Cyber-Physical Mario Kart

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Project Overview

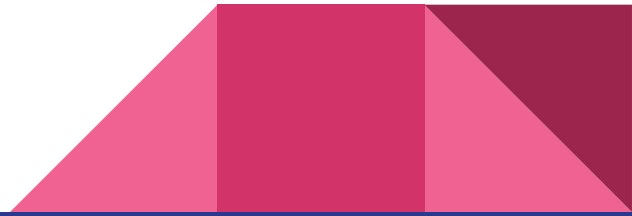
Goal: to create a virtual reality simulation of the game *Mario Kart* for a driver on a physical go-cart within a real-world test track

Main components:

- Crazy Cart XL
- Oculus Rift DK2
- Google Tango Tablet
- 3D Unity Game Engine

Other components:

- Arduino microcontroller
- Ultrasonic and laser distance sensors
- Misc. electronic devices

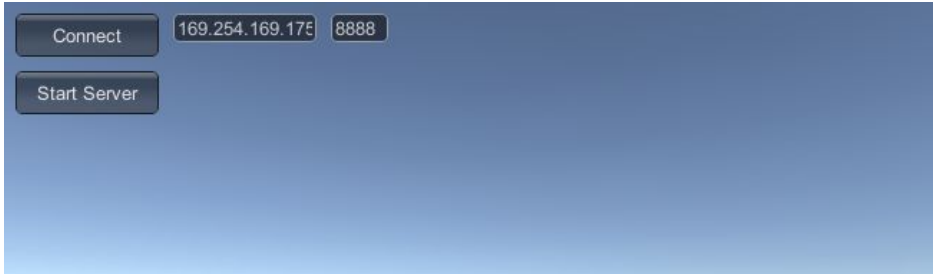


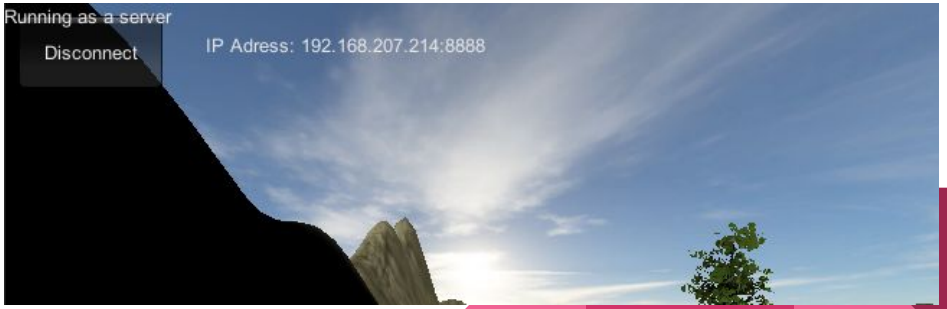
This Week

- Gathered and organized last year's code
- Checked Oculus Rift, Project Tango, PC system
- Encountered network configuration issues between the Tango tablet and PC
- Implemented multiple clients to one server connection to enable the possibility for multiplayer
- Created a script via Unity and JavaScript to establish this network connection
- Tested all of the sensors with the Arduino
- Calibrated the Ultrasonic Sensors
- Implemented running mean and median on the incoming sensor data to denoise it

