Introduction to FRC LabVIEW Programming
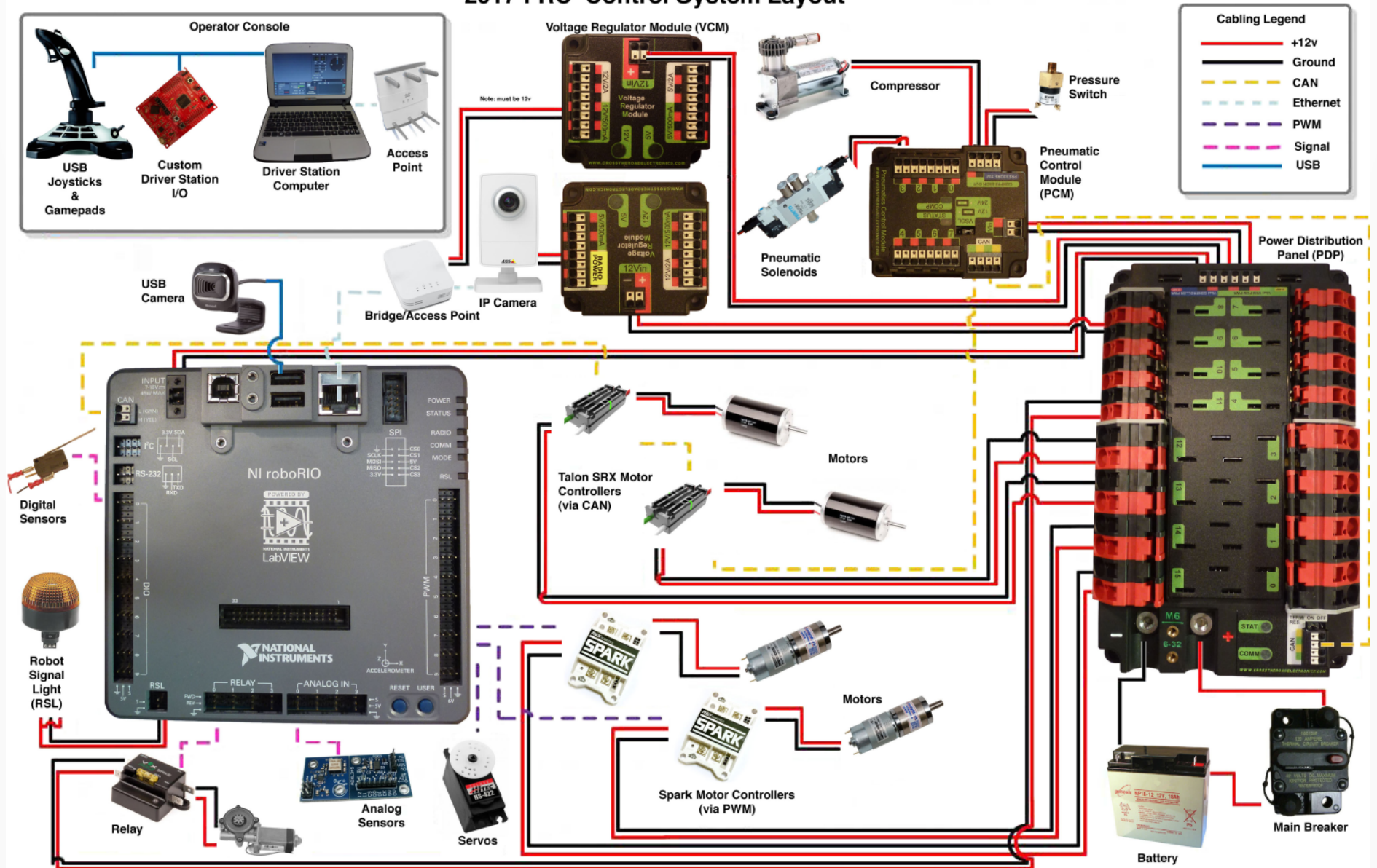
David Turner (dkt01) – Argos 1756

Agenda

- FRC Programming Overview

- Basics of LabVIEW

- Introduction to Drive Code

- Drive Code Implementation

- Ideas for Refinement

- Build Your Own

FRC Programming

2017 FRC® Control System Layout

FRC Programming

- Outputs:
  - Motors
  - Pneumatics
  - Lights
  - Electromagnets

- Inputs
  - Camera
  - Joysticks
  - IMU
  - Ultrasonic sensors
  - Encoders

And more!

