Dancing Driving Robots (DDR)

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Summary

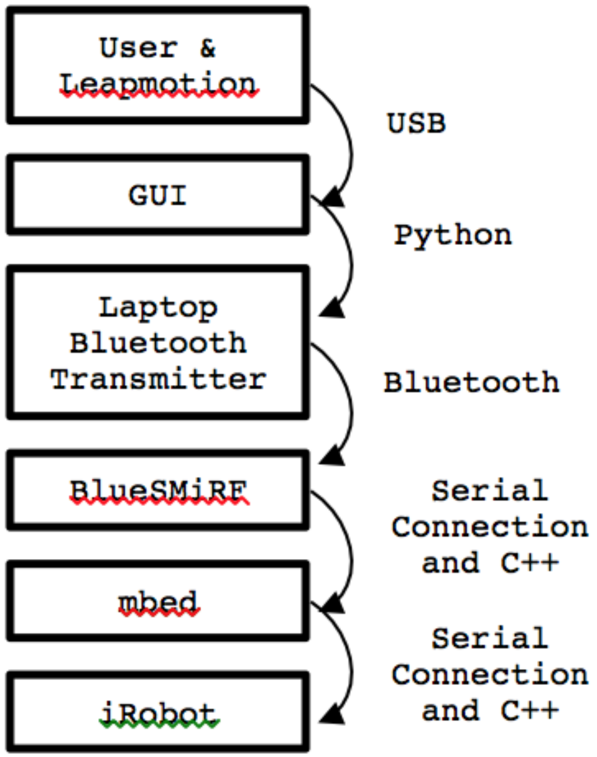
DDR is a time-trial based game in which a user interacts with a GUI and Leap Motion to control an iRobot.

If you can travel the goal distance before the song ends, then you win. Else you lose!

Inspired by popular arcade game: Dance Dance Revolution

Demo Time!

How it works

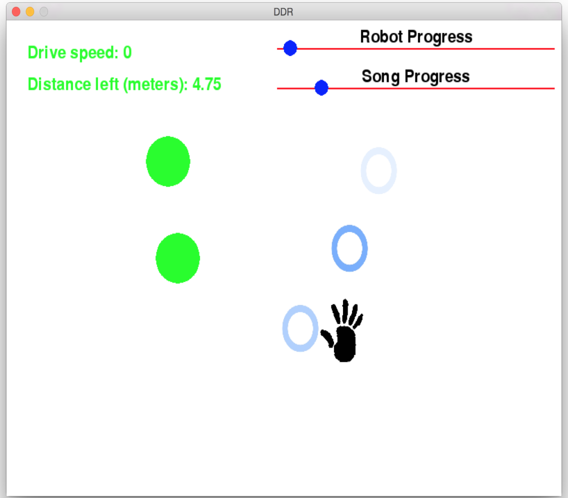


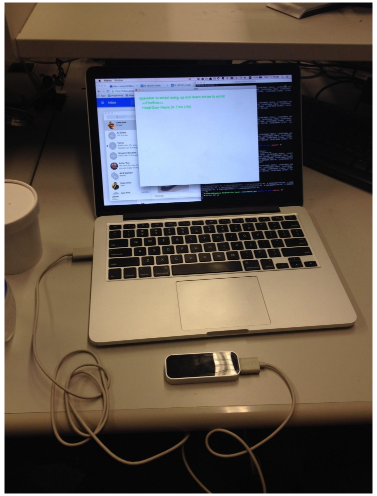
User & Leapmotion
USB
GUI
Python
Laptop Bluetooth Transmitter
Bluetooth
BlueSMiRF
Serial Connection and C++
mbed
Serial Connection and C++
iRobot

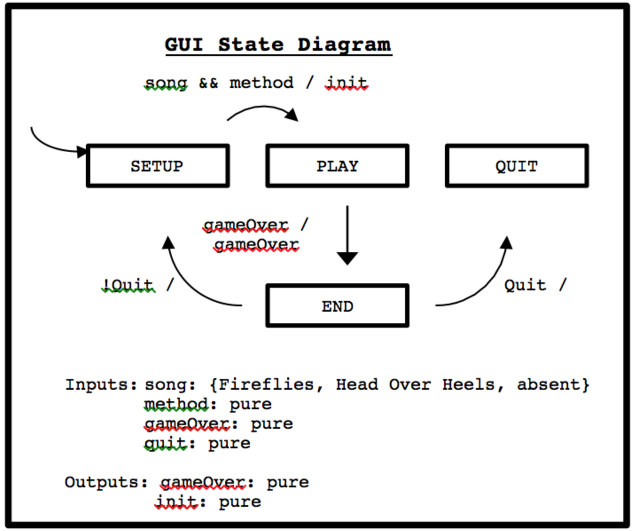
The Leap Motion and GUI

Leap Motion is a motion sensor that sends data to a computer via USB.

