

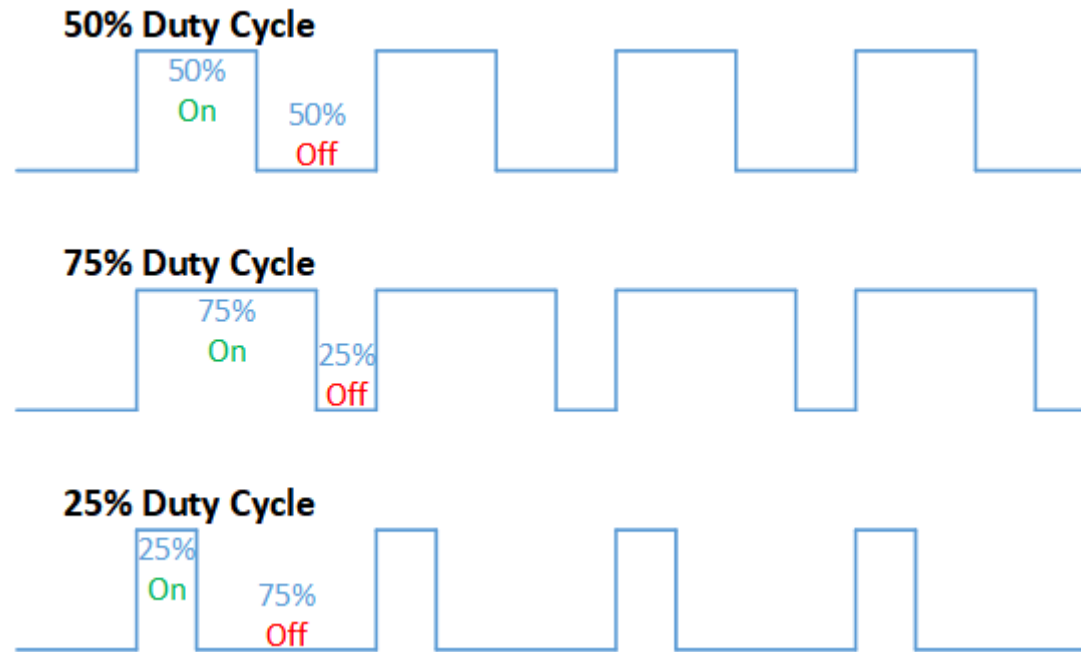
PWM 테스트, analogWrite, analogRead

“수업자료는 여기”

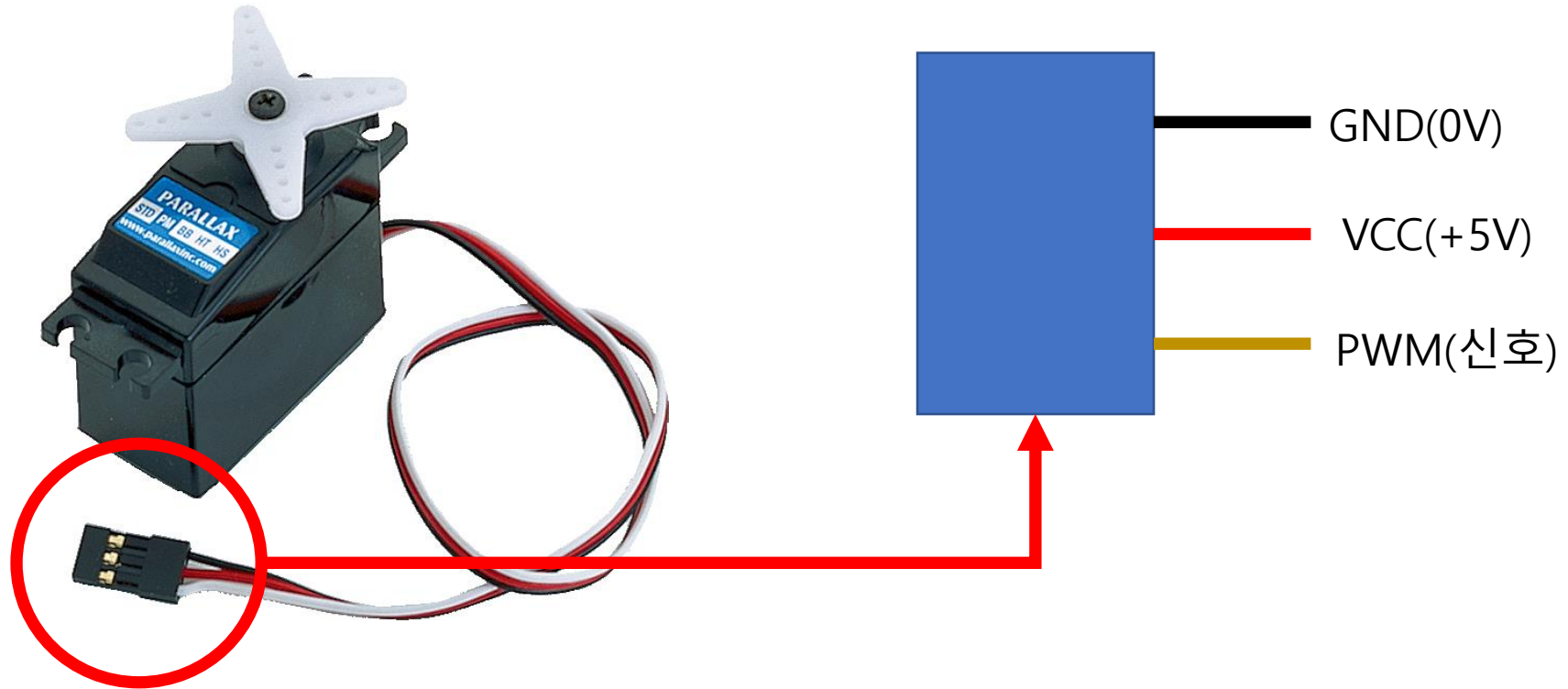
마이크로프로세서종합설계



PWM(Pulse Width Modulation)

