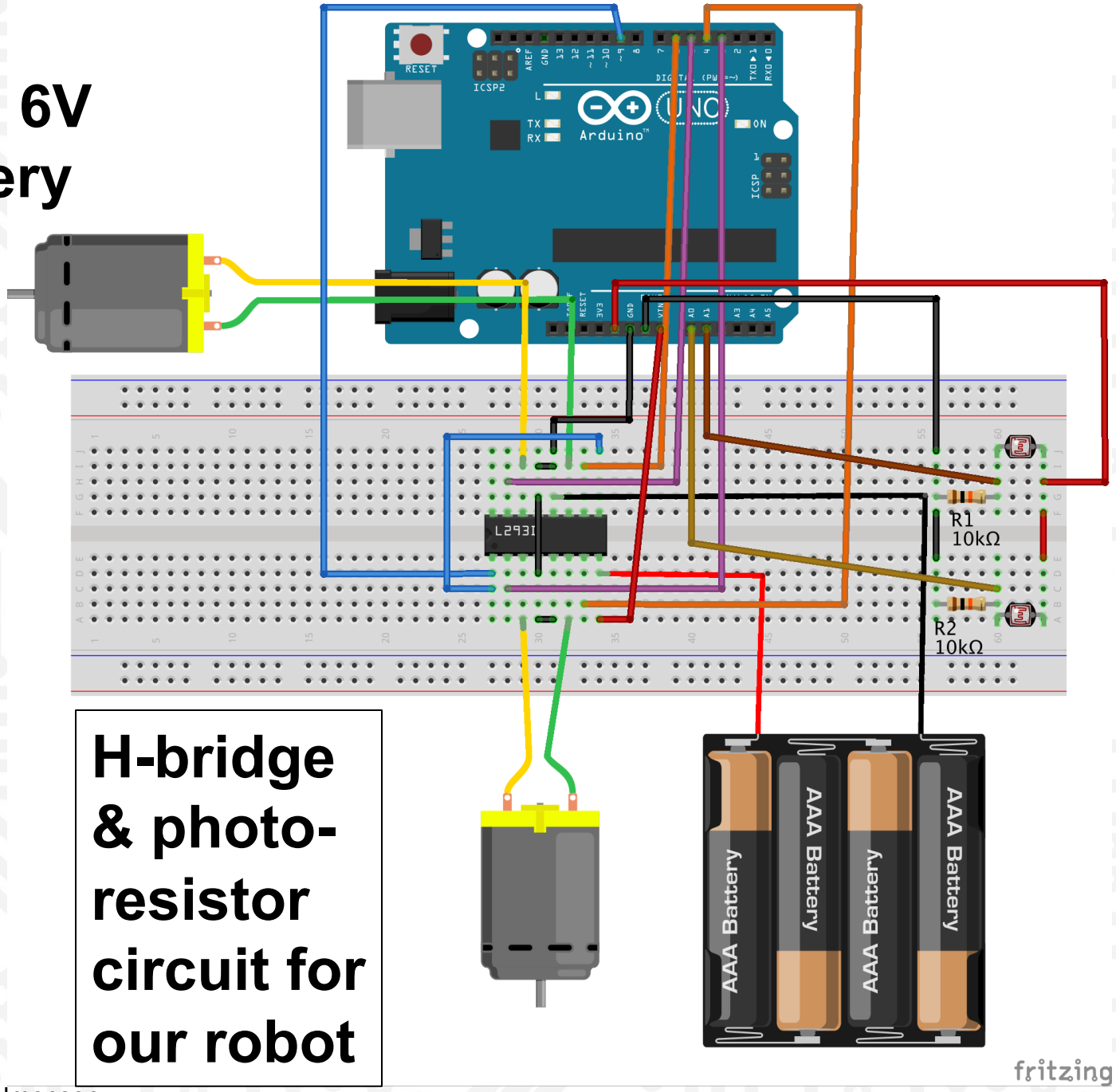
