//Hoang Nguyen  
//This is the project that the robot can follow the black line, using the Shield Bot from Parallax  
//The LDR and white LED are attached together, and put face towards the ground  
//The LED will emit light and ground will reflect that light. Finally, LDR will measure that intensity of a light  
//black color will absorb most of the light, returning low value readed by LDR; we save that value in the variable name "threshold"  
//There will be two pairs of "sensor": left and right  
//If left one is inside and the right one is outside the black line; we maked the bot turn left and vice versa...  
//If both outside, it's mean it has reached the end of the line, or being put outside of black line, the bot will stop  
//If both "sensor" are inside, go straightforward  
  
#include <Servo.h> // Include servo library  
  
Servo servoLeft; // Declare left and right servos  
Servo servoRight;  
const int photoLeft = A1;  
const int photoRight = A2;  
const int threshold = 13; //value for black line: 0-5  
  
void setup() // Built-in initialization block  
{  
 pinMode(9, OUTPUT); pinMode(8, OUTPUT); //LED  
 pinMode(photoLeft, INPUT); pinMode(photoRight, INPUT);  
 digitalWrite(8, HIGH); //turn on both LEDs  
 digitalWrite(9, HIGH);  
 servoLeft.attach(13); // Attach left signal to pin 13  
 servoRight.attach(12); // Attach right signal to pin 12  
 Serial.begin(9600);  
}  
  
void loop() // Main loop auto-repeats  
{  
 int valLeft = analogRead(photoLeft);  
 int valRight = analogRead(photoRight);  
 Serial.print("valLeft: ");  
 Serial.print(valLeft);  
 Serial.print(" ");  
 Serial.print("valRight: ");  
 Serial.println(valRight);  
 if (valLeft > threshold && valRight < threshold ) //left is outside, right is inside  
 maneuver(200, -200, 20); // Right for 20 ms  
 if (valRight > threshold && valLeft < threshold) //Right is outside, left is inside  
 maneuver(-200, 200, 20); // Left for 20 ms  
 if (valRight > threshold && valLeft > threshold) //if both outside, stop  
 maneuver(0, 0, 20); //stop  
 if (valRight < threshold && valLeft < threshold) // if both inside, go straight forward  
 maneuver(200,200,20); //go straigh for 20ms\*/  
}  
  
  
  
void maneuver(int speedLeft, int speedRight, int msTime)  
{  
 // speedLeft, speedRight ranges: Backward Linear Stop Linear Forward  
 // -200 -100......0......100 200  
 servoLeft.writeMicroseconds(1500 + speedLeft); // Set left servo speed  
 servoRight.writeMicroseconds(1500 - speedRight); // Set right servo speed  
 if (msTime == -1) // if msTime = -1  
 {  
 servoLeft.detach(); // Stop servo signals  
 servoRight.detach();  
 }  
 delay(msTime); // Delay for msTime  
}