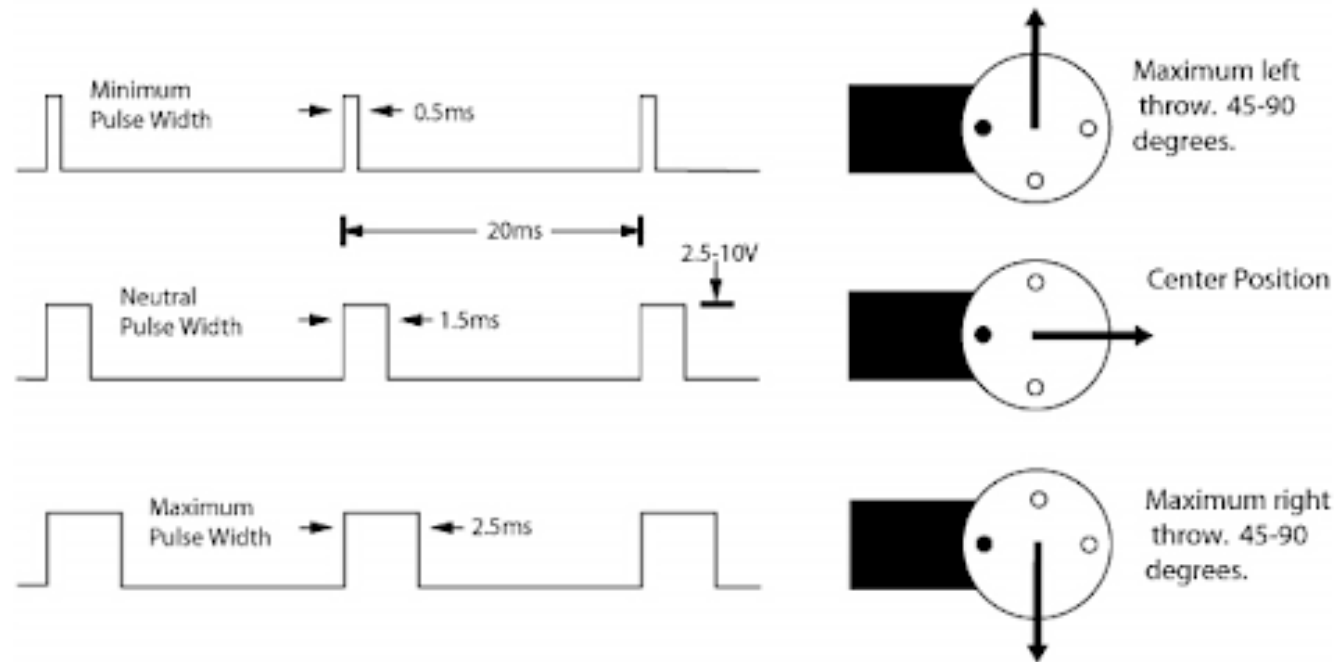


RC 서보모터



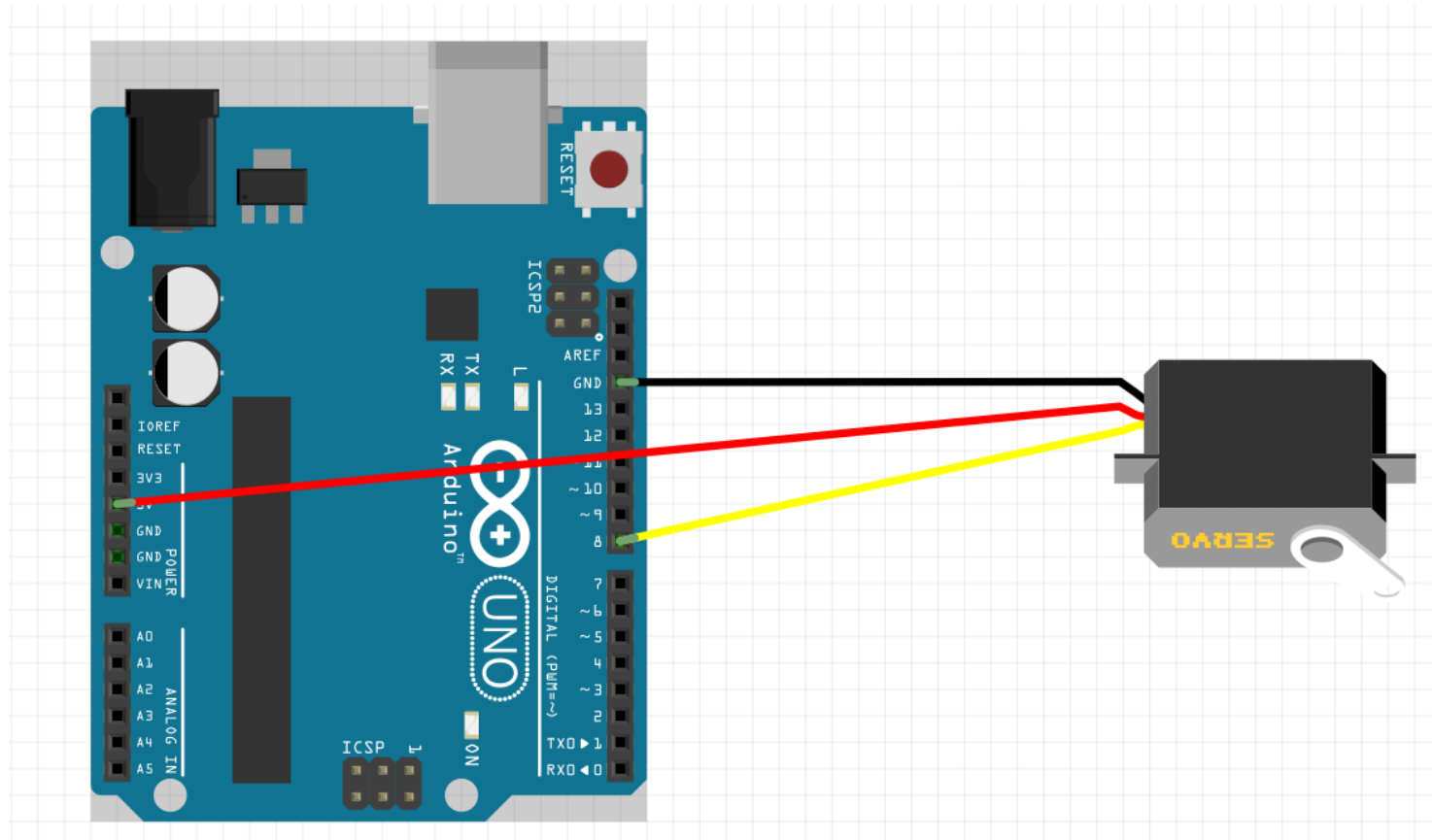
PWM을 이용한 RC 서보모터 제어

R/C Control Signal Theory



아두이노를 이용한 서보모터 제어

- 테스트 회로 구성

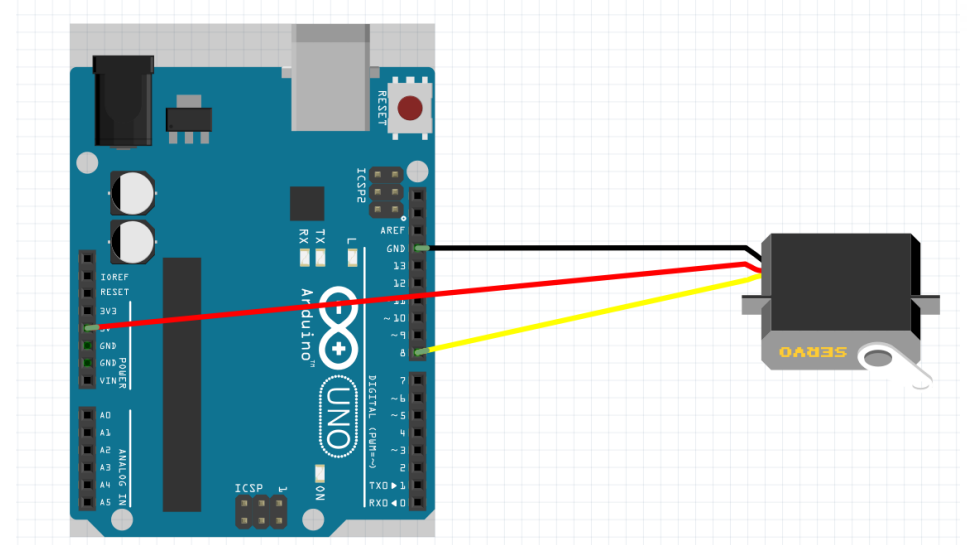
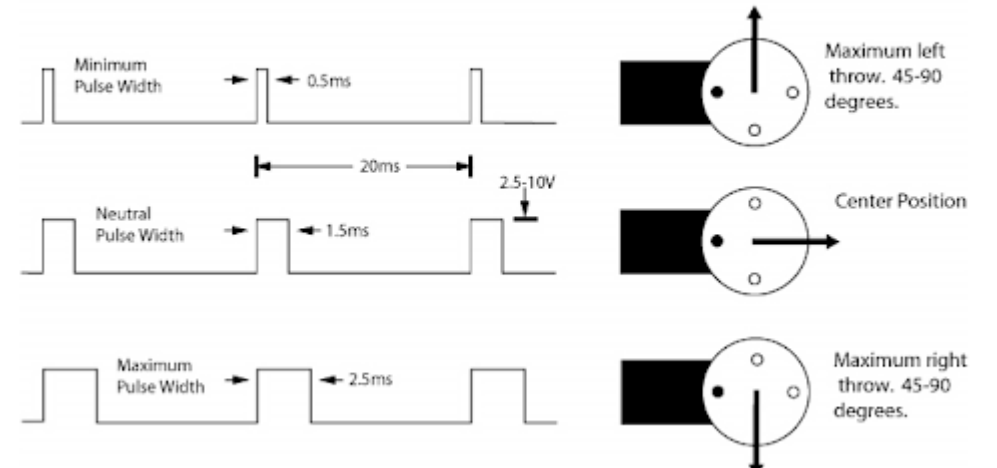


아두이노를 이용한 서보모터 제어

```
void setup() {  
  pinMode(8, OUTPUT);  
}
```

```
void loop() {  
  
  digitalWrite(8, HIGH);  
  delayMicroseconds(1400);  
  
  digitalWrite(8, LOW);  
  delayMicroseconds(20000-1400);  
}
```