FRC Programming

- Autonomous (15s)
  - Sensor input or pre-programmed actions only
- Teleop (2min 15s)
  - Driver controls robot
  - Operator assist features (semi-autonomous)
- Endgame (last ~30s)
  - Similar to Teleop, possibly more focus on operator assist features

FRC Programming

- Main components:
  - Drive train
  - Implements
    - Shooters, intakes, climbers, manipulators
- What can we do?
  - Anything!

FRC Programming

- Languages:
  - C++
  - Java
  - Python
  - LabVIEW


```cpp
#include <iostream>

int main()
{
    std::cout << "Hello C++" << std::endl;
    return 0;
}
```
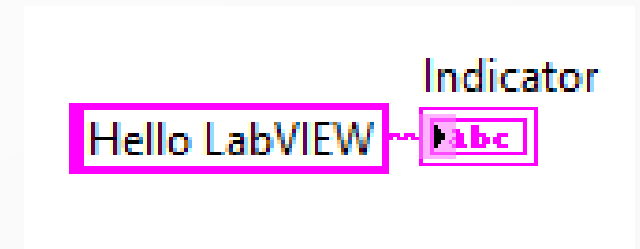
```java
package hello;

public class HelloWorld {
    public static void main(String[] args){
        System.out.println("Hello Java");
    }
}
```
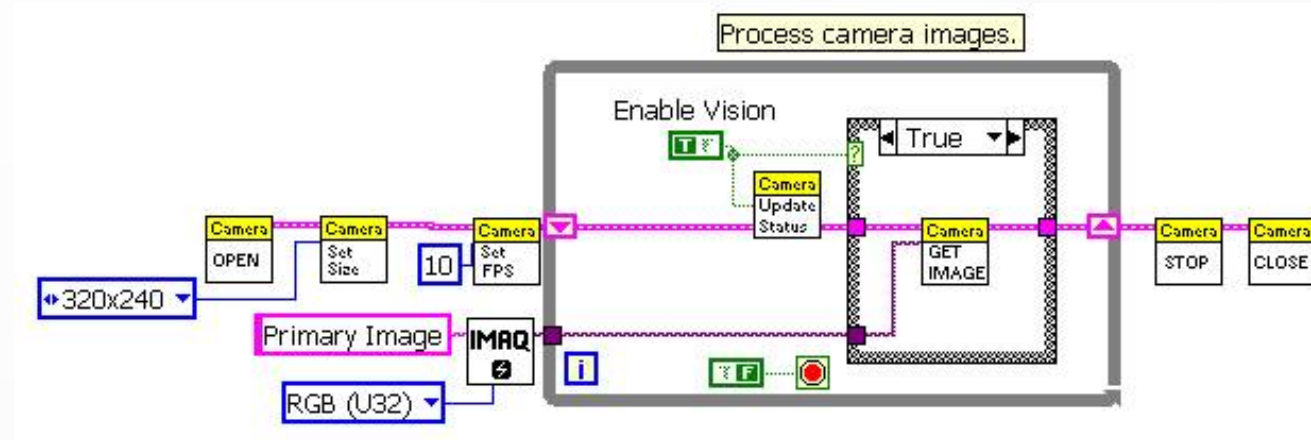
```python
#!/usr/bin/env python

print("Hello Python3")
```

Indicator

Hello LabVIEW

Basics of LabVIEW

- Graphical programming language

- Basic Unit: Virtual Instrument (VI)

- Inputs and outputs connected with "wires"

