Pandemic Simulation Strategy Game GDD

-Ryan Moncrief

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# Changelog

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| --- | --- | --- |
| Date | Name | Change Summary |
| 9/20/22 | Ryan Moncrief | Initial doc creation |

# Game Overview

## High Level Pitch

[GAME TITLE] is a cooperative, turn-based, web-deployed, educational game where players take on roles to identify and contain a dangerous pathogen. Players must make careful choices and manage limited resources each turn to safely neutralize the threat. Each turn player choices are sent to a simulation engine running on real-world models, so the effects of each decision can be seen with realism and accuracy.

## Overview

**Genre**: Cooperative Turn-Based Strategy Game

**Platform(s):** PC (Web)

**Engine:** Unity

**Key Features:**

* Turn-based resource management
  + Many roles with different abilities
* Real-time simulation engine
  + Will react to player choices and give feedback accordingly
* Customization
  + Each scenario can be fully customized both before and during the game
* Modularity and scalability
  + Different simulation models can be added or subtracted to the simulation, each with their own set of roles
  + Designed to be scaled as large or small as needed

**Game Pillars:**

1. Web-deployed application that can support several concurrent games of many players at once.
2. Fully modular, scalable, and customizable scenarios, both before and during the simulation.
3. Cooperative resource management that encourages communication and collaboration to work towards a goal.
4. Unique roles and abilities for each player, for targeted learning situations.

**Target Audience:**

1. Those in positions of authority in some facet of pandemic response
2. Those that want to learn more about the far-reaching affects of pandemics
3. CAPTRS training recipients
4. Ages 13+

**Aesthetic:**

1. Sleek, non-invasive design
2. Simple, easily digested shapes and diagrams
3. High contrasting colors

**Competitive Reference:**

1. *Democracy 4*
2. *Rebel Inc. Escalation*
3. *Defcon*

## Gameplay Moment

3 Players, Anna, Charlie, and Jean, are playing the game with Aaron, their moderator. Their current scenario tasks them with formulating a plan to contain a new pathogen. Anna has taken the hospital director role, Charlie is playing as the director of transportation, and Jean is playing as the head of R&D. At the start of the round, a new info card appears, telling the players that this pathogen has a high airborne infection rate. In addition, enough research has been conducted to begin distributing tests. The graphs on each player’s screen show a moderate uptick in confirmed cases, especially in hospitals.

Since Anna has spent previous turns hiring more hospital staff, she has some extra resources this turn. She elects to enforce more strict sanitation mandates, and works to get more hospital beds, in an effort to reduce transmission within the hospital. She selects both actions and locks in her turn. Charlie, after learning about the airborne infection rate, decides to enforce limited capacity on city busses, in an effort to keep people further apart from each other. Jean has a choice to allocate more resources toward developing a vaccine, or into developing and distributing tests. She decides that she will shift more resources this turn into tests, hoping that it will slow the increasing transmission rate, as a result, the progress toward developing a vaccine slows.

Once all three players lock in their actions, Aaron asks each player why they selected their choice, and how that might contribute toward their overall goal of reducing the transmission rate below 15%. After a brief discussion, Aaron moves the game to the next round. But before he does so, he changes the value of the overall hospital capacity, and reduces it by one third! At the start of the next round, he presents an event to the players: one of the major hospitals in the city has lost power due to a blackout, and so that hospital is temporarily out of commission. Now the players must deal with the severely reduced capacity on the fly, if they hope to salvage this scenario.

