

Infra-Raid



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Laser Tag using IR emitters, project includes: command center, charging station, IR emitter guns, IR receiver vests

Summary

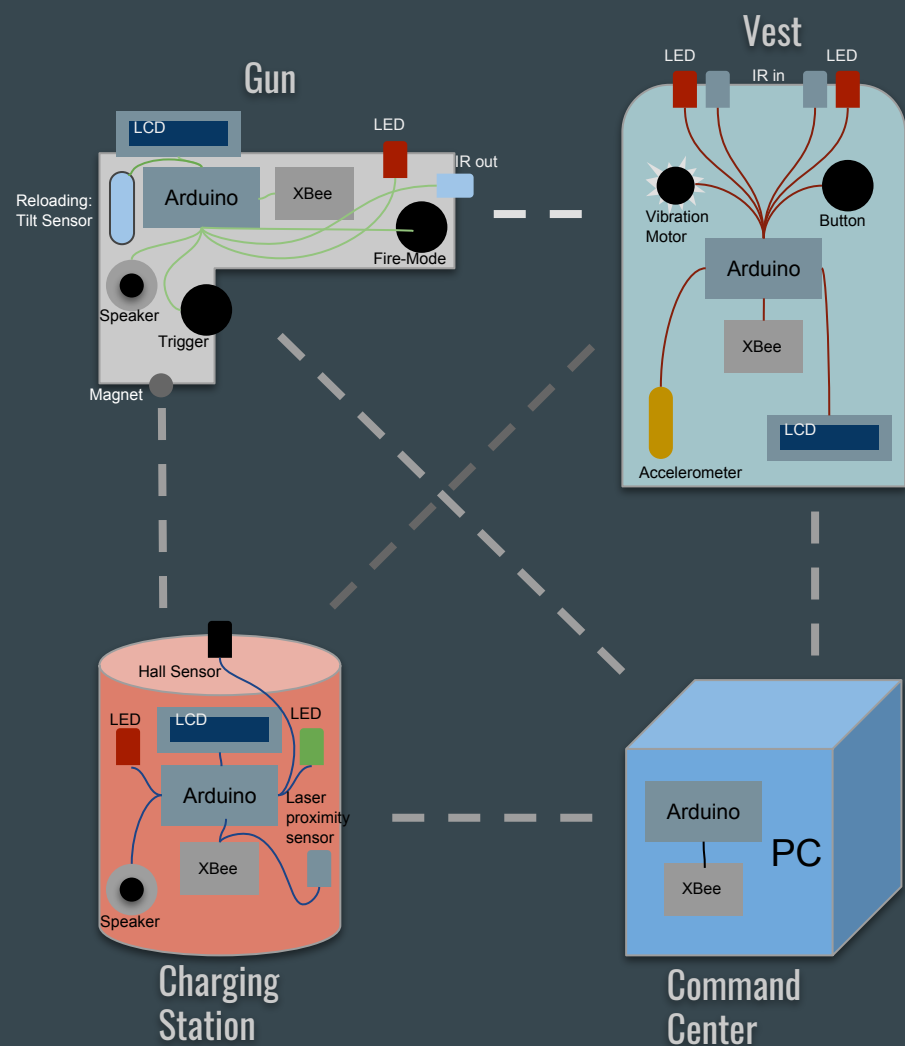
Infra-Raid will be an AR, first person shooter multiplayer game that uses IR emitters, receivers, sensors and Arduinos to create an immersive, clean, cheap, reusable version of paintball or laser tag (ideally playable anywhere). There will be IR emitting guns, IR receiving vests, intelligent charging stations, and a command center which will keep score and track player stats. Check out this video for the desired aesthetic.



Project Description

Project Description: The Infra-Raid system consists of 4 components: the gun, vest, charging station, and command center. Each work together to deliver an immersive, video-game-like experience to promote health through exercise, social interaction, and fun, all in the form of an accessible game.

On a basic level, the system will work by starting a game through the command center which informs all of the components through radio wave using an XBee. The gun will have an IR emitter that will be registered on the vest (or other guns, if we are to complete our stretch goal of multiple sets of guns and vests) when the beam makes contact. Each event will be reported to the command center to create player stats. The gun will run out of charge after using all of its ammo, and the player will have to recharge at the charging station that will inform the command center and in turn, the gun, that it is being recharged. Other features such as LEDs, LCDs and speakers will add flavor and responsiveness to the system.



System Components - Gun Device

Inputs

- Trigger button (local) - activates the IR LED when pressed to “shoot” other players if the gun has enough ammo.
- Firing-mode button (local) - switches the firing mode between automatic (constant IR) or semi-auto (short burst of IR).
- IR receiver - detects when another gun fires at this player. The vest device also detects incoming IR, allowing for greater shootable area. Reports to command center when shot.
- Tilt sensor - allows the player to tilt the gun back to reload, replenishing ammo.

Outputs

- IR LED(s) - sends IR light in the direction the gun is facing. We may cluster several IR LEDs to amplify the effect. Light angle will be limited by enclosure
- Audio and LEDs - light up and play sound when shooting or shot.
- Magnet - allows charging station device to detect when gun is charging.
- LCD - displays game state (score, time) and player state (ammo, health).

Enclosure

- We plan to model and 3D print a gun-shaped enclosure in which the IR LEDs will be clustered in the barrel, the LCD will be facing the user, and the internal components (Arduino, tilt sensor, speaker, XBee) will be placed in the handle and back of the gun (see system diagram on previous slide for approximate design).

Display Messages

Our gun LCD will display various state information of the current player and the game.

- Current ammo
- Player score
- Player health
- Time until game end

Challenges

- We haven't formally learned about IR LEDs and receivers, so we may run into issues setting those up with appropriate quality and range (i.e. figuring out how to create a proper aiming effect that works at long range). From the Adafruit product page for the IR LEDs we know that they can take far more power than the Arduino can supply and that we can use N-channel MOSFETS for that, but we will need to learn how to use these as we go.
- We hope to create a sleek gun-like enclosure for our system, but we know that 3D printing can be totally hit or miss concerning print success and whether components fit into the model correctly, so we may need to cut corners here and either create a simpler 3D model or laser cut the enclosure.