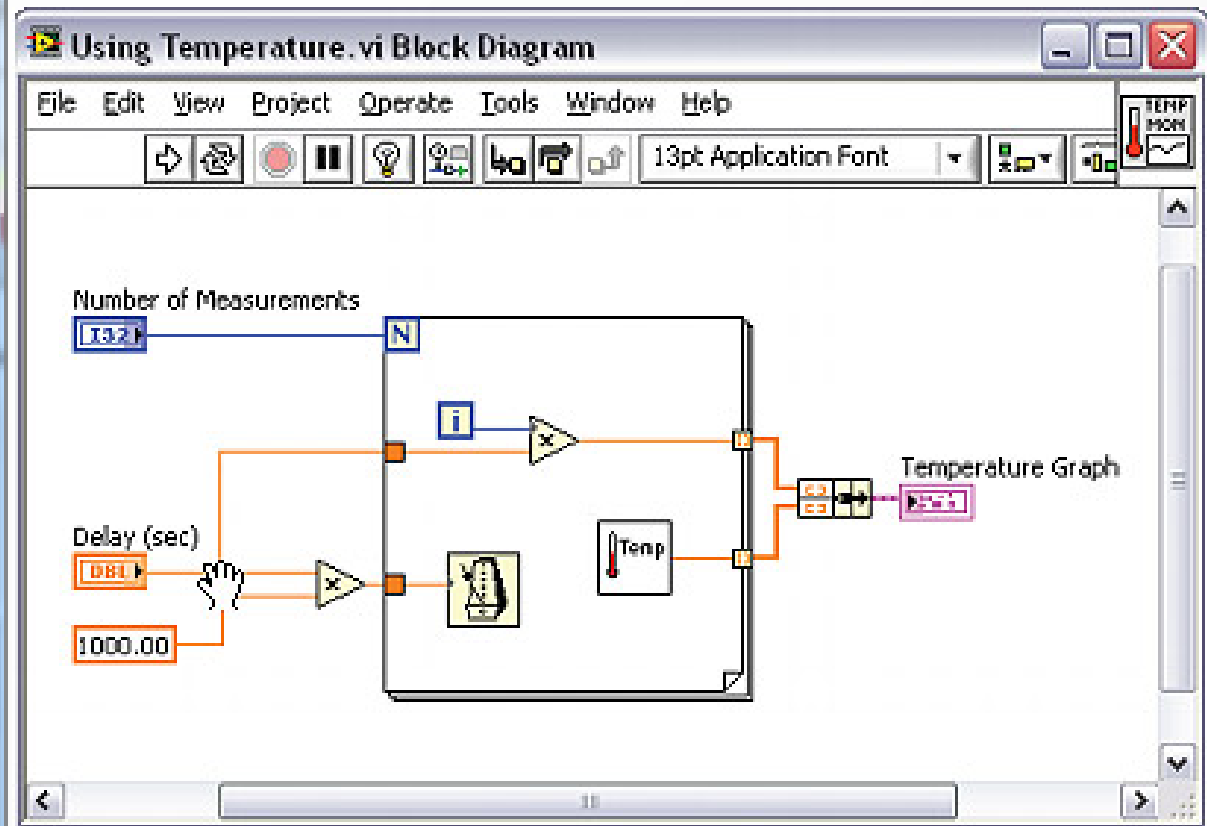# Data Types in LabVIEW

- LabVIEW uses colors to show data type
    - **GREEN**: Boolean – True or False
    - **BLUE**: Integers – Whole numbers
    - **ORANGE**: Floating Point – Numbers that may have decimals
    - **PINK**: Strings – Text values
    - **BROWN**: Cluster – Multiple data types
- Thick wires hold multiple values (arrays)
- Dotted black lines are broken (mismatched data types)