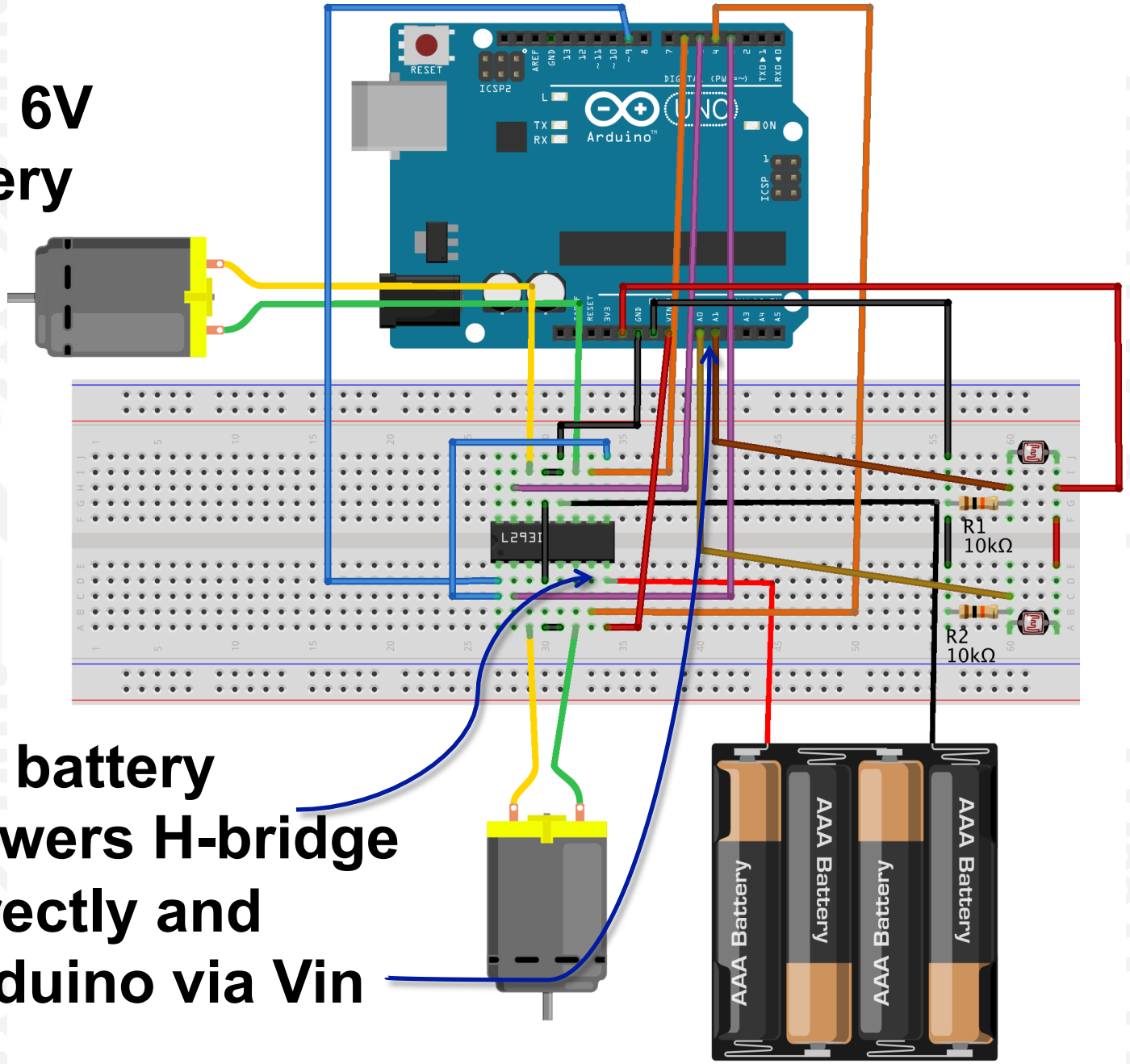
With 6V battery



