

LAMPIRAN

Source code sensor LDR

```
byte ldr1= A0;
byte ldr2= A1;
int nilaildr1;
int nilaildr2;
void loop() {
  nilaildr1= analogRead(ldr1);
  Serial.println("----- Input -----");
  Serial.print("Nilai LDR 1: ");
  Serial.println(nilaildr1);

  nilaildr2= analogRead(ldr2);
  Serial.print("Nilai LDR 2: ");
  Serial.println(nilaildr2);
}
```

Kode Program 4.1 Program Sensor LDR

Source Code Sensor Ultrasonik

```
int trig= 6; // membuat variabel trig yang di set ke-pin 3
int echo= 7; // membuat variabel echo yang di set ke-pin 2
long durasi, jarak; // membuat variabel durasi dan jarak
int durasiLampu = 0; // membuat durasi lama lampu terang
inMode(trig, OUTPUT); // set pin trig menjadi OUTPUT
pinMode(echo, INPUT); // set pin echo menjadi INPUT
//Ultrasonic

digitalWrite(trig, LOW);
delayMicroseconds(10);
digitalWrite(trig, HIGH);
delayMicroseconds(10);
digitalWrite(trig, LOW);
```

```

delayMicroseconds(10);

durasi= pulseIn(echo, HIGH); // menerima suara ultrasonic
jarak= (durasi/2) / 29.1; // mengubah durasi menjadi jarak (cm)
if (jarak >= 25){
  if (durasiLampu > 0) {
    WA1=(WA/2)-2;
    durasiLampu = --durasiLampu; // decrement, atau bisa menggunakan
durasiLampu - 1
  }else {
    WA1=(WA/4)-2;
  }
  Serial.println("Tidak ada kendaraan yang melintas");
}else if(jarak<=24){
  WA1=(WA/2)-2;
  Serial.println("Terdapat kendaraan yang melintas");
  durasiLampu = 30;
}
Serial.print(jarak); // menampilkan jarak pada Serial Monitor
Serial.println(" CM");
if(WA1 < 10){ // untuk kondisi float biar tidak error
  WA1 = 10;
}

```

Kode Program 4.2 Program Sensor Ultrasonik

Source Code Metode Fuzzy

```
//Fuziikasi MiU LDR1
if (nilaildr1 <= 10){
    gelap = 1;
    sedang = 0;
    terang = 0;
}else if (nilaildr1 >= 80){
    gelap = 0;
    sedang = 0;
    terang = 1;
}else if (nilaildr1 == 40){
    gelap = 0;
    sedang = 1;
    terang = 0;
}else if (nilaildr1 > 10 && nilaildr1<40){
    gelap1 = (40-nilaildr1);
    gelap=(gelap1/30);
    sedang1 = (nilaildr1-10);
    sedang=(sedang1/30);
    terang = 0;
}
else if (nilaildr1 > 40 && nilaildr1<80){
    gelap=0;
    sedang1 = (80-nilaildr1);
    sedang=(sedang1/40);
    terang1 = (nilaildr1-40);
    terang = (terang1/40);
}
Serial.println("----- FUZZYFIKASI -----");
Serial.println("LDR 1 =");
Serial.print("    μ Gelap : ");
```

```

Serial.println(gelap);
Serial.print("    μ Sedang : ");
Serial.println(sedang);
Serial.print("    μ Terang : ");
Serial.println(terang);

//Fuziikasi MiU LDR2
if (nilaidr2 <= 10){
    gelap = 1;
    sedang = 0;
    terang = 0;
}else if (nilaidr2 >= 80){
    gelap = 0;
    sedang = 0;
    terang = 1;
}else if (nilaidr2 == 40){
    gelap = 0;
    sedang = 1;
    terang = 0;
}else if (nilaidr2 > 10 && nilaidr2<40){
    gelap1 = (40-nilaidr2);
    gelap=(gelapp1/30);
    sedang1 = (nilaidr2-10);
    sedang=(sedangg1/30);
    terang = 0;
}
else if (nilaidr2 > 40 && nilaidr2<80){
    gelap=0;
    sedang1 = (80-nilaidr2);
    sedang=(sedangg1/40);
    terang1 = (nilaidr2-40);