LabVIEW UI
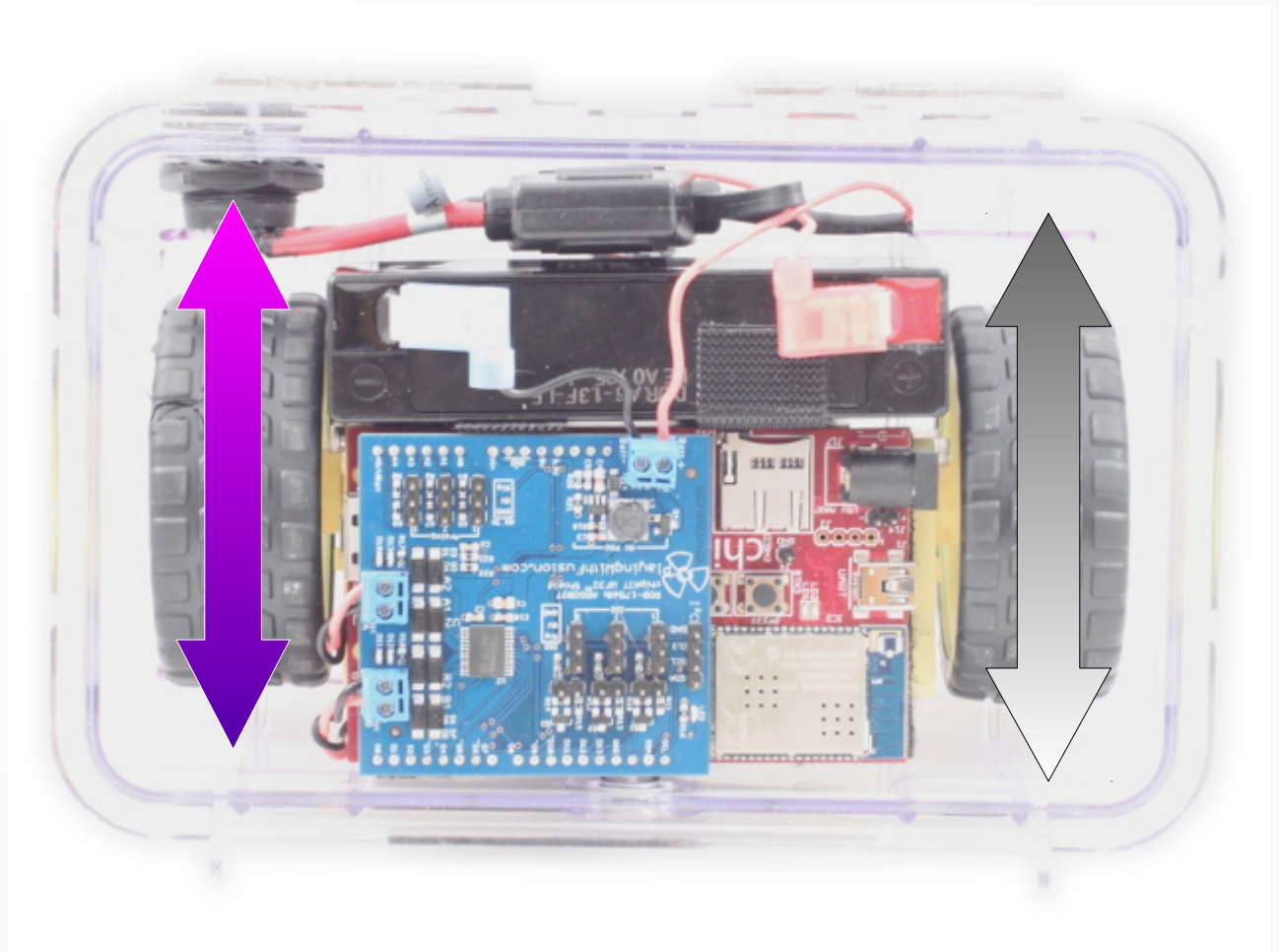