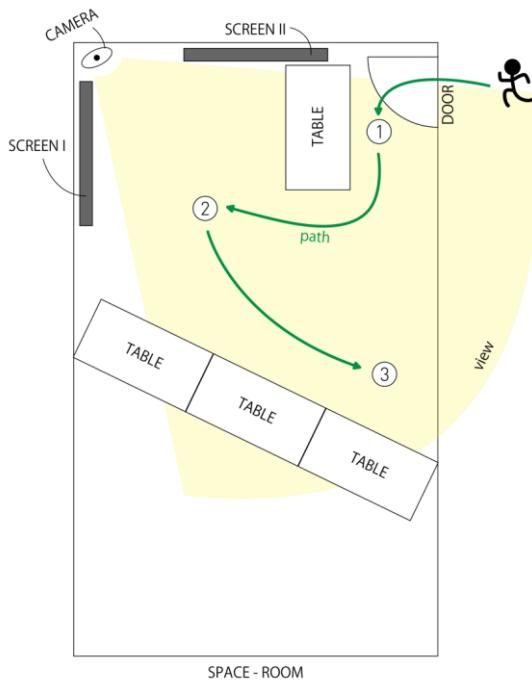


Technical Description

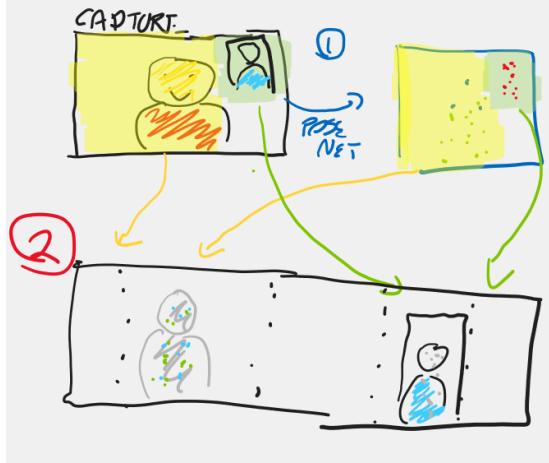
- For the hardware, we are using a webcam, a tripod, a Bluetooth speaker and 2 extended screens. For the software, we use P5js to draw particles representing microbes, drawn on an extended canvas that spreads across two screens. P5js is also used for managing the sounds of the soundscape. We use PoseNet body position data to create particles and to track people in the space. An application called Voicemeeter, is used to channel different sounds to different areas of the room. To persist particles on the same person, the position of poses in the current frame are compared with the position of the assigned pose in the previous frame (see bodyManager.js).
- Given the body position, particles are drawn on the body, and as a breathing effect. Particles that start near the mouth but spread independently of the body. These breath particles are used to fill the space.

Final Design

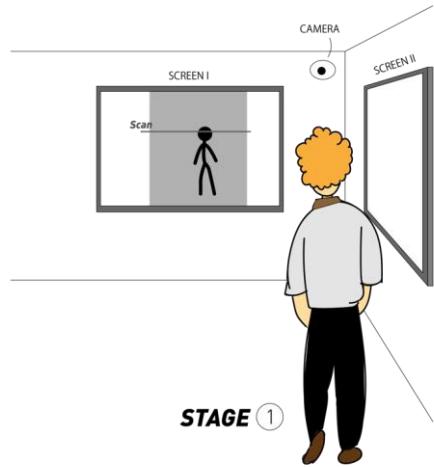
- The final code can be accessed here: <https://github.com/tbeatty-sk/Screen-Space>
- Video of experience: <https://www.youtube.com/watch?v=pLrTyiisAza>
- We identify an enclosed room to control the interaction as well as create an optimal experience, such that one camera can be used for two perspectives and increasing the feeling of a crowded space with other people and everyone's microbes in the space.



