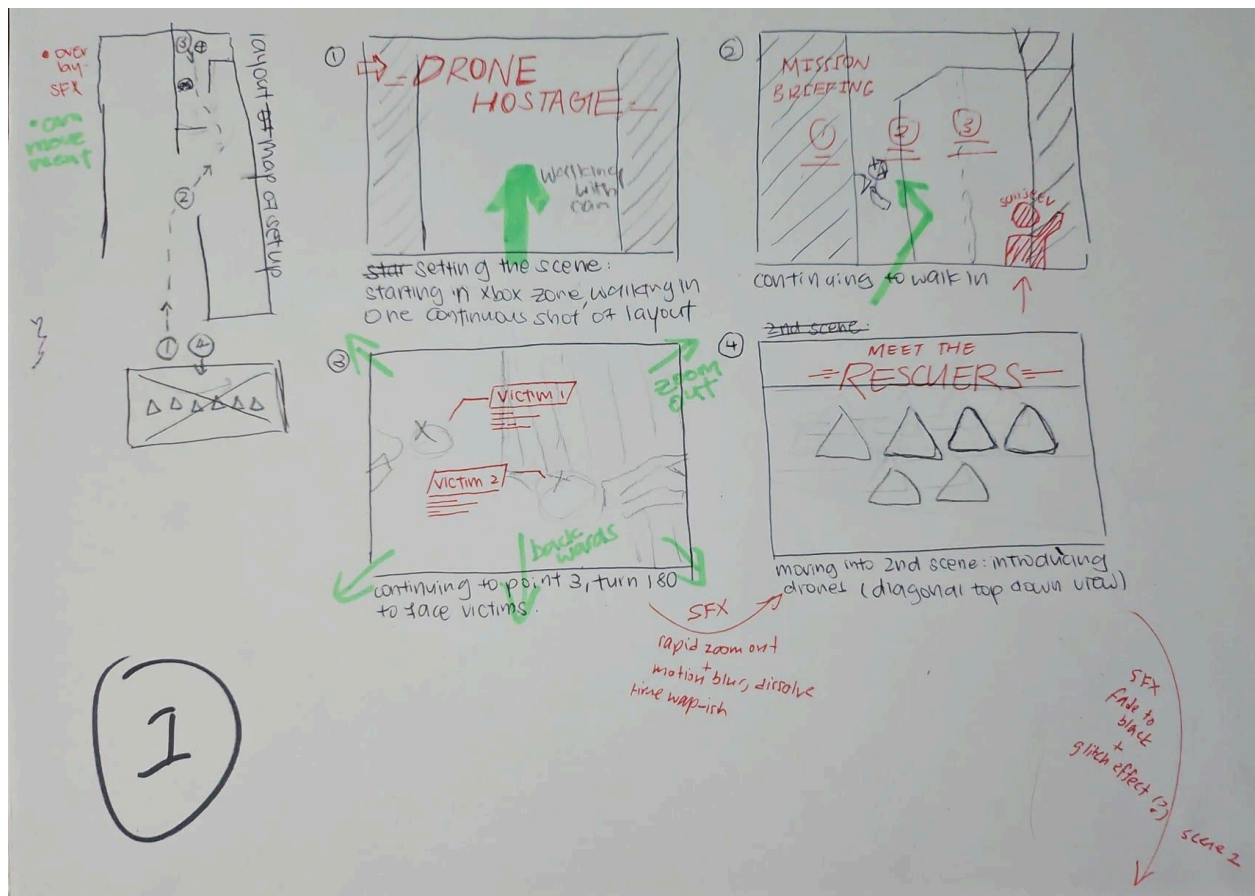


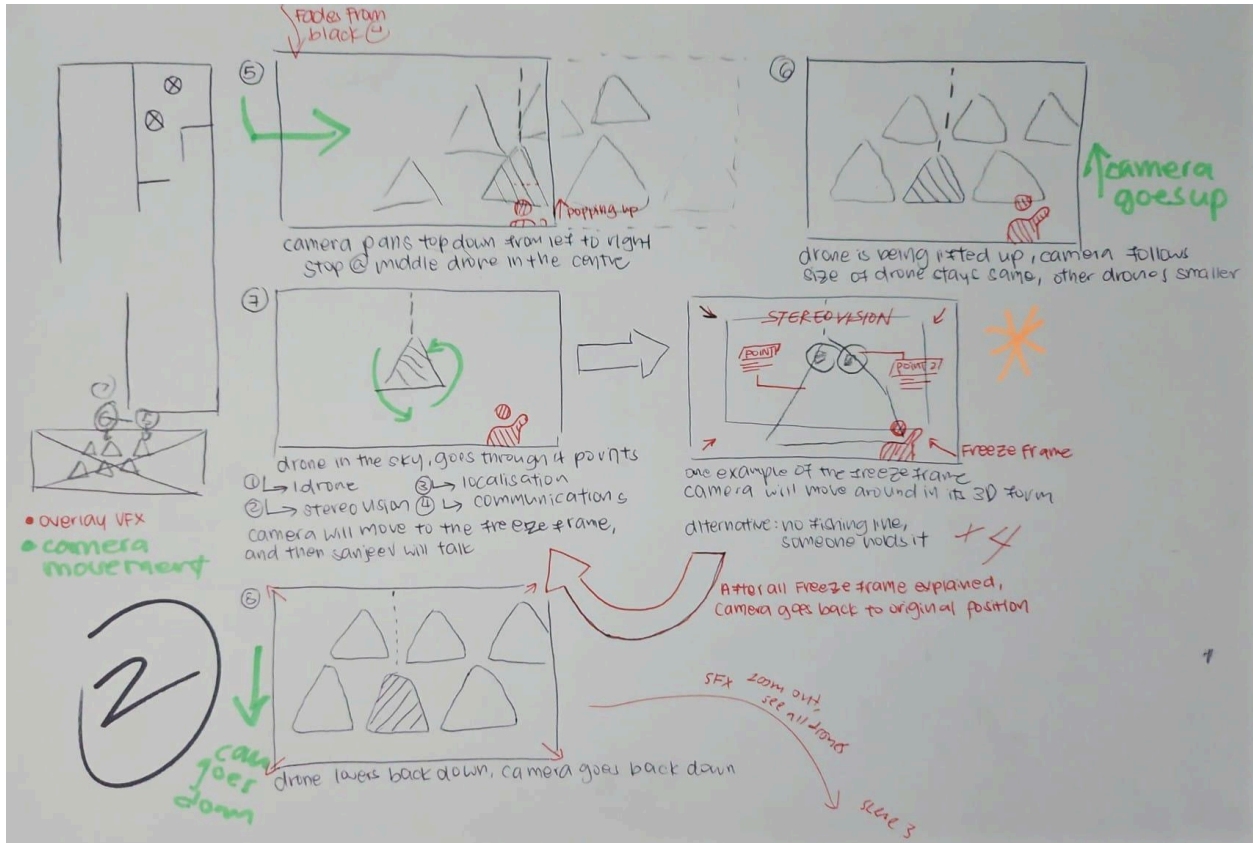
Background info and context (sanjeev)

Following a disappointing performance in Singapore Amazing Flying Machine Competition last year, our team refused to be deterred. We undertook a comprehensive analysis of our shortcomings and devised a strategic plan for improvement. Key areas targeted for enhancement included technology upgrades, training and skill development, team collaboration, scenario simulation, and mental preparation. With a renewed sense of determination and a commitment to excellence, we embarked on a journey of redemption, ready to prove our capabilities and emerge victorious in the upcoming competition.



Mission briefing (Armando)

- You're about to embark on a thrilling operation. Your mission is to lead a squad of drones through a complex indoor environment, rescuing victims along the way. It's not just about saving lives; it's about strategy, teamwork, and skill!
- You'll be in command of a squad comprising 6 drones, each armed with cutting-edge technology. These drones are your eyes, your ears, and your hands in the field. It's up to you to unleash their potential and lead them to victory.
- Beneath the rubble and amidst the shadows, there are souls in need of rescue. Your mission is to locate and save them. But be warned, there are two types of victims lurking in the darkness:
- Single-Rescue Victims where only one drone is needed to save them earning your squad 10 points for each successful rescue. and
- Double-Rescue Victims. These are tougher challenges, requiring the coordinated effort of at least two drones. But the rewards are greater: 5 points for the first rescuer and a whopping 15 points for the second.
- Time is of the essence, team! Every second counts. You must move swiftly, yet with precision. But remember, safety first! Navigate through the labyrinthine corridors, dodge obstacles, and steer clear of danger.
- Your performance will be measured by your ability to rescue victims and your efficiency in doing so. The more lives you save, the higher your score.
- Are You Ready?
- Prepare yourselves, team. Gear up, strategize, and get ready to embark on a mission that will test your mettle like never before. Lives are on the line, and the world is watching. It's time to show them what you're made of. Operation Drone Rescuers awaits!
- Good luck, team. The fate of the victims rests in your hands.