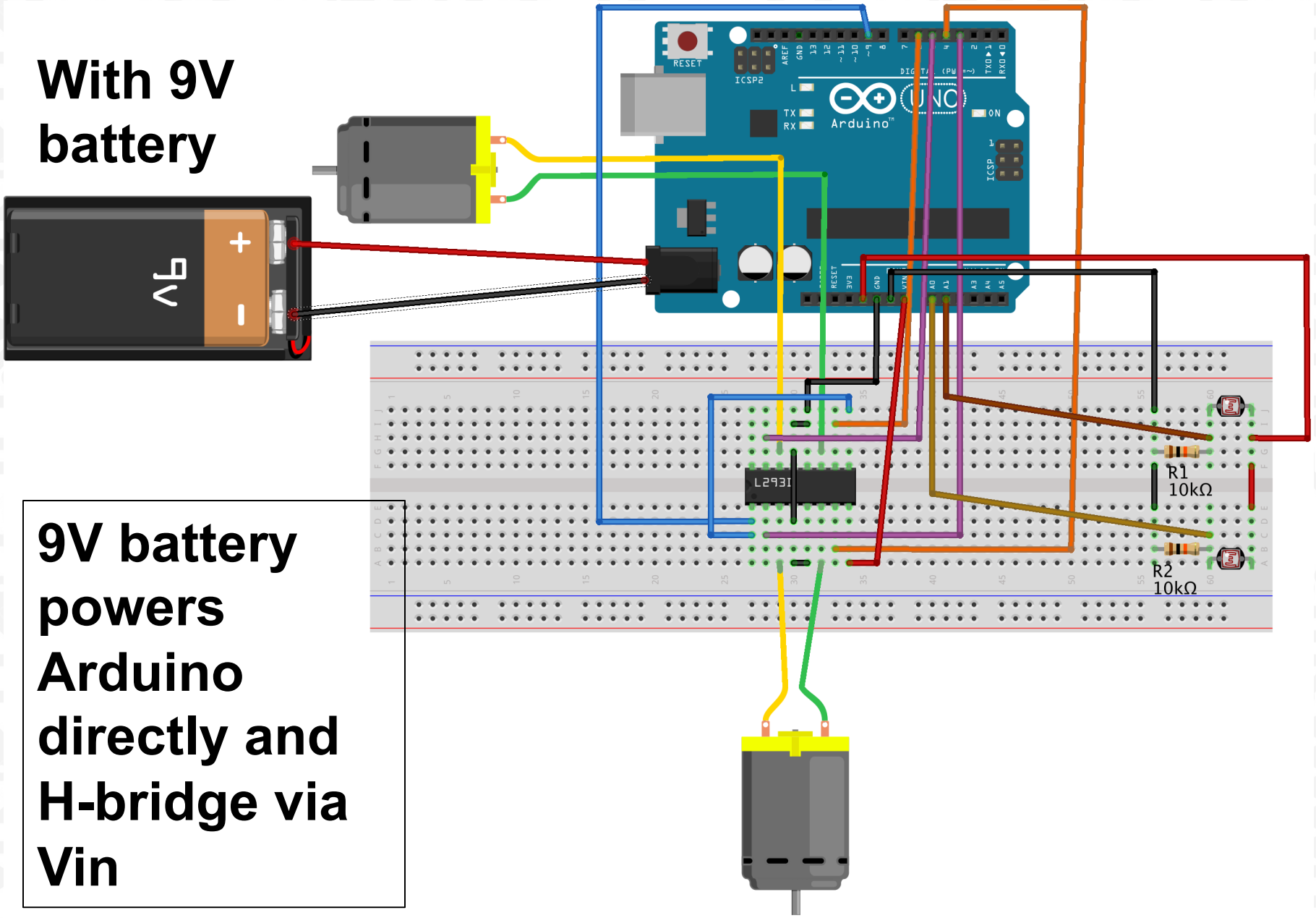
H-bridge & photo-resistor circuit for our robot