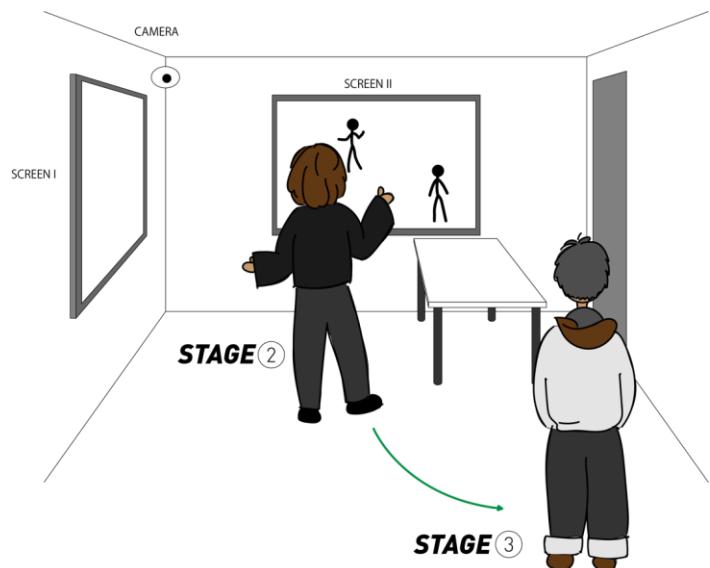
- To avoid the complexity of multiple camera inputs, an optimal camera position was needed that captured both the doorway for stage 1 and a large area in the room. Two areas of the video capture are used on the two different screens.



- In our experience, we have 3 stages and we had to break down the stages each with its own implementation needs. The screens are placed in an L shape to prevent blocking the view of each other and breaking down the experience of the people.

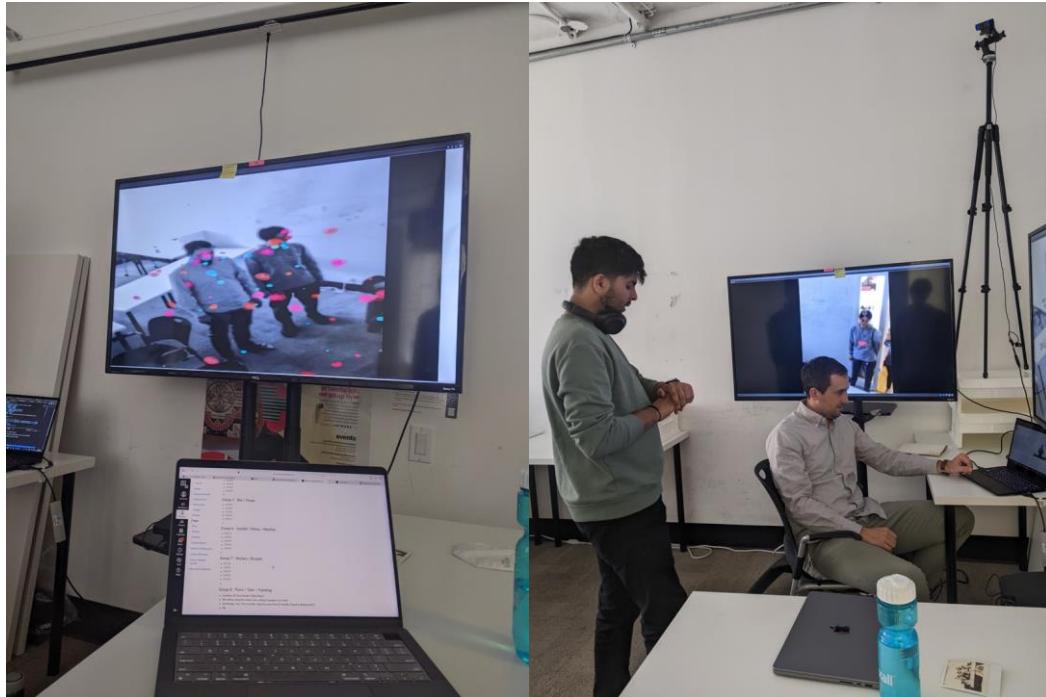


- In the stage 1, the participant enters the room and must be scanned for the microbes and using a table we ensure the participant stand at a certain distance and without blocking the other screen. In this stage a scanner effect and sounds are used to introduce the participant to the experience.



- In stage 2, the participants move further in the room and view themselves in the other screen and interact with the particles they are creating. We want to keep the space open for the participants to move around and interact with each other as well as the particles on the screen.
- In stage 3, one participant is infected with an “angry” particle, indicated by a looming sound from a Bluetooth speaker at a distance. The disease spreads person-to-person until everyone is infected at which point the screen turns black and looming sounds are stopped.

Testing Photos





Presentation Day



Stage 1





Stage 2



Stage 3

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