## Details and Features

### Role-Based Gameplay

* Each model that is loaded into the game will require the creation of one or more roles that the player can play as during the game.
  + The roles will have titles, actions, and inputs directly related to the associated model
    - Note: Each model will have its own set of input and output parameters that get posted onto the **global blackboard.**
    - Having roles associated with the model will ensure that each new/unique parameter to that model is used at some point during the scenario
  + Some roles may have overlapping actions, or different actions that may affect the same variables in the simulation.
    - This will become more relevant if and when the simulation engine is prepared to load several models at once to test **resilience** in simulation
* Each round, each player will have a limited amount of resources with which to “spend” on their actions
  + Depending on the role, the resources could take the form of time, money, personnel, etc.
  + Each action will take up a certain amount of resources, which can be seen both on the action card, and on the resource meter
  + All resources will be replenished to their maximum value at the start of each round of gameplay
  + Certain actions may change the amount of maximum resources the player has access to in subsequent rounds
* The actions that each player can take will relate to the model, and can be used to work towards the goal of that particular scenario, whether it be pathogen identification, containment, or something else entirely.
  + The goal of the scenario can be set and tracked by one of the outputs of the simulation model onto the **global blackboard** (ie. Getting the transmission rate below a certain numeric value)
* Each action will have an associated **response severity level** that can be visualized on each player’s screen
  + If players are able to take multiple actions in a round, their severity response will be tracked and shown as the average of the **response severity levels**
* Example scenario and roles
  + Scenario: Covid-19 is emerging as a dangerous pathogen, and has only just become known as a threat to the public. The disease has been identified, but no cure or vaccine has been created yet. The task is to formulate a plan to contain the pathogen, while still keeping the public calm and informed.
  + Goal: Keep the transmission rate below 18% for 5 consecutive rounds
  + Roles
    - Hospital Manager
      * Affects hospital capacity, transmission rate within hospitals, recovery rate
    - R&D Director
      * Affects testing rate, severity of pathogen, vaccine development progress, false positive/negative test rate
    - Transportation Director
      * Affects transmission rate out of hospital, rate of contact
* Each player will have access to shared information and graphs relating to the scenario as a whole, as well as unique data relevant to their role, which they can communicate to their team members during the game
  + Below is a mockup of a player’s game screen. More detail and screens can be found in the Game Screens section of this document

Graphical user interface

Description automatically generated with medium confidence

### Multiplayer Cooperative Gaming

* Multiple players will work at the same time to work towards the game’s goal.
* The game can be played with one or more players. Maximum number of players is TBD, but at least 4 should be able to player in one session at once.
* The game is designed to be deployed on web, so multiple games can be run simultaneously.
* The game can be run either by a human moderator, who can customize the scenario and modify values during the game (covered in more detail in the next section), or by an AI game manager.
  + The moderator can pause the game and overwrite values on the global blackboard at any time to steer the game in any direction.
  + This AI manager can provide feedback and information cards based on game time and player choices.
  + The AI manager can also provide random modifiers and events to the game (frequency of random events can be modified before the game begins)
  + The AI manager should be able to read/write to the global blackboard
* Players will have a method of communicating directly with one another during the game
  + This can be an external program (Zoom, Discord), or local multiplayer, not necessarily an in-game chat function

### Fully Customizable Scenarios

* The game will come prepared with several scenarios that are dependent on the models in the simulation engine. Naturally, the scenarios will be dependent on the models, as the models dictate the relevant data for each game
* The scenario will require the players to reach some numerical value of one or more of the variables in the model
  + Ex. Covid-19 containment- the transmission rate variable must be below a certain value for x consecutive rounds.
* In addition, created scenarios will have a collection of info cards and events that are given to the player over the course of the game
  + Info cards
    - Each scenario will have associated info cards, which will be presented to players at the start of a round. These info cards can have any relevant information or context on them, and can be customized and created manually.
    - The info cards can be presented based on a timer (ie. Number of turns), or have an associated condition set
      * Ex. If the transmission rate gets too high, the game can present an info card about things that cause increased transmission rates, encouraging teaching moments at the immediately relevant time
    - Info cards can also be created and presented in response to player actions.
      * Ex. A player uses an action on their turn to research a pathogen. On the next turn, all players are presented with an info card with more information on the pathogen, which may influence or direct their future choices.
  + Events
    - Each scenario will also have several events that can help or hinder players, deployed at random times during the game. They will be presented at the start of a round, if and when they are activated
    - These events will often dramatically modify a value in the game that otherwise would not have occurred through the simulation engine. This is to simulate a more realistic, chaotic world, where things may not go exactly as planned.
      * Ex. A fire broke out at one of the hospitals, drastically decreasing the players’ hospital capacity.
    - Players can create custom events before the game begins
    - Players can also adjust the frequency of events occurring.
* When using a new model in the simulation engine (or a combination of models), new scenarios can be created manually to incorporate the new models
  + The user will be able to set custom goals and time frames before the game begins
* In game customization
  + If the game is run with a moderator, that moderator will be able to monitor and modify values on the **global blackboard** during the game.
    - Note: if the game is not run with a moderator, the players will not be able to manually override values during the game itself, but they can customize the starting values of the scenario before the game begins
  + Moderators can manually create and trigger custom events during the game
  + The moderator will also have the ability to pause the game for all players, and prevent the game from moving forward, for discussion or teaching periods.
  + Note: moderators can adjust values at any point, and the simulation will respond to these new values accordingly, but will not generate an event. Therefore, the moderator will need to present the relevant context information to the players themselves, or create an associated event or info card before the game begins