R/C Control Signal Theory



아두이노를 이용한 서보모터 제어

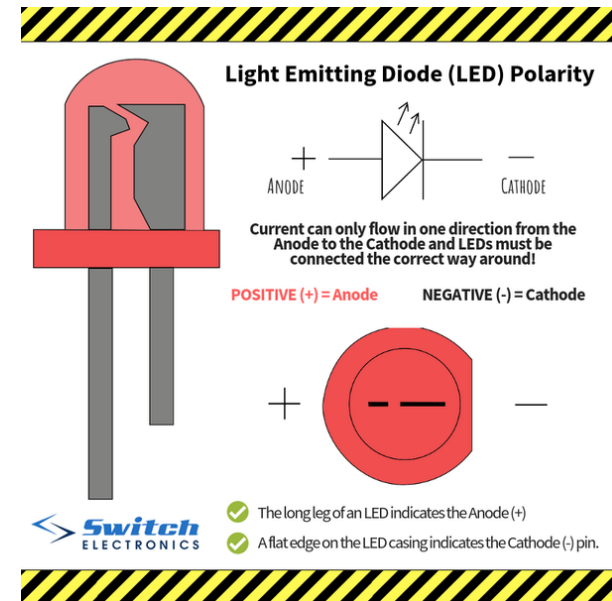
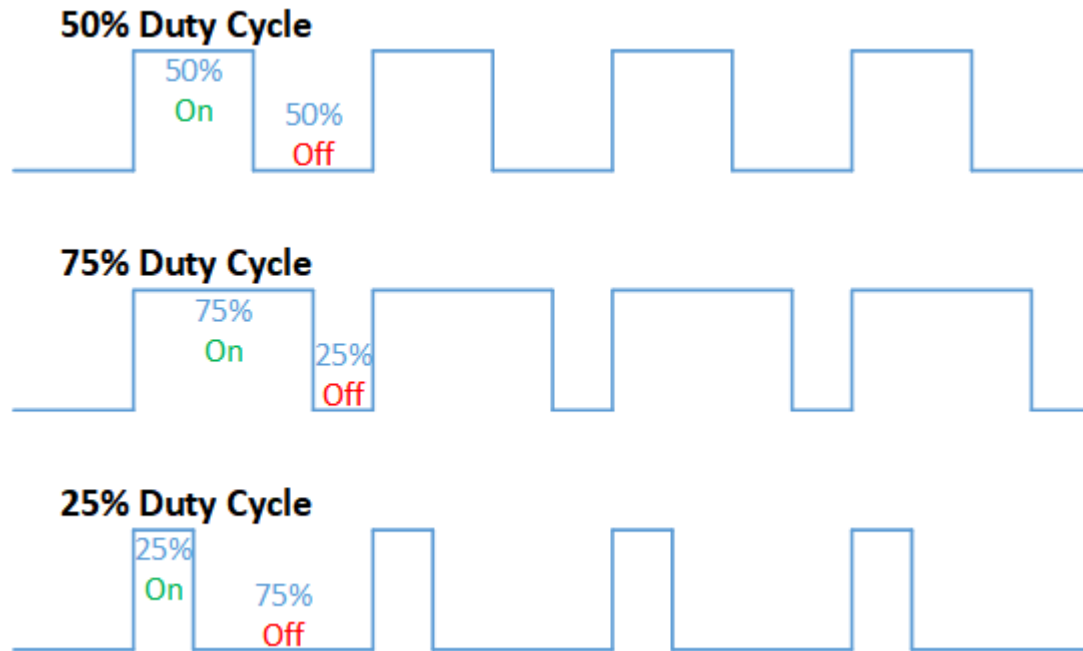
- 퀴즈

- 버튼을 누르는 동안에만 모터가 0도에 위치하고 그렇지 않으면 90도 (반대로) 이동시키는 코드를 작성하시오

- Hint

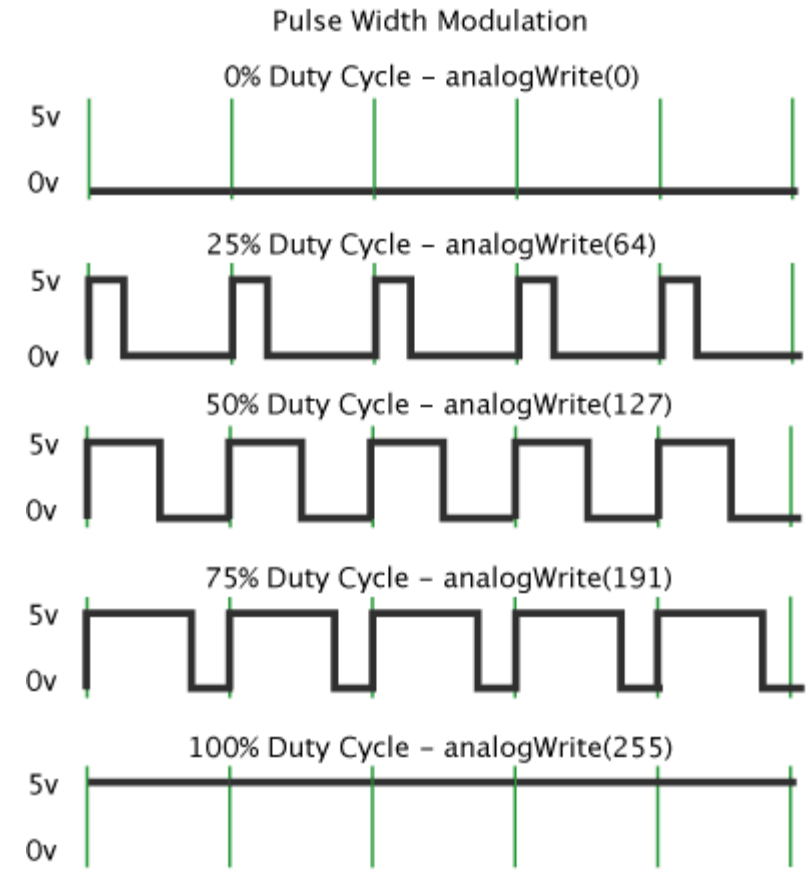
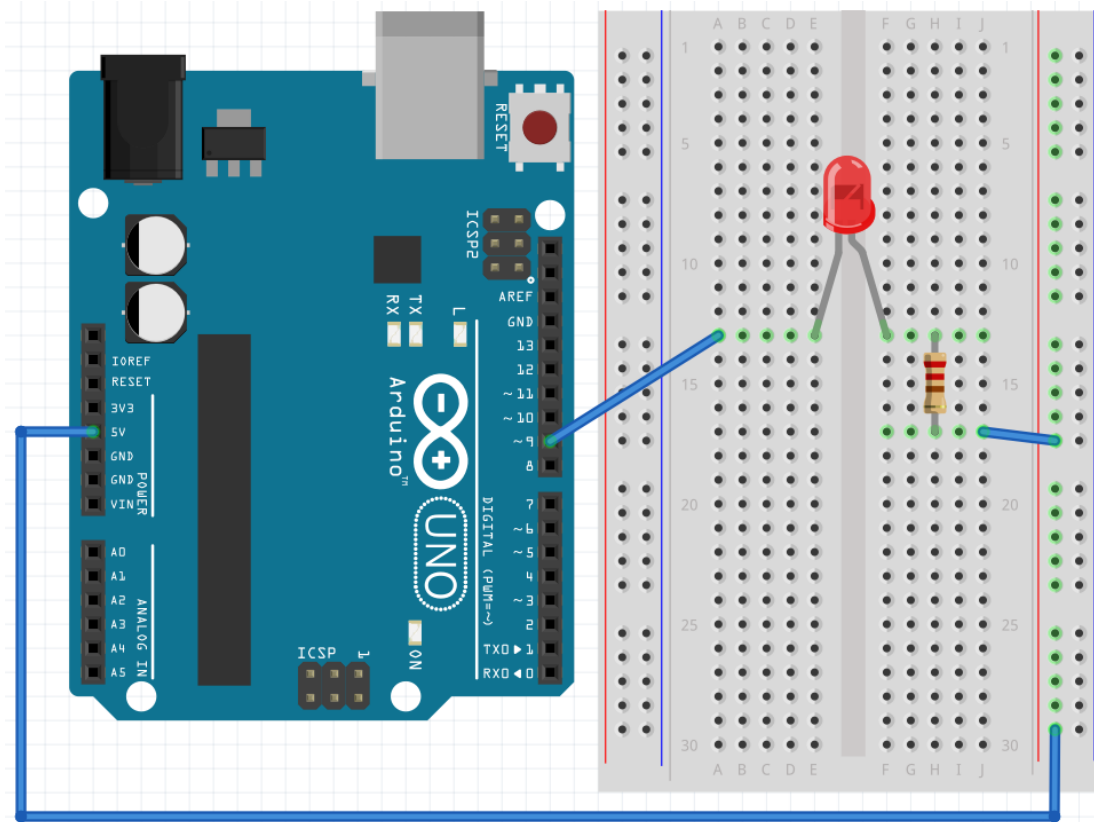
- pinMode(핀번호, INPUT_PULLUP);
- if (digitalRead(핀번호) == LOW){} ~ else{}