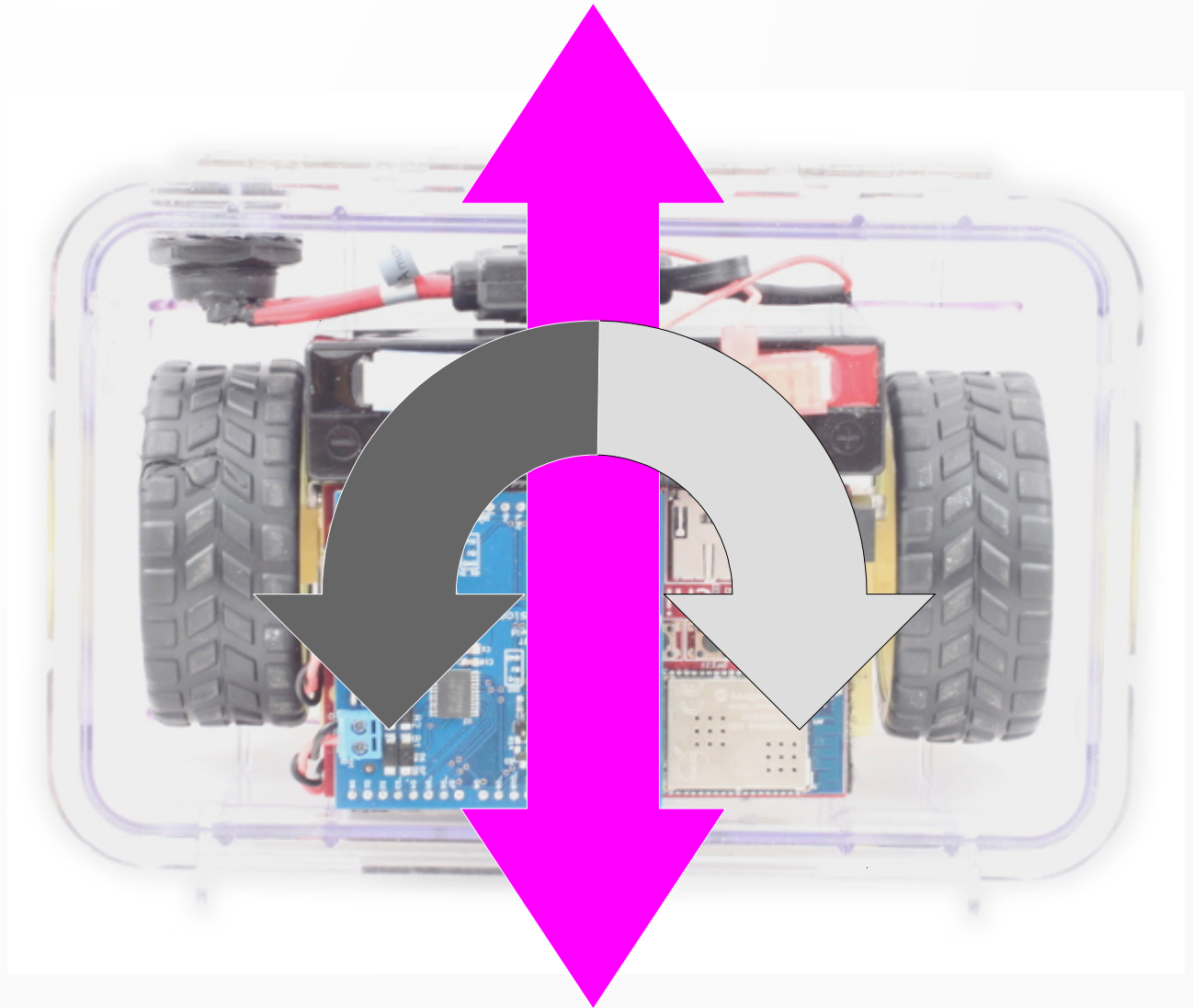
Front Panel