```

```
terangg = (terangg1/40);  
}  
Serial.println("LDR 2 =");  
Serial.print("  μ Gelap : ");  
Serial.println(gelapp);  
Serial.print("  μ Sedang : ");  
Serial.println(sedangg);  
Serial.print("  μ Terang : ");  
Serial.println(terangg);
```

```
//Inferensi
```

```
Serial.println("----- INFERENSI -----");
```

```
a1=(min(terang,terangg));
```

```
z1=(10);
```

```
Serial.print("a1 : ");
```

```
Serial.print(a1);
```

```
Serial.print(" || z1 : ");
```

```
Serial.println(z1);
```

```
a2=(min(terang,sedangg));
```

```
z2=(10);
```

```
Serial.print("a2 : ");
```

```
Serial.print(a2);
```

```
Serial.print(" || z2 : ");
```

```
Serial.println(z2);
```

```
a3=(min(terang,gelapp));
```

```
z3=(100);
```

```
Serial.print("a3 : ");
```

```
Serial.print(a3);
```

```
Serial.print(" || z3 : ");
```

```
Serial.println(z3);
```

```
a4=(min(sedang,terangg));
```

```
z4=(10);
```

```
Serial.print("a4 : ");
```

```
Serial.print(a4);
```

```
Serial.print(" || z4 : ");
```

```
Serial.println(z4);
```

```
a5=(min(sedang,sedangg));
```

```
z5=(100);
```

```
Serial.print("a5 : ");
```

```
Serial.print(a5);
```

```
Serial.print(" || z5 : ");
```

```
Serial.println(z5);
```

```
a6=(min(sedang,gelapp));
```

```
z6=(200);
```

```
Serial.print("a6 : ");
```

```
Serial.print(a6);
```

```
Serial.print(" || z6 : ");
```

```
Serial.println(z6);
```

```
a7=(min(gelap,terangg));
```

```
z7=(100);
```

```
Serial.print("a7 : ");
```

```
Serial.print(a7);
```

```
Serial.print(" || z7 : ");
```

```
Serial.println(z7);
```

```
a8=(min(gelap,sedangg));
```

```

z8=(200);
Serial.print("a8 : ");
Serial.print(a8);
Serial.print(" || z8 : ");
Serial.println(z8);

a9=(min(gelap,gelapp));
z9=(200);
Serial.print("a9 : ");
Serial.print(a9);
Serial.print(" || z9 : ");
Serial.println(z9);

//Defuzzifikasi
Serial.println("----- DEFUZZYFIKASI -----");

atas=((a1*z1)+(a2*z2)+(a3*z3)+(a4*z4)+(a5*z5)+(a6*z6)+(a7*z7)+(a8
*z8)+(a9*z9));
bawah=(a1+a2+a3+a4+a5+a6+a7+a8+a9);
WA=(atas/bawah);

Serial.print("Nilai WA = ");
Serial.println(WA);

```

Kode Program 4.3 Program Metode Fuzzy

Source Code Ac Light Dimmer

```

#define PWM      12
volatile intptr_t *portPWM;
byte bitPWM;
portPWM = (volatile intptr_t *) portOutputRegister(digitalPinToPort(PWM));

```

```

bitPWM = digitalPinToBitMask(PWM);

pinMode(PWM, OUTPUT);
#if inputSerial

if (Serial.available())
{
int data = Serial.parseInt();
dutyCycle = setDutyCycle(data);
}

#else

// for (byte i = 50; i <= 100; i++)
// {
dutyCycle = setDutyCycle(WA1); //nilai ldr
delay(0);
// }
// for (byte i = 99; i != 20; i--)
// {
// dutyCycle = setDutyCycle(i);
// delay(20);
// }

#endif

}

uint16_t setDutyCycle(uint8_t dutyCycle)
{
return maxDutyCycle - (1.0 * dutyCycle / 100 * (maxDutyCycle - 1)) + 1;
}

```



```

#if defined(__AVR_ATmega328P__)
# if ((ZCD >= 0) & (ZCD <= 7))
ISR (PCINT2_vect)
# elif ((ZCD >= 8) & (ZCD <= 13))
ISR (PCINT0_vect)
# elif ((ZCD >= 14) & (ZCD <= 19))
ISR (PCINT1_vect)
# endif
#elif defined(__AVR_ATmega2560__)
# if ((ZCD >= 50) & (ZCD <= 53)) || ((ZCD >= 10) & (ZCD <= 13))
ISR (PCINT0_vect)
# elif ((ZCD >= 14) & (ZCD <= 15))
ISR (PCINT1_vect)
# elif ((ZCD >= A8) & (ZCD <= A15))
ISR (PCINT2_vect)
# endif
#endif
{
  OCR2B = dutyCycle;
  TCNT2 = 0;
}

ISR (TIMER2_COMPB_vect)
{
  *portPWM |= bitPWM;
  delayMicroseconds(30);
  *portPWM &= ~bitPWM;
}