PWM을 이용한 LED 밝기 제어



아두이노를 이용한 LED 밝기 제어 예제

- 함수 : `analogWrite(핀번호, duty cycle)`

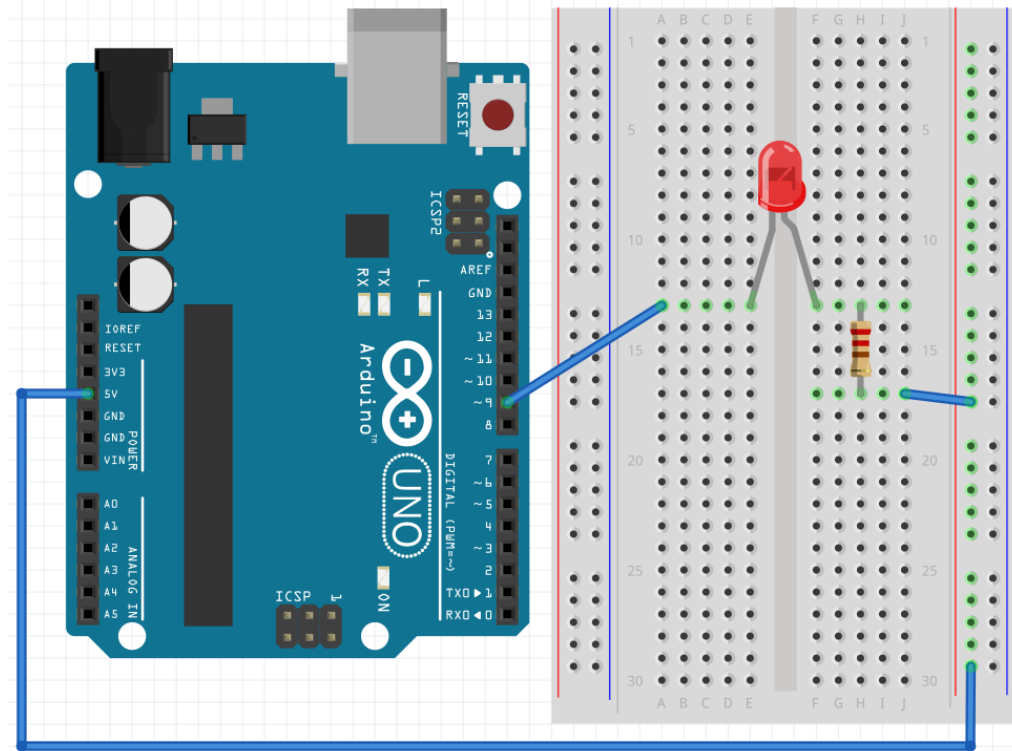


아두이노를 이용한 LED 밝기제어 예제

- 함수 : `analogWrite(핀번호, duty cycle)`

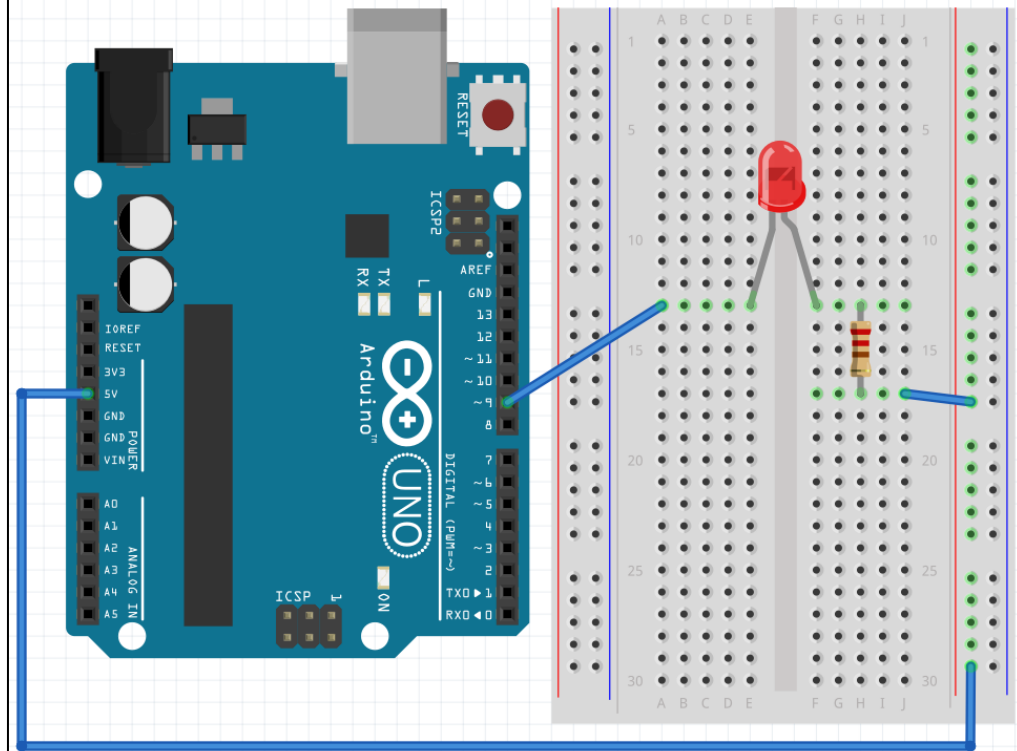
```
void setup() {  
  pinMode(9, OUTPUT); // 핀을 출력으로 설정  
}  
  
void loop() {  
  analogWrite(9, 0); //analogWrite 값은 0 부터 255까지  
}
```

```
void setup() {  
  pinMode(9, OUTPUT); // 핀을 출력으로 설정  
}  
  
void loop() {  
  analogWrite(9, 255); //analogWrite 값은 0 부터 255까지  
}
```