With 6V battery



6V battery powers H-bridge directly and Arduino via Vin

With 9V battery



9V battery powers Arduino directly and H-bridge via Vin

Light-chasing robot w/ Joystick sketch: initialization

Joystick

```
// bit to tell whether we're in joystick or photoresistor (light-seeking) mode:
int joy_or_photo;
boolean iserial = false; // run serial terminal


// joystick pins:
int xPin = A4;
int yPin = A5;
int buttonPin = 2;


// joystick variables:
int xPos0, xPosition;
int yPos0, yPosition;
int buttonState, prevButtonState;
```

The Joystick has 5 inputs:
xPin,
yPin,
buttonPin,
Vcc - wire to Arduino 5V
Gnd – wire to Arduino Gnd

Photoresistor_n_Joystick_to_HbridgeL293D.ino

Light-chasing robot w/ Joystick sketch: setup()

Joystick

```
void setup() {

  joy_or_photo = 1; // initial state: 1 = joystick, 0 = photoresistor


  // joystick:
  pinMode(xPin, INPUT);
  pinMode(yPin, INPUT);
  //activate pull-up resistor on the push-button pin
  pinMode(buttonPin, INPUT_PULLUP);
  xPos0 = analogRead(xPin);
  yPos0 = analogRead(yPin);
  buttonState     = 1;
  prevButtonState = 1;


}
```


Photoresistor_n_Joystick_to_HbridgeL293D.ino

Light-chasing robot w/ Joystick sketch: loop()

Joystick

```
void loop() {
  xPosition   = analogRead(xPin);
  yPosition   = analogRead(yPin);
  buttonState = digitalRead(buttonPin);

  if (joy_or_photo) {
    float dx, dy;
    if (xPosition > xPos0) {
      dx = float(xPosition - xPos0) / (1023.0 - xPos0);
    } else {
      dx = float(xPosition - xPos0) / xPos0;
    }
    if (yPosition > yPos0) {
      dy = float(yPosition - yPos0) / (1023.0 - yPos0);
    } else {
      dy = float(yPosition - yPos0) / yPos0;
    }

    // dx is the forward/backward vector spanning [-1.0:1.0]
    // dy is the twist left/right vector spanning [-1.0:1.0]
    float drvThresh = 0.05;
    float drvRight = 0.5*(dx + dy);
    float drvLeft  = 0.5*(dx - dy);
```

Continued …

Photoresistor_n_Joystick_to_HbridgeL293D.ino

Light-chasing robot w/ Joystick sketch: loop()

… Continued

Joystick

```
if (abs(drvRight) <= drvThresh) {
  analogWrite(motorPin1[0], 0 );
  analogWrite(motorPin2[0], 0 );
} else if (drvRight > drvThresh) {
  analogWrite(motorPin1[0], 175 + int( 80.*drvRight ));
  analogWrite(motorPin2[0], 0 );
} else {
  analogWrite(motorPin1[0],  0 );
  analogWrite(motorPin2[0], (175 - int( 80.*drvRight )) );
}
```

Same for Left…

```
}
```


Photoresistor_n_Joystick_to_HbridgeL293D.ino

Light-chasing robot sketch: initialization

Photoresistor

```
// pin assignments
int LDR[2] = {A1, A0};
int motorPin1[2] = {5, 3};
int motorPin2[2] = {6, 4};

// allocate variables:
int v[2];
int base[2];
int thresh[2] = {0, 0};
int drv[2];
int min[2]    = { 1000,  1000};
int max[2]    = {-1000, -1000};
```

Photoresistor2_to_HbridgeL293D.ino

Light-chasing robot sketch: setup()

Photoresistor

```
void setup() {
    // set up the pins:
    for (int i = 0; i <= 1; i++)
      {
       pinMode(LDR[i], INPUT);
       int base = analogRead(LDR[i]);
       min[i] = base;
       max[i] = base+100;
       pinMode(motorPin1[i], OUTPUT);
       pinMode(motorPin2[i], OUTPUT);
       analogWrite(motorPin1[i],0);
       analogWrite(motorPin2[i],0);
      }
}
```