```

Kode Program 4.3 Program Ac Light Dimmer

Source Code Smart Light System

```
#define PWM      12
#define ZCD      5 // A0 = 14, A5 = 19
#define frekuensi 50 //50 Hz
#define inputSerial 0

byte ldr1= A0;
byte ldr2= A1;
int nilaildr1;
int nilaildr2;

float gelap,gelap1,sedang,sedang1,terang, terang1; //LDR1
float gelapp,gelapp1,sedangg,sedangg1,terangg,terangg1; //LDR1
float a1,a2,a3,a4,a5,a6,a7,a8,a9;
float z1,z2,z3,z4,z5,z6,z7,z8,z9;
float atas,bawah;
byte WA,WA1;

int trig= 6; // membuat varibel trig yang di set ke-pin 3
int echo= 7; // membuat variabel echo yang di set ke-pin 2
long durasi, jarak; // membuat variabel durasi dan jarak

volatile uint16_t dutyCycle;
#define maxDutyCycle ((16000000L / (2 * 1024L * frekuensi)) - 1)

volatile intptr_t *portPWM;
byte bitPWM;

void setup() {
  Serial.begin(9600);
  pinMode(trig, OUTPUT); // set pin trig menjadi OUTPUT
```

```

pinMode(echo, INPUT); // set pin echo menjadi INPUT
//Serial.println(dutyCycle);

TCCR2A = _BV(WGM21);
TCCR2B = _BV(CS22) | _BV(CS21) | _BV(CS20);
OCR2A = maxDutyCycle;
OCR2B = setDutyCycle(0);
TIMSK2 = _BV(OCIE2B);

*digitalPinToPCMSK(ZCD) |= bit (digitalPinToPCMSKbit(ZCD));
PCIFR |= bit (digitalPinToPCICRbit(ZCD));
PCICR |= bit (digitalPinToPCICRbit(ZCD));

portPWM = (volatile intptr_t *) portOutputRegister(digitalPinToPort(PWM));
bitPWM = digitalPinToBitMask(PWM);

pinMode(PWM, OUTPUT);
}

void loop() {
  nilaildr1= analogRead(ldr1);
  Serial.println("----- Input -----");
  Serial.print("Nilai LDR 1: ");
  Serial.println(nilaildr1);

  nilaildr2= analogRead(ldr2);
  Serial.print("Nilai LDR 2: ");
  Serial.println(nilaildr2);

  //Fuziikasi MiU LDR1
  if (nilaildr1 <= 10){

```

```

gelap = 1;
sedang = 0;
terang = 0;
}else if (nilaidr1 >= 80){
    gelap = 0;
    sedang = 0;
    terang = 1;
}else if (nilaidr1 == 40){
    gelap = 0;
    sedang = 1;
    terang = 0;
}else if (nilaidr1 > 10 && nilaidr1<40){
    gelap1 = (40-nilaidr1);
    gelap=(gelap1/30);
    sedang1 = (nilaidr1-10);
    sedang=(sedang1/30);
    terang = 0;
}
else if (nilaidr1 > 40 && nilaidr1<80){
    gelap=0;
    sedang1 = (80-nilaidr1);
    sedang=(sedang1/40);
    terang1 = (nilaidr1-40);
    terang = (terang1/40);
}
Serial.println("----- FUZZYFIKASI -----");
Serial.println("LDR 1 =");
Serial.print("  μ Gelap : ");
Serial.println(gelap);
Serial.print("  μ Sedang : ");
Serial.println(sedang);