아두이노를 이용한 LED 밝기제어 예제

```
void setup() {  
  pinMode(9, OUTPUT); // 핀을 출력으로 설정  
}  
  
void loop() {  
  for( int i=0 ; i<255 ; i++ )  
  {  
    analogWrite(9, i); //analogWrite 값은 0 부터 255까지  
    delay(30) ;  
  }  
  
  for( int i=0 ; i<255 ; i++ )  
  {  
    analogWrite(9, 255-i); //analogWrite 값은 0 부터 255까지  
    delay(30) ;  
  }  
}
```



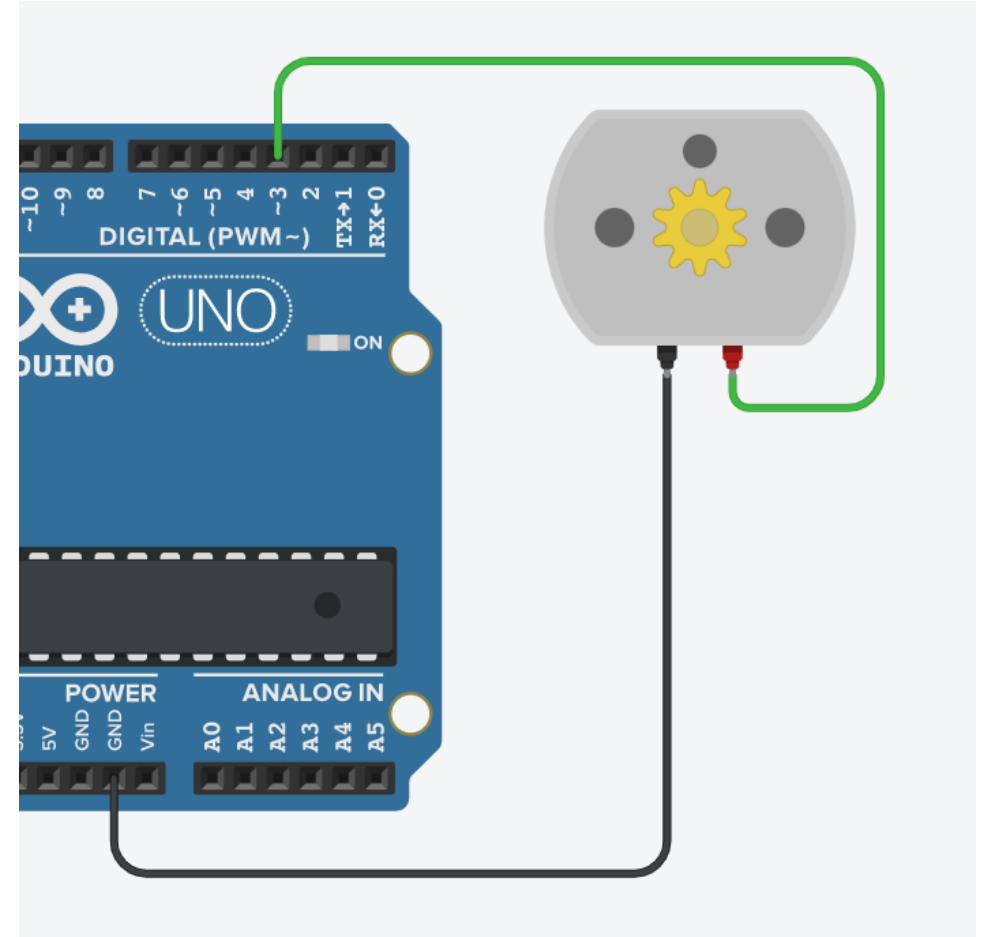
analogWrite(PWM)을 이용한 DC모터 제어

```
void setup()
{
  pinMode(3, OUTPUT); // 핀을 출력으로 설정
}

void loop()
{
  analogWrite(3, 255); //analogWrite 값은 0 부터 255까지
}
```

```
void setup()
{
  pinMode(3, OUTPUT); // 핀을 출력으로 설정
}

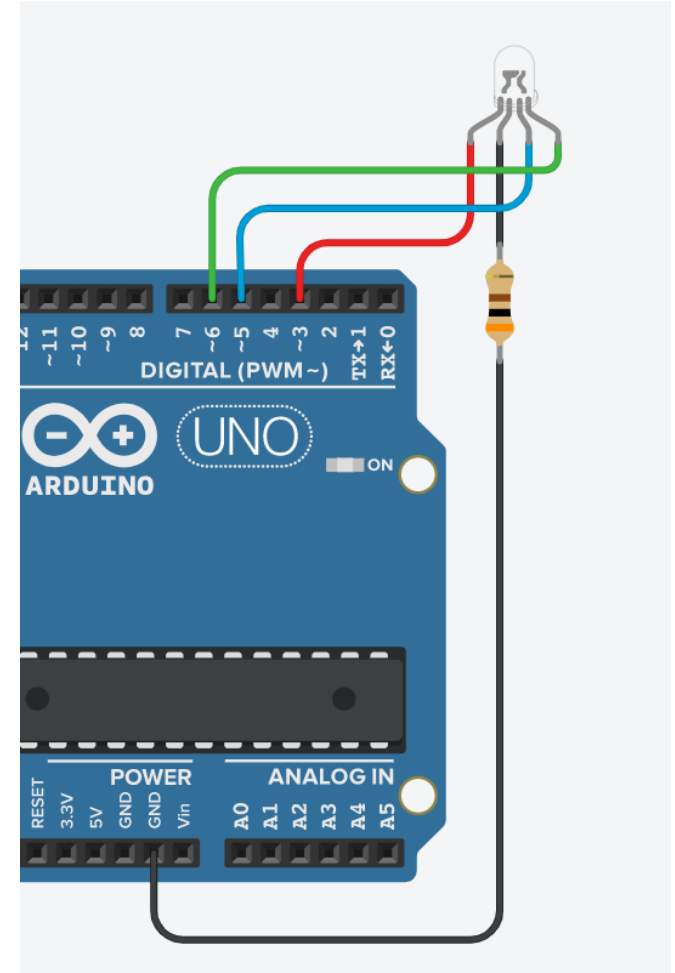
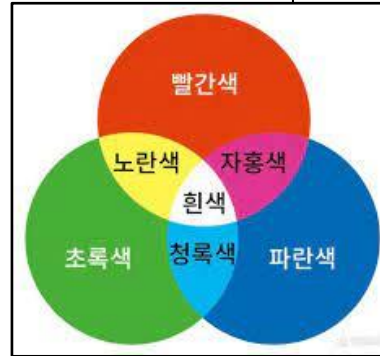
void loop()
{
  analogWrite(3, 128); //analogWrite 값은 0 부터 255까지
}
```