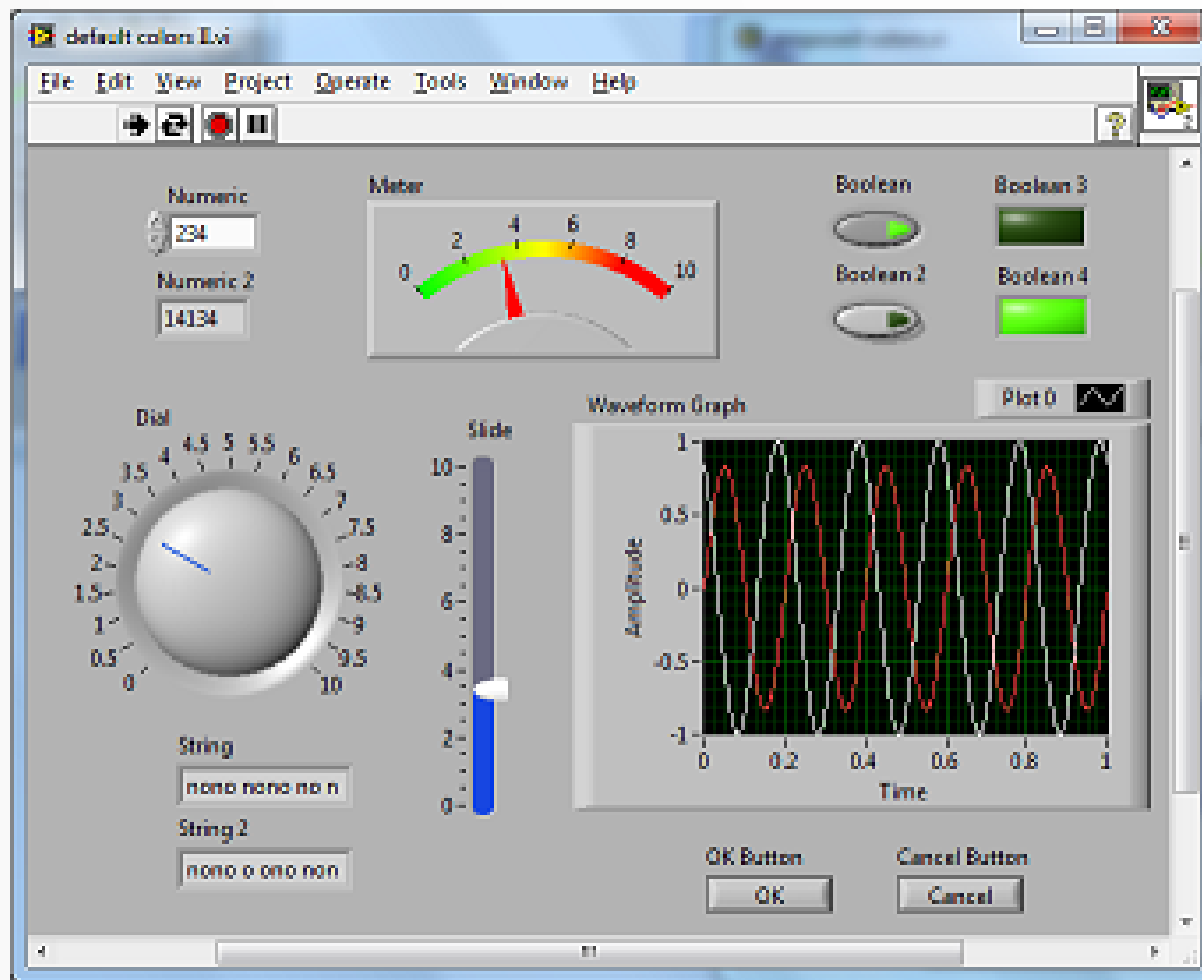
Block Diagram