```

```
Serial.print("  μ Terang : ");
Serial.println(terang);

//Fuziikasi MiU LDR2
if (nilaidr2 <= 10){
    gelapp = 1;
    sedangg = 0;
    terangg = 0;
}else if (nilaidr2 >= 80){
    gelapp = 0;
    sedangg = 0;
    terangg = 1;
}else if (nilaidr2 == 40){
    gelapp = 0;
    sedangg = 1;
    terangg = 0;
}else if (nilaidr2 > 10 && nilaidr2<40){
    gelapp1 = (40-nilaidr2);
    gelapp=(gelapp1/30);
    sedangg1 = (nilaidr2-10);
    sedangg=(sedangg1/30);
    terangg = 0;
}
else if (nilaidr2 > 40 && nilaidr2<80){
    gelapp=0;
    sedangg1 = (80-nilaidr2);
    sedangg=(sedangg1/40);
    terangg1 = (nilaidr2-40);
    terangg = (terangg1/40);
}
Serial.println("LDR 2 =");
```

```
Serial.print("  μ Gelap : ");
Serial.println(gelapp);
Serial.print("  μ Sedang : ");
Serial.println(sedangg);
Serial.print("  μ Terang : ");
Serial.println(terangg);

//Inferensi
Serial.println("----- INFERENSI -----");
a1=(min(terang,terangg));
z1=(10);
Serial.print("a1 : ");
Serial.print(a1);
Serial.print(" || z1 : ");
Serial.println(z1);

a2=(min(terang,sedangg));
z2=(10);
Serial.print("a2 : ");
Serial.print(a2);
Serial.print(" || z2 : ");
Serial.println(z2);

a3=(min(terang,gelapp));
z3=(100);
Serial.print("a3 : ");
Serial.print(a3);
Serial.print(" || z3 : ");
Serial.println(z3);

a4=(min(sedang,terangg));
```

```
z4=(10);
Serial.print("a4 : ");
Serial.print(a4);
Serial.print(" || z4 : ");
Serial.println(z4);

a5=(min(sedang,sedangg));
z5=(100);
Serial.print("a5 : ");
Serial.print(a5);
Serial.print(" || z5 : ");
Serial.println(z5);

a6=(min(sedang,gelapp));
z6=(200);
Serial.print("a6 : ");
Serial.print(a6);
Serial.print(" || z6 : ");
Serial.println(z6);

a7=(min(gelap,terangg));
z7=(100);
Serial.print("a7 : ");
Serial.print(a7);
Serial.print(" || z7 : ");
Serial.println(z7);

a8=(min(gelap,sedangg));
z8=(200);
Serial.print("a8 : ");
Serial.print(a8);
```

```

Serial.print(" || z8 : ");
Serial.println(z8);

a9=(min(gelap,gelapp));
z9=(200);
Serial.print("a9 : ");
Serial.print(a9);
Serial.print(" || z9 : ");
Serial.println(z9);

//Defuzzifikasi
Serial.println("----- DEFUZZYFIKASI -----");

atas=((a1*z1)+(a2*z2)+(a3*z3)+(a4*z4)+(a5*z5)+(a6*z6)+(a7*z7)+(a8*z8)+(
a9*z9));
bawah=(a1+a2+a3+a4+a5+a6+a7+a8+a9);
WA=(atas/bawah);

Serial.print("Nilai WA = ");
Serial.println(WA);

//Ultrasonic
digitalWrite(trig, LOW);
delayMicroseconds(10);
digitalWrite(trig, HIGH);
delayMicroseconds(10);
digitalWrite(trig, LOW);
delayMicroseconds(10);

durasi= pulseIn(echo, HIGH); // menerima suara ultrasonic
jarak= (durasi/2) / 29.1; // mengubah durasi menjadi jarak (cm)

```



```

if (jarak >= 25){
    WA1=(WA/4);
    Serial.println("Tidak ada kendaraan yang melintas");
}else if(jarak<=24){
    WA1=(WA/2);
    Serial.println("Terdapat kendaraan yang melintas");
//delay(500);
}
//Serial.print(jarak); // menampilkan jarak pada Serial Monitor
//Serial.println(" CM");
delay(0);

//Akhir ultrasonik

#if inputSerial

if (Serial.available())
{
    int data = Serial.parseInt();
    dutyCycle = setDutyCycle(data);
}

#else

// for (byte i = 50; i <= 100; i++)
// {
    dutyCycle = setDutyCycle(WA1); //nilai ldr
    delay(0);
// }
// for (byte i = 99; i != 20; i--)
// {

```

```

//  dutyCycle = setDutyCycle(i);
//  delay(20);
//  }

#endif
}
uint16_t setDutyCycle(uint8_t dutyCycle)
{
    return maxDutyCycle - (1.0 * dutyCycle / 100 * (maxDutyCycle - 1)) + 1;
}
#if defined(__AVR_ATmega328P__)
# if ((ZCD >= 0) & (ZCD <= 7))
ISR (PCINT2_vect)
# elif ((ZCD >= 8) & (ZCD <= 13))
ISR (PCINT0_vect)
# elif ((ZCD >= 14) & (ZCD <= 19))
ISR (PCINT1_vect)
# endif
#elif defined(__AVR_ATmega2560__)
# if ((ZCD >= 50) & (ZCD <= 53)) || ((ZCD >= 10) & (ZCD <= 13))
ISR (PCINT0_vect)
# elif ((ZCD >= 14) & (ZCD <= 15))
ISR (PCINT1_vect)
# elif ((ZCD >= A8) & (ZCD <= A15))
ISR (PCINT2_vect)
# endif
#endif
{
    OCR2B = dutyCycle;
    TCNT2 = 0;
}

```

```
ISR (TIMER2_COMPB_vect)
```

```
{  
  *portPWM |= bitPWM;  
  delayMicroseconds(30);  
  *portPWM &= ~bitPWM;  
}
```

Kode Program 4.5 Program Keseluruhan