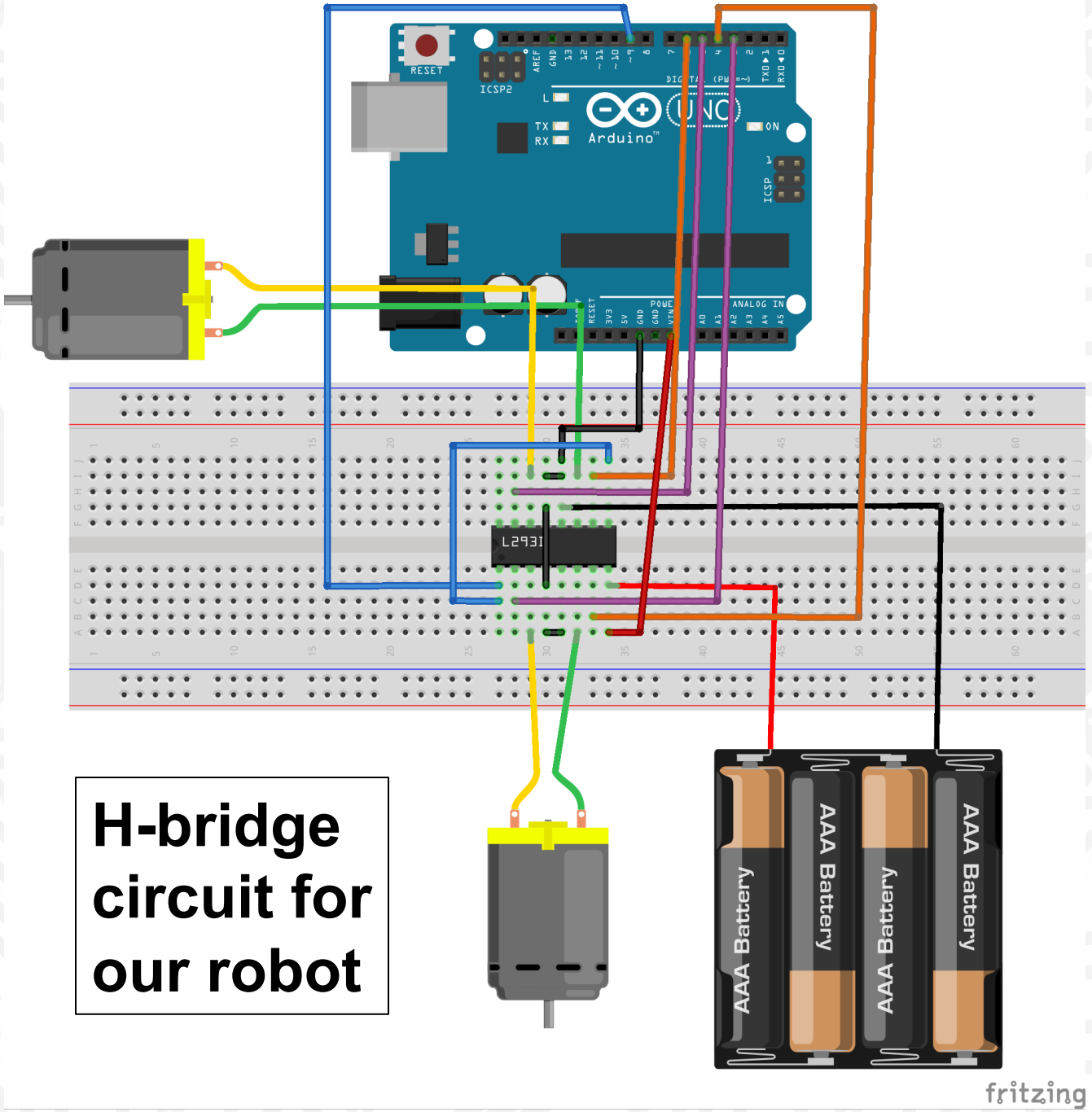

Photoresistor2_to_HbridgeL293D.ino

Light-chasing robot sketch: loop()