Drive Code

- Consider a simple 2-motor drivetrain

- How can we control this with an Xbox controller?

  - Tank drive

  - Arcade drive

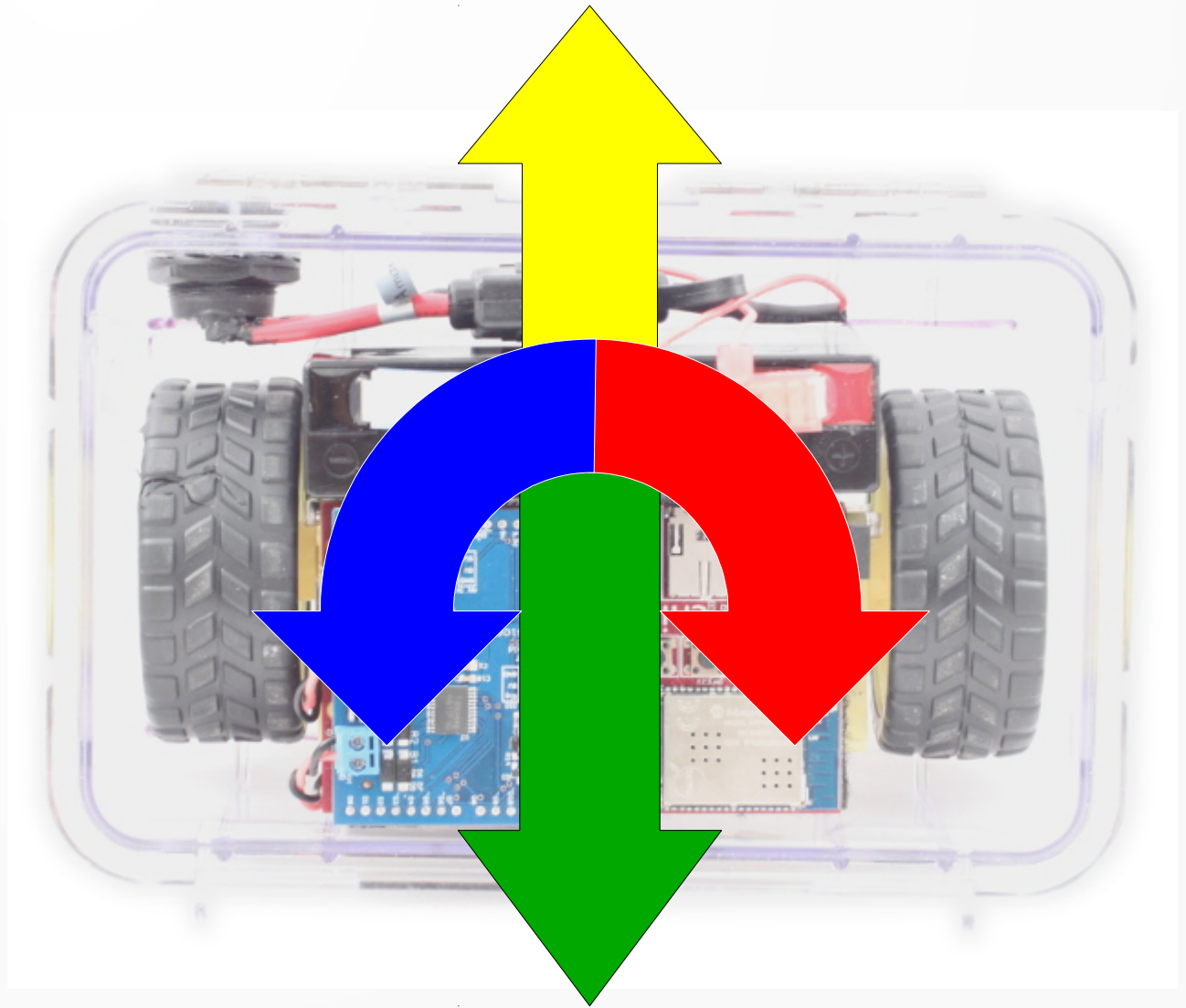 - Button drive

  - Cheezy drive

Tank Drive

Arcade Drive

Button Drive

Cheezy Drive

- Special type of Arcade Drive

- Developed by team 254 "The Cheezy Poofs"

- Constant radius turns

- Can enable smooth driving around the field

Demo