Using this data and the Leap Motion Python SDK, we constructed the GUI

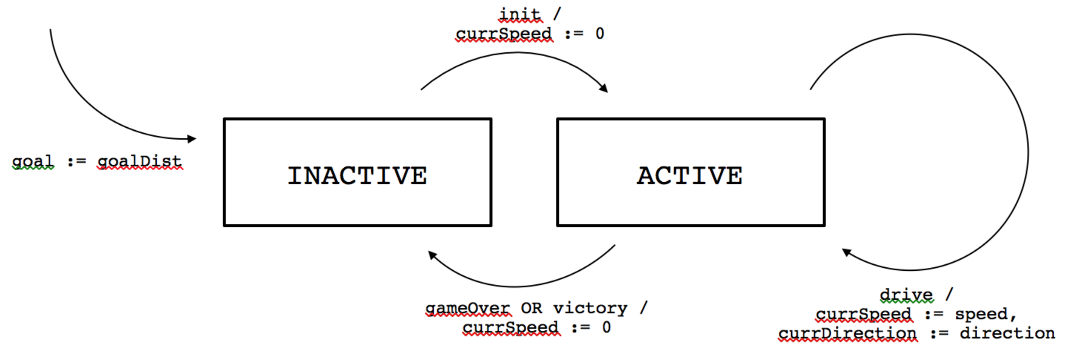






The iRobot

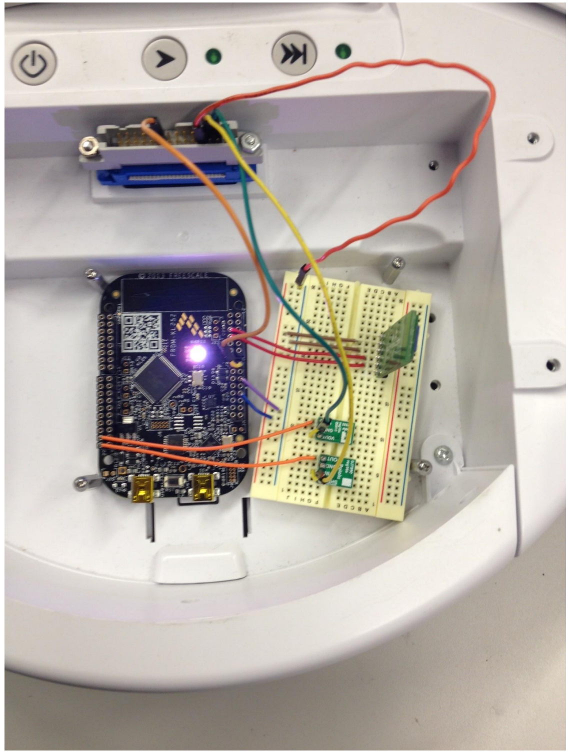
iRobot Navigation State Chart



```
Inputs:    init: pure
           drive: pure
           gameOver: pure
           speed:
           direction: {Forward, Backward, absent}
           victory: {true, false, absent}
           goalDist:

Outputs:   None
```

```
Continuous Variables:
          currSpeed:
          currDirection: {Forward, Backward, absent}
```



Design inspired by: http://developer.mbed.org/cookbook/iRobot-Create-Robot

Communication

Packet transmission via Bluetooth

Created custom Bluetooth protocol for transactions

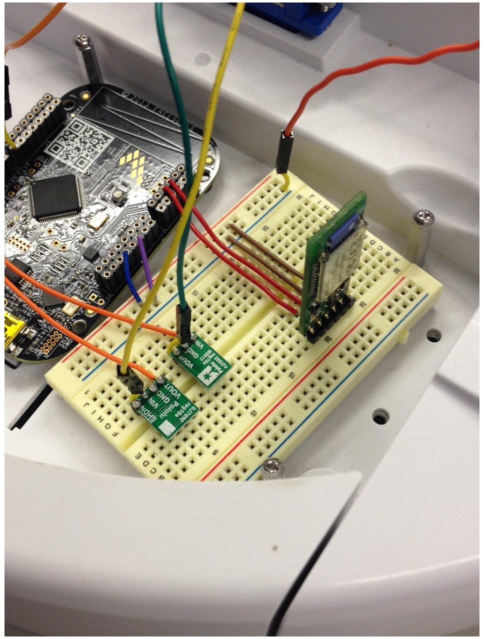
Packets formatted as such:

[OpCode] [Packet ID] [Packet Data] [Checksum]

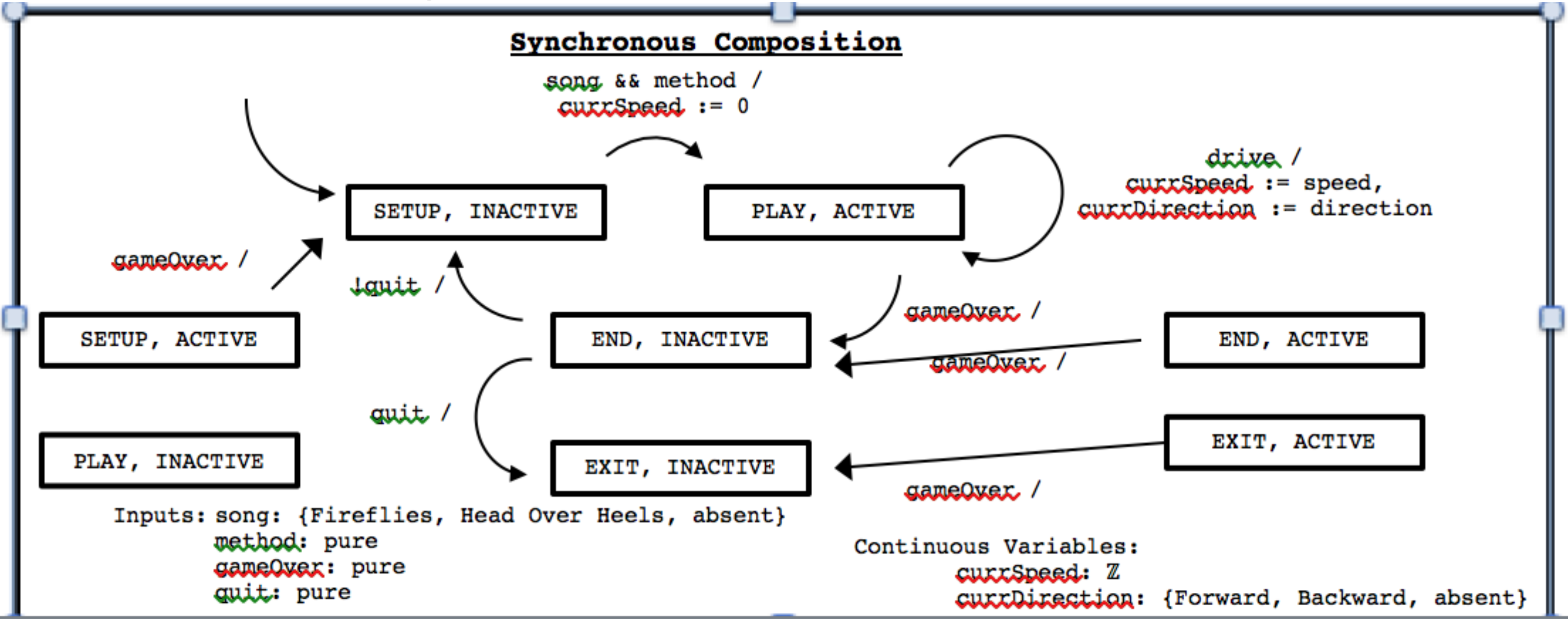
Transmitter code in GUI, uses LightBlue – Bluetooth API

Receiver code on mbed uses mbed API to read serial data from BlueSMiRF

Transmission latency ~ 34ms



Overall System Model



```
Inputs: song: {Fireflies, Head Over Heels, absent}
        method: pure
        gameOver: pure
        quit: pure
```

```
Continuous Variables:
    currSpeed: ℤ
    currDirection: {Forward, Backward, absent}
```

Reaction latency ~78 ms

Issues Raised

Where to do distance calculation?

Faulty iRobot clock

Commanding the iRobot Create

ISRs

Where do we go from here?

Increase user experience

- smarter scoring algorithm
- notes appearing in rhythm, not just each quarter note

Perform distance calculations on mbed/iRobot

- decreases computation on GUI
- can do through multithreading

Multiplayer experience?

- need multiple systems
- single system with split screen and two robots would require more calculations on GUI

Questions?