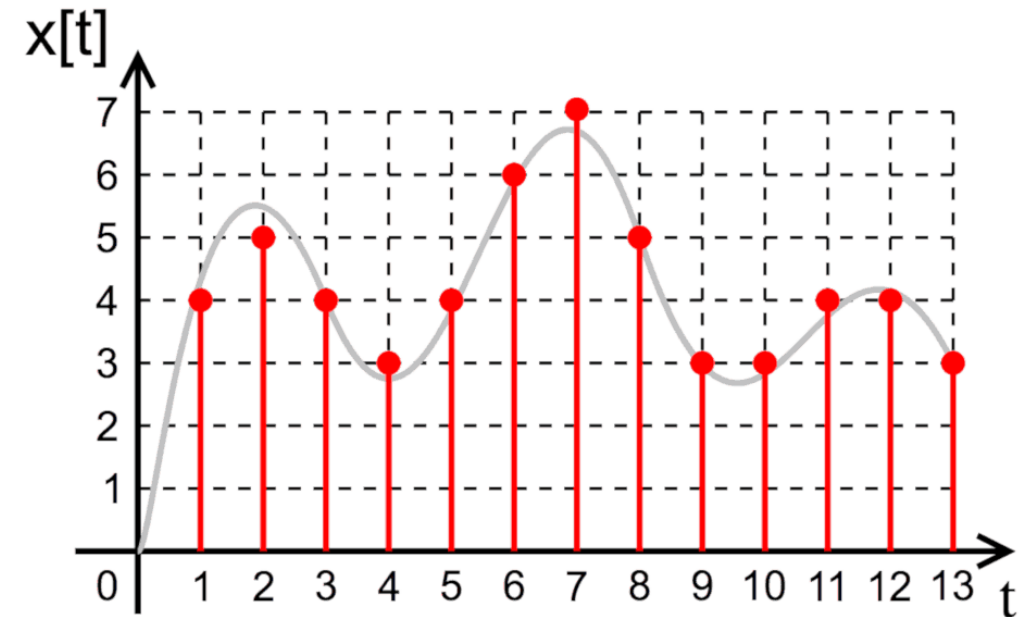
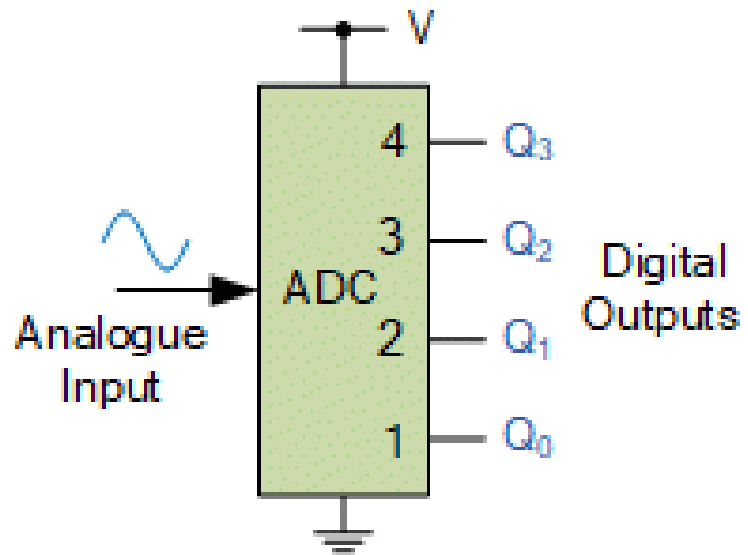
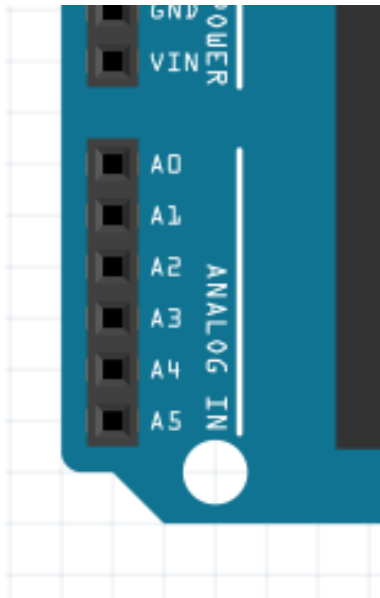
analogWrite(PWM)을 이용한 RGB LED제어

```
void setup()
{
  pinMode(3, OUTPUT); // 핀을 출력으로 설정
  pinMode(5, OUTPUT); // 핀을 출력으로 설정
  pinMode(6, OUTPUT); // 핀을 출력으로 설정
}
```

```
void loop()
{
  analogWrite(3, 255); //analogWrite 값은 0 부터 255까지
  analogWrite(5, 255); //analogWrite 값은 0 부터 255까지
  analogWrite(6, 0); //analogWrite 값은 0 부터 255까지
}
```