Photoresistor

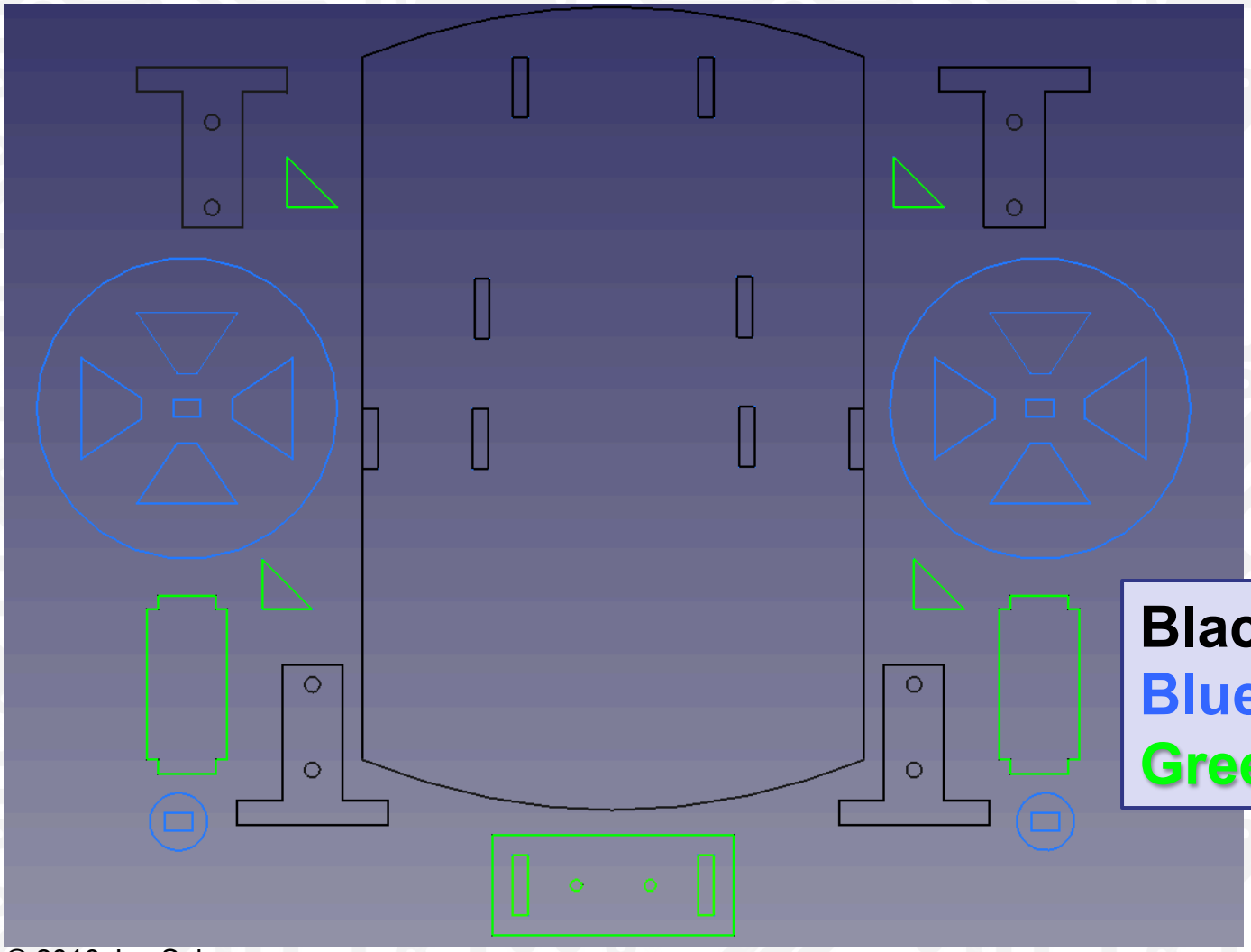
```
void loop() {

      // for each photoresistor 'i':
      for (int i = 0; i <= 1; i++) {
        // read the voltage of the photoresistor:
        v[i] = analogRead(LDR[i]);

        // find min and max value of the photoresistor:
        if (v[i] > max[i]) max[i] = v[i];
        if (v[i] < min[i]) min[i] = v[i];

        // Set the threshold to activate the motor at 35% between min and max
        int mx_mn35 = int(0.35*(max[i] - min[i]));
        thresh[i] = mx_mn35 + min[i];

        // If we're above threshold, then scale the motor voltage according to how far above threshold we are.
        if (v[i] > thresh[i]) {
          // minimum speed is 175.
          // maximum speed is 175 + 80 = 255.
          drv[i] = 175 + int( 80.0*( float(v[i] - thresh[i]) / (max[i] - thresh[i]) ));
        } else {
          drv[i] = 0; // remember to turn the motor off if below threshold
        }

        // send the voltage to the motor pins on the H-bridge:
        analogWrite(motorPin1[i], drv[i] );
        analogWrite(motorPin2[i], 0 );
      }

      // If either motor is driving, light the LED:
      if (drv[0] > 0 || drv[1] > 0) {
        digitalWrite(ledPin, HIGH);
      } else {
        digitalWrite(ledPin, LOW);

}
```

Photoresistor2_to_HbridgeL293D.ino



H-bridge circuit for our robot

Robot1c plans



Black – chassis
Blue – wheels
Green – nose gear

Units

Distance – meters (m)
Mass – kilograms (kg)
Time – seconds (s)

Charge – Coulomb (C)
Current – Amp (A)
Resistance – Ohm (Ω)
Magnetic Field – Tesla (T)

f – femto (10^{-15})
p – pico (10^{-12})
n – nano (10^{-9})
μ – micro (10^{-6})
m – milli (10^{-3})

k – kilo (10^{3})
M – mega (10^{6})
G – giga (10^{9})
T – tera (10^{12})
P – peta (10^{15})