Sensor suite

As you prepare for Operation Drone Rescuers, let's delve into the impressive sensor suite onboard your drones. These cutting-edge technologies are your eyes and ears in the field, enabling precise navigation, victim detection, and communication with the ground control station.

- Drone (sanjeev)

At the heart of each drone lies a sophisticated vision positioning system. This system, comprising a **high-resolution camera** and a **3D Infrared Module**, empowers the aircraft to maintain its position with unparalleled accuracy. Whether navigating through the tight confines of indoor spaces or braving the open skies, the vision positioning system ensures stability and precision like never before.

- Stereovision (lynuz)

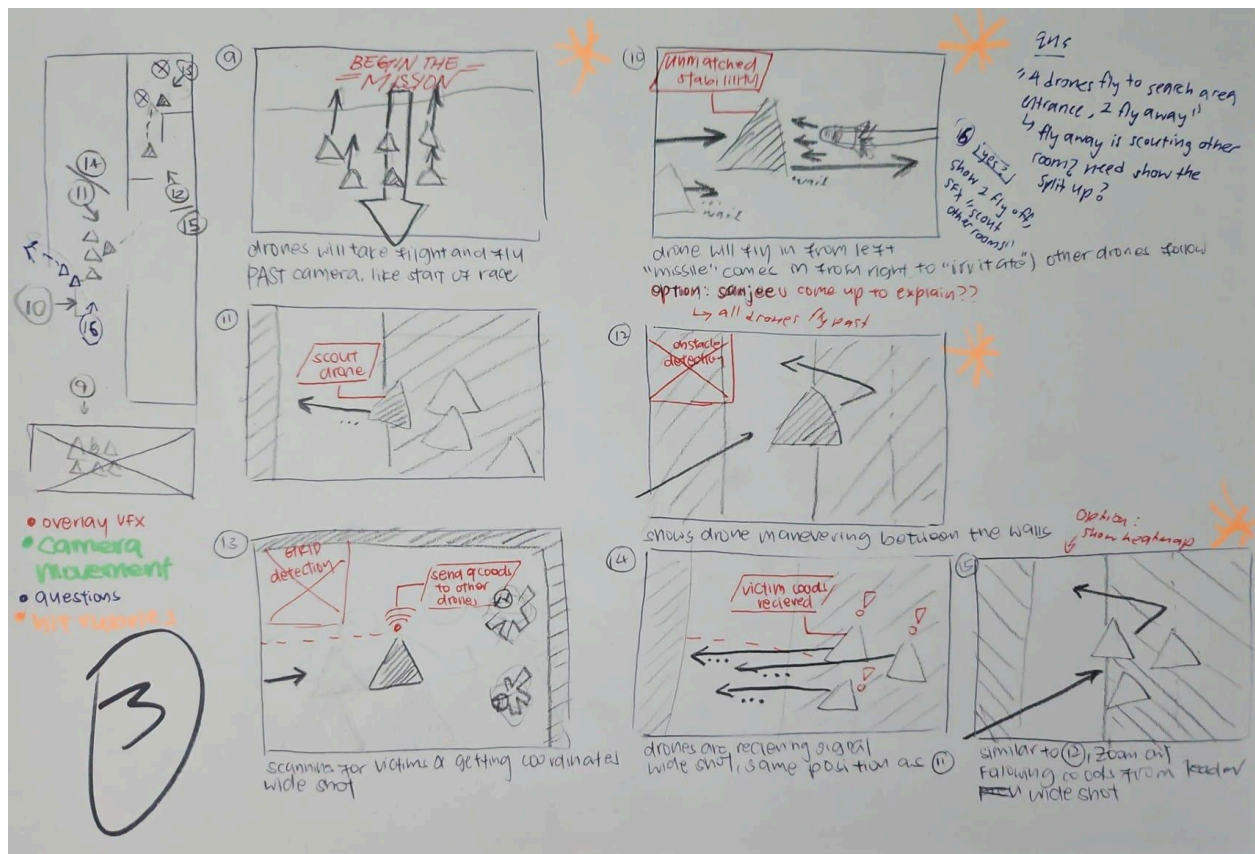
In addition to the vision positioning system, your drones are equipped with **dual Esp32Cams boasting 2-megapixel cameras**. These cameras work in tandem to capture stereoscopic imagery, providing a **3D render** of each sector within the search area. This invaluable data is utilized to scour the environment for victims, enabling your team to swiftly locate those in need of rescue. The information gathered is then relayed to the ground control station for further action.