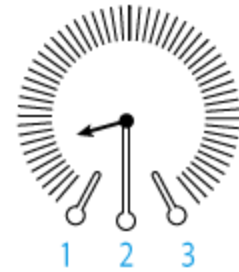
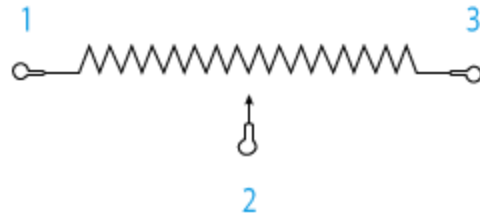


아날로그 입력(ADC)



가변저항(Potentiometer, 볼륨)

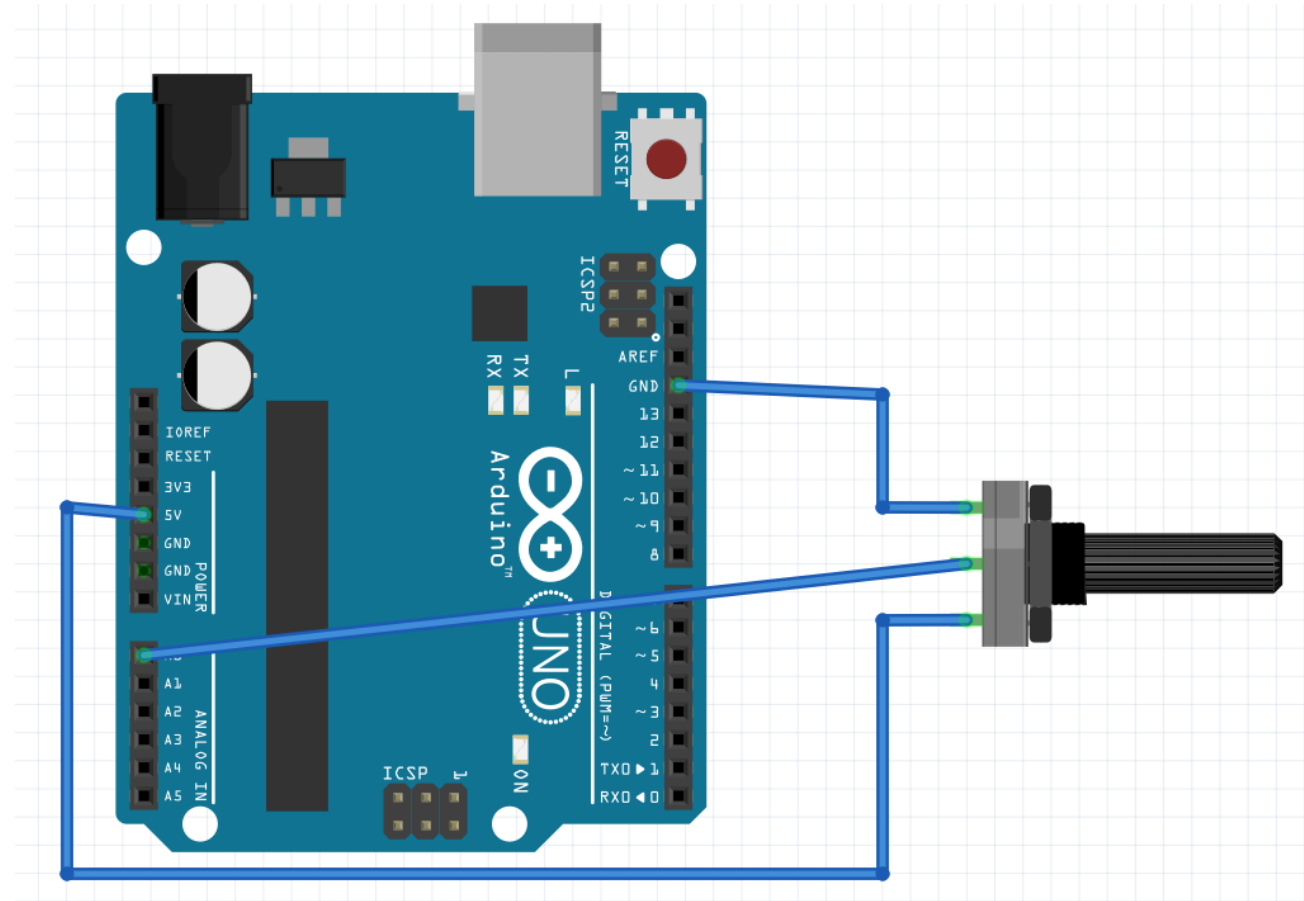
- 저항값을 변경



가변저항의 동작방식

가변저항(Potentiometer, 볼륨)

```
void setup (){\n  Serial.begin(9600);\n}\n\nvoid loop(){\n  int val = analogRead(A0);\n  Serial.print("Analog : ");\n  Serial.println(val);\n}
```



가변저항(Potentiometer, 볼륨)

```
void setup (){  
  Serial.begin(9600);  
  pinMode(9,OUTPUT);  
}  
  
void loop(){  
  int val = analogRead(A0);  
  Serial.print("Analog : ");  
  Serial.println(val);  
  
  val = val / 4 ;  
  
  analogWrite(9, val);  
}
```

