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// To be used with the Techspace Learning Motor Governor V2 project.
// The pot sets the speed, the power is regulated to maintain the speed under load.
// The onboard analogWrite PWM function is used, so pins 9 and 10 must be used.
// The sensor times should be between 2500us - 12500us.
// If it does not work, change the sensor.

int overLoad = 3;    //Red LED
int under = 4;      //Yellow LED
int onSpeed = 5;    //Green LED
int over = 6;       //Yellow LED
int sensor = 2;     //This has a Y lead with a white LED.
int fwd = 9;
int rev = 10;
int pot = A0;
int potLevel;
int Power;
unsigned long darkTime = 0;
int Speed;          //Do not use capitals.
int hiSpeed;
int loSpeed;

void setup() {
  pinMode(sensor, INPUT);
  pinMode(pot, INPUT);
  pinMode(fwd, OUTPUT);
  pinMode(rev, OUTPUT);
  pinMode(overLoad, OUTPUT);
  pinMode(under, OUTPUT);
  pinMode(onSpeed, OUTPUT);
  pinMode(over, OUTPUT);
  digitalWrite(rev, 0);
  Serial.begin(9600);
}

void loop() {
  //Reads the pot and converts potLevel to between 5 - 25.
  potLevel = analogRead(pot);
  potLevel = (20 - (potLevel/50)) + 5;

  //Read the light sensor to get a pulse length. Times out after 300ms.
  darkTime = pulseIn(sensor, LOW, 300000);

  //If stopped too long, then it kicks the motor back on to get it moving.
  if(darkTime == 0){darkTime = 300000;
                    Power = Power + 40;}

  //should keep darktime between 0 and 30ish.
  darkTime = darkTime/500;

  //Adjust the power based on the light pulse.
  if(darkTime > potLevel){Power = Power + 2;}
  if(darkTime < potLevel){Power = Power - 2;}

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//Lights the overstrain light if the power is trying to exceed 255.
  if(Power > 255){digitalWrite(overLoad,1);}
    else{digitalWrite(overLoad,0);}

//Keep the power between 40 and 255. (Arduino PWM)
  Power = constrain(Power,40,255);
  analogWrite(fwd,Power);

//Adjusts the lights for over/underspeed.
  loSpeed = darkTime - 2;
  hiSpeed = darkTime + 2;
  if(potLevel > hiSpeed){
    digitalWrite(over,1);
    digitalWrite(onSpeed,0);
    digitalWrite(under,0);
  }
  if(potLevel < loSpeed){
    digitalWrite(over,0);
    digitalWrite(onSpeed,0);
    digitalWrite(under,1);
  }
  if(potLevel >= loSpeed && potLevel <= hiSpeed){
    digitalWrite(over,0);
    digitalWrite(onSpeed,1);
    digitalWrite(under,0);
  }

//Converts the darkTime into a speed, slow = 1, fast = 30.
  Speed = 30 - darkTime;
  Speed = constrain(Speed,0,30);

//Prints it all to serial.
  Serial.print("Speed = ");
  Serial.print(Speed);
  Serial.print("    Power = ");
  Serial.println(Power);
}

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