- Localization (Armando)

Localization is key to the success of your mission, and your drones employ a sophisticated blend of technologies to pinpoint their position within the environment. Using **Bluetooth Low Energy (BLE)** on the Esp32Cams, your drones gather Received **Signal Strength Indication (RSSI) values**. These values undergo rigorous processing to identify the drones position within the arena, including **Kalman filtering and machine learning algorithms optimized through backpropagation and particle swarm optimization**. Additionally, an external Inertial Measurement Unit (IMU) enhances localization accuracy by calculating the drone's orientation using data from accelerometers, magnetometers, and gyroscopes. With velocity calculations integrated, your drones possess a comprehensive understanding of their 3D position within the environment.

- Comms (Armando)

Efficient communication is vital for seamless coordination between the drones and the ground control station. Utilizing both **WiFi and ESP NOW protocols**, your drones establish a robust communication link with the main ground control station. Images captured by the onboard cameras are transmitted via WiFi, allowing **real-time visualization of the environment**. Simultaneously, ESP NOW facilitates the transmission of RSSI values to the server for processing. This streamlined communication ensures that your team remains connected and informed throughout the mission.



Mission (lynuz)

The air crackles with anticipation as the mission begins. Six drones leap into action, their propellers slicing through the air with purpose. Two drones break away, veering sharply to the right to explore adjacent rooms. Meanwhile, the remaining four drones glide forward in perfect harmony, executing a synchronized dance above the camera, a testament to their seamless coordination.

A missile enters aimed at the showing the drone's stability and precision. With unwavering determination, it takes aim and launches into the unknown abyss, a lone sentinel in pursuit of the mission's objectives. Meanwhile, the other three drones maintain their forward trajectory, undeterred by the challenges ahead.

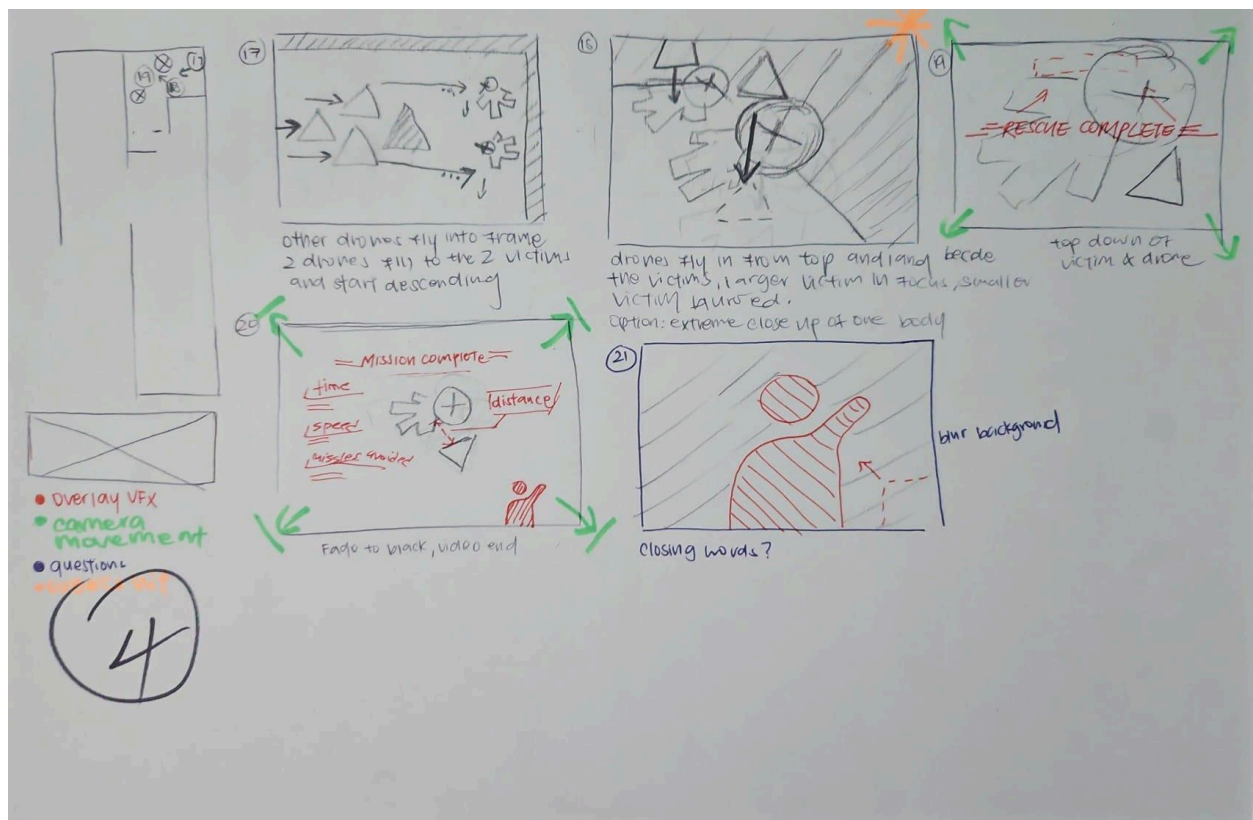
All drones converge at the entrance, a formidable lineup ready to embark on their daring mission. The camera follows the scout drone as it sweeps left, analyzing the room with calculated precision. A single-rescue victim is detected, prompting a swift response from the team. The scout drone surveys the area once more, its sensors alert for any sign of danger. Satisfied with its assessment, it returns to its original position, poised and ready for the next phase of the operation.