ConnectionGUI Script

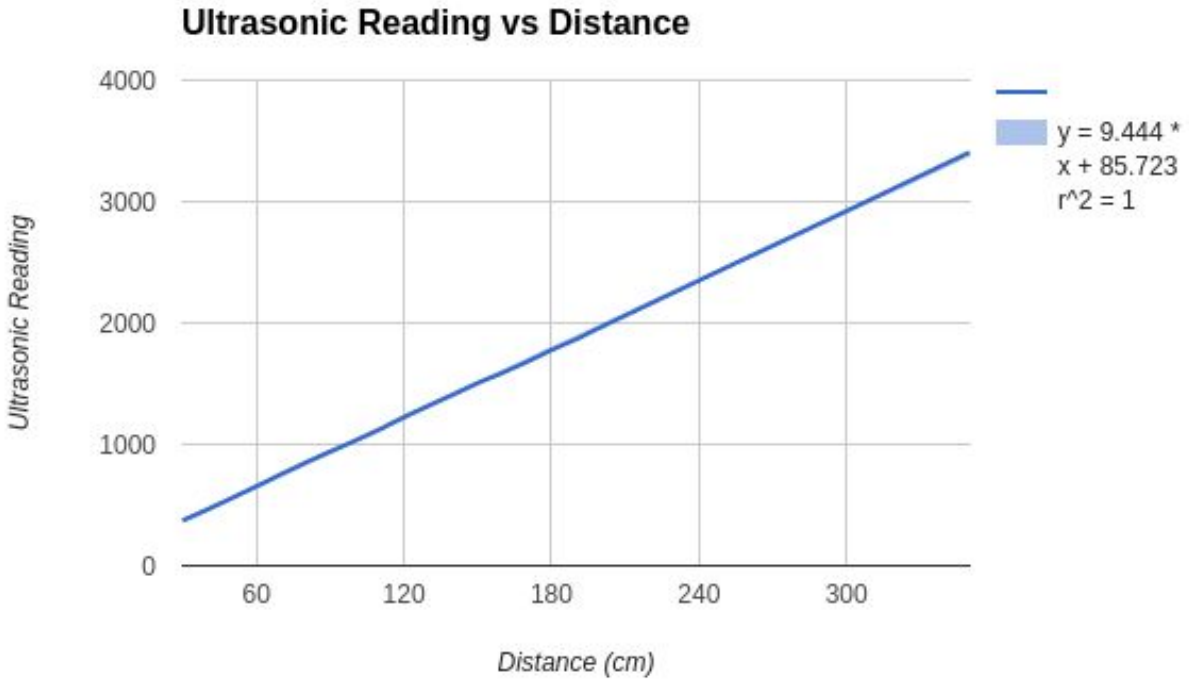
```
#pragma strict
var remoteIP = "169.254.169.175";
var remotePort = 8888;
var listenPort = 8888;
var useNAT = false;
var ipaddress = "";
var port = "";
function Start () {
}
function Update () {
}
function OnGUI () {
 // Checking if you are connected to the server or not
 if (Network.peerType == NetworkPeerType.Disconnected)
 {
       // If not connected
       if (GUI.Button (new Rect(10,10,100,30),"Connect"))
       {
             // Connecting to the server
             Network.Connect(remoteIP, remotePort);
       }
       if (GUI.Button (new Rect(10,50,100,30),"Start Server"))
       {
             // Creating server
             Network.InitializeServer(32, listenPort, false);
             // Notify our objects that the level and the network is ready
             for (var go : GameObject in FindObjectsOfType(GameObject))
             {
                   go.SendMessage("OnNetworkLoadedLevel",SendMessageOptions.DontRequireReceiver);
             }
             Application.LoadLevel("MarioTrack");
       }
       // Fields to insert ip address and port
       remoteIP = GUI.TextField(new Rect(120,10,100,20),remoteIP);
       remotePort = parseInt(GUI.TextField(new Rect(230,10,40,20),remotePort.ToString()));
 }
 else
 {
       // Getting your ip address and port
       ipaddress = Network.player.ipAddress;
       port = Network.player.port.ToString();
       GUI.Label(new Rect(140,20,250,40),"IP Address: "+ipaddress+":"+port);
       if (GUI.Button (new Rect(10,10,100,50),"Disconnect"))
       {
             // Disconnect from the server
             //Network.DestroyPlayerObjects();
             Network.Disconnect(200);
             Application.LoadLevel("Start");
       }
 }
 if (Network.isServer)
       GUILayout.Label("Running as a server");
 else if (Network.isClient)
       GUILayout.Label("Running as a client");
}
function OnConnectedToServer () {
 // Notify our objects that the level and the network are ready
 for (var go : GameObject in FindObjectsOfType(GameObject))
       go.SendMessage("OnNetworkLoadedLevel",SendMessageOptions.DontRequireReceiver);
```





Calibrating the Ultrasonic Sensor

Distance (cm)	Front
30	372
40	462
50	557
60	654
70	754
80	850
90	941
100	1028
110	1121
120	1225
130	1319
140	1411
150	1506
160	1588
170	1679
180	1777
190	1865
200	1964
250	2446
300	2923
350	3406



Goals for Next Week

- Restore connection between Tango tablet and PC instance of Unity
- Fix connection script and allow multiple clients to connect to the host server and spawn their own Mario Kart in the host server's Unity program
- Calibrate the LIDAR sensors
- Connect the relay for speed control of the kart
- Continue looking into ways to denoise the sensor data