* Introduce HUD/Mask
* Introduce Pi
  + WiFi communication to HUD
  + Receivers sensor data from hopper and air tank
  + Battery
* Hopper
  + Arduino Pro Mini
  + Gyroscope/accelerometer
  + Xbee
  + Ultrasonic
  + Battery
* Air Tank
  + Pressure Sensor
  + Arudino Pro Mini
  + Xbee
  + Battery

Welcome to the video presentation of the Paintball Environment Tactical Engagement Recon System, otherwise known as PETERS. In this video, we’ll provide a quick overview of the system functionality and show a brief demonstration of the system in use. Let’s get started.

The main objective of PETERS is to provide pertinent information to paintball players on the field. This information includes:

* Teammate location
* Remaining paintball levels
* Remaining air pressure

Peters achieves this through sensor data acquisition, microcontroller data processing, and wireless communication via xbee modules and a wifi router. Each player will be equipped with a Heads up display or HUD that is mounted within their paintball mask. This HUD will receive a visual representation of the data processed by the main processing unit, the raspberry pi. The HUD will also transmit location data from it’s built-in GPS module back to the pi. In addition to communicating with the hud, the pi is also responsible for interpreting data from two external sensors. The first of these sensors is an ultrasonic sensor mounted to the hopper. The ultrasonic sensor estimates how many paintballs are left in the hopper by emitting a hi-frequency tone and measuring how long it takes to reflect. This measurement is then relayed to the Raspberry Pi for processing by means of an Xbee. An accelerometer/gyroscope chip is used to determine when the player is in the firing position to ensure accurate measurements. This entire process is facilitated by an attached Arduino Pro Mini and powered by a removable, rechargeable battery. The second external sensor that the raspberry pi communicates with is a pressure sensor. The pressure sensor is attached directly to the player’s air tank. Like the ultrasonic sensor, the pressure sensor’s data is transmitted wirelessly to the pi via an Xbee module. Once again, the entire process is facilitated by an Arduino Pro Mini and powered by a removable, rechargeable battery.

Aside from processing individual player data, the raspberry pi is also responsible for communication between players. Each player’s Raspberry Pi uses wifi to exchange GPS data to be displayed on the HUDs. Now we’ll switch to a live demonstration of the project.

Live Video Script

On the left side of the screen you can see one of our group members with the completed hopper attachment fixed to the marker. On the right side of the screen in the smaller central window, you can see what the user will see displayed on the HUD. The left bar shows remaining air pressure in psi, and the right bar shows remaining paint level in percentage. The center image is where teammate location will be displayed in relation to the user. As the video plays and the marker’s hopper is emptied, you will notice a steady drop in the pressure reading from the tank. You will also notice an overall downward trend in percentage of paint left in the hopper until it reads zero percent. It should be noted that the paint data will be jumping around quite a bit due to incomplete filtering. In addition to filtering, a players’ movement will be taken into consideration to further smooth out this data. We anticipate remaining paint levels to be much more reliable at the conclusion of this project.