As the scout drone forges ahead, it encounters a formidable obstacle—a towering wall blocking its path. Undeterred, the drone demonstrates its prowess in obstacle avoidance, gracefully maneuvering around the barrier with expert precision. Pressing onward, it

uncovers both a single-rescue and a double-rescue victim, swiftly relaying their locations to the rescue drones poised for action.

The three drones move forward with purpose, their mission clear and unwavering. One veers left, swooping in with precision to rescue the single-rescue victim. Meanwhile, the other two drones navigate a labyrinth of obstacles, skillfully evading each one as they close in on both the single and double-rescue victims, determined to bring them to safety.

In the climactic finale, all drones descend in perfect unison, landing gracefully in front of the victims. With the rescue mission complete, a sense of triumph fills the air as the drones stand as beacons of hope amidst the chaos. The mission concludes with a victorious flourish, a testament to the skill, determination, and unwavering teamwork of the drone rescue squad.



Mission summary/closing words (Sanjeev)

- Mission accomplished! Operation Drone Rescuers has concluded, and your squad has emerged victorious. It's time to celebrate your achievements and reflect on your stellar performance in the field.

- Mission Performance Overview:
- Obstacles Avoid ed: Your expert navigation skills and the advanced obstacle avoidance capabilities of your drones ensured that you successfully avoided all obstacles encountered during the mission. Well done on maintaining safety and efficiency throughout the operation.
- Speed:
- The agility and speed of your drones were unmatched, allowing you to swiftly maneuver through the indoor environment and respond to challenges with precision and finesse. Your ability to adapt to changing circumstances and maintain a high-speed operation was commendable.
- Victims Saved:
- Amidst the chaos and uncertainty, your team displayed unwavering determination to save lives. Through meticulous search and rescue efforts, you successfully located and rescued all victims within the designated search area. Each life saved is a testament to your dedication and skill.
- Mission Success:
- With precision, teamwork, and cutting-edge technology, your team has achieved the impossible. Operation Drone Rescuers has not only demonstrated the power of innovation but also the unwavering resolve to make a difference in the face of adversity. You've proven that no challenge is too great when hearts and minds come together for a common cause.
- As the dust settles and the drones return to base, take pride in your accomplishments. Your bravery, ingenuity, and commitment to saving lives have made a lasting impact. Operation Drone Rescuers will be remembered as a testament to the indomitable spirit of humanity.
- Congratulations, Team. Mission complete.