### Scalability and Simulation

* The game is able to run different models and scenarios, to create custom games
* For each new model that is created and run within the game, several things will also need to be done for players to interact with the model
  + Associated role(s) for the new parameters associated with the model must be made
  + At least one scenario goal will need to be created
  + Events and info cards for each created scenario will need to be generated
* Alternatively, the game can also be run with no players, allowing the model to run within the simulation engine with no player input or events. This is largely for research and discussion, as there will be no player inputs involved
* The simulation and simulation engine is discussed in more detail in [ASSOCIATED DOCUMENT]
* Ideally, this game will allow for multiple models to be run simultaneously, and players will be able to take roles from any active model, and their actions will likely have effects within all models being simulated in the game.

### Data and Outputs

* The game will track the actions of each player over the course of the game, as well as the values on the global blackboard during each round.
  + This data will be available to review after the game, both in raw data form and visualized in graphs
* The visualized data will also be available to players and moderators during the game
  + The actual contents and format of the visualizations will depend on the running model, and the values on the **global blackboard**
    - Ex, if the transmission rate of a pathogen is tracked in the model, the players will be able to see the transmission rate over time, updated each round of the game.
  + Each player will also see a visualization of the **response severity level** of their actions, shown in a triangle on the display.
* Each role will have its own set of unique data that will be tracked and visualized for the player using that specific role
  + Ex. A hospital manager would have more data relating specifically to hospital capacity or hospitalization rate of a pathogen.

### 

### Menu Flow

Diagram

Description automatically generated

### Gameplay Screens

#### Player Game Screen (Idle)

Graphical user interface

Description automatically generated with medium confidence

#### Player Game Screen (Hover over action)

Graphical user interface

Description automatically generated with low confidence

#### Moderator Game Screen

Graphical user interface

Description automatically generated

#### New Info/Event Pop-up

Graphical user interface, application

Description automatically generated

#### Pause Menu

Graphical user interface, application

Description automatically generated

#### Game End Screen

Graphical user interface, application

Description automatically generated

### Menu Options

#### Main Menu

Graphical user interface, text

Description automatically generated with medium confidence

#### Game Start Menu

Diagram

Description automatically generated

#### Settings Main Menu

Graphical user interface, application, table

Description automatically generated

#### AV Settings

Diagram, table

Description automatically generated

#### Model Config Menu

Diagram

Description automatically generated with medium confidence

#### Scenario Config

Graphical user interface, table

Description automatically generated

#### Create/Edit Scenario

Graphical user interface, table

Description automatically generated

#### Create/Edit Role

Graphical user interface

Description automatically generated

#### Create/Edit Info Cards

Graphical user interface, application

Description automatically generated

#### Create/Edit Events

Graphical user interface, application

Description automatically generated

## Glossary

* Global Blackboard
  + A component of the simulation engine. This is where all input and output variables are posted and written during the simulation. The variables can be updated each time the simulation is run, or manually overwritten at any time.
* Resilience
  + In the context of this project, resilience refers to the far-reaching, and often overlooked effects of a choice, and being able to observe, map, and predict the full outcomes of that action
* Response Severity Level
  + In relation to the CAPTRS response triangle in the PSA game, which tracks the severity of a response on a scale of light, moderate, or drastic response. The three responses are placed on the points of a triangle, and the players are able to justify an action as existing anywhere within the triangle