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Data Hunt

For my project, I created a tech-enhanced playground game, tentatively named *Data Tag*. This project was inspired by the games I played growing up, like *Capture the Flag*, *Hide and Seek*, and *Manhunt*. Adding a tech component to this type of game allows for complex interactions that would not be otherwise possible.

THE GAME RULES

Overview

Data Tag is played by two teams of three people each; the thieves and the guards. At the start of the game, the guards hide a secret data terminal. The thieves then then "board" the guards' vessel in order to procure the data. For the thieves to win, at least one thief must locate the secret terminal, download the information, and make it back to their craft's airlock without being captured. The guards win if all thieves are imprisoned. The game is intended to be played outdoors, in an area about the size of a football field with natural obstacles.

The Thieves

In the game world, each thief is protected and kept invisible by a shield. The shield has limited energy, and is disrupted by movement. The more intensely a thief moves, the faster their shield will drain. As their shield drains, they will become more visible; represented by their body becoming increasingly illuminated and a emitting a progressively more noticeable sound. In order to recharge their shield, a thief must stand perfectly still. As the shield charges, their light will dim, and their speaker will become silent.

The Guards

A guard can attempt to capture a thief by using their short-range raygun to deplete the thief's shield and stun them. The ray will only be effective within a few feet of a thief, and using the ray will drain the guard's energy. When the guard's energy is depleted, they must return to the guard station to recharge. The guard has just enough power to deplete a fully-charged shield and then stun a thief. So, even a motionless thief is not completely safe. Thieves must judge their movement carefully and guards must use their energy resources wisely.

The Prison

If a thief's shield is fully drained and the thief is stunned, they become imprisoned. The prison can be deactivated if a free thief gets within close range. An imprisoned thief can also try to break out by "hacking" the prison. This is done by playing a pitch-matching game with the prison. Each successful pitch match will drain the prison shields, while a failure will strengthen them. If the shields are taken down, the imprisoned thieves escape and are free to hunt for the data. A guard can use their raygun to recharge the prison's shields, but this obviously takes him away from hunting any free thieves. If the guards manage to imprison all 3 thieves, the guards win the game.

The Data Terminal

The thieves' mission is to locate the secret data terminal, which is hidden by the guards at the beginning of the game. The play space will hopefully be large enough to prevent the

thieves from finding the terminal merely by looking around.

In order to locate the terminal, the thieves must therefore use their wireless scanners to “call out” to the terminal. This will increase the terminal's visibility, causing it to grow in brightness and emit a sound. This visibility is cumulative, and, with enough scanning, the terminal will become relatively easy to locate. Only a stationary thief with a full shield may scan for the terminal. Scanning will completely drop the thief's shield. This makes the thief completely vulnerable, so must not be taken lightly.

If a thief finds the terminal, they can download the secret data. If the terminal is below 50% visibility at this time, they can do this without any negative repercussions. If the terminal is above 50% visibility, their shields will drop and the guards will be alerted. Either way, they'll have to make it back to the airlock with the data. If the thief is stunned on the way back, the data will be lost, and they'll be imprisoned.

THE TECH

In order for *Data Hunt to work*, each player and game-module includes an ATmega-based microprocessor, which coordinates all of the module's components. In addition, each unit includes distinct components, such as lights, speakers, transmitters and more, depending on the specific unit's functionality. Here are lists of the various distinct module components and descriptions of how they're used.

The Thief

The thief is the most complex unit in the game. Each thief wears a necklace module and a small wrist module, which allow for all of their interactions.

Main Module

- *8x8 LED matrix*: lights up as shield decreases, indicating visibility
- *Piezo buzzer*: plays various sound effects depending on game state
- *3 axis accelerometer*: detects motion intensity, which affects shield/visibility
- *IR receiver*: detects guard attacks, prison jailbreak signal, and airlock proximity
- *Momentary pushbutton*: initiates terminal scanning
- *RF transmitter*: Sends terminal scanning signal as well as jailbreak signal when at the prison

Wrist Module

- *LED*: Indicates data download progress
- *Linear Hall Sensor*: Allows for close proximity detection of the data terminal and prison

The Guard

Each guard has a hand-held raygun, which allows them to attack thieves and recharge the prison.

- *IR LED*: Sends IR pulses for attacking thieves and recharging the prison

- *IR Receiver*: Allows for recharging the raygun at the guard station
- *Momentary Pushbutton*: Initiates the attack/recharge pulses
- *8x8 LED matrix*: Indicates energy level, diminishes as energy depletes
- *Piezo buzzer*: plays sound effects for attack and recharge

The Prison

The prison is a hanging module, where captured thieves must gather.

- *2 ATmega units, which serially communicate*: Provides 6 timers total, which allows for 2 simultaneous tones, IR pulsing, IR receiving, RF reception and general timing
- *IR LEDs*: Send proximity pulses to captured thieves, send jailbreak messages
- *IR Receiver*: Allows for recharging from guard rayguns
- *8x8 LED matrix*: Indicates energy level, diminishes as energy depletes
- *Momentary Pushbutton*: Initiates the pitch-matching hacking game
- *2 Piezo buzzers*: play sound effects for idle, recharge, jailbreak and allow for the pitch-matching game
- *Externally mounted Potentiometer with knob*: Allows for tuning during the pitch-matching game
- *Visible LEDs*: Indicate location, and change during jailbreak/recharge
- *RF Receiver*: Receives message from a free thief who is making a jailbreak
- *Externally Mounted North Pole Magnet*: Triggers a free thief's hall sensor, which causes a jailbreak

The Data Terminal

The data terminal is a hidden box that will grow increasingly more visible when scanned.

- *4 sets of visible LEDs*: indicate location
- *Piezo Buzzer*: Plays sound effects depending on visibility
- *RF Receiver*: Receives messages from scanning thieves, which increases visibility
- *Externally Mounted South Pole Magnet*: Triggers a free thief's hall sensor, which triggers a jailbreak

The Guard Station and Airlock

These are both hanging modules, which will allow for guard recharge and thief escape.

- *IR LEDs*: Send appropriate signal for recharge/escape
- *Momentary Pushbutton*: Initiates the signal pulsing
- *Visible LEDs*: indicate location, blink when pulsing (red for guard station, blue for airlock)

The modules containing arrays of visible LEDs (guard station, airlock, data terminal and prison) all uses NPN transistors to channel 9V power directly

THE CODE

Data Hunt has many moving parts, and therefore requires code to govern all the game's interactions. In order to keep the code clean and modular, I wrote libraries that support IR and RF communication, sound synthesis, light emission, motion gauging, switch state detection, magnetic field state detection and LED matrix control. Many of these libraries (IR, RF, sound and LED matrix) use pre-existing code as a jumping-off point. All prior authors are credited in the code comments.

Conclusion

Data Hunt is still a work in progress, but, it's showing great promise. There are a few bugs to work out, but, it will soon be ready for a full playtest!