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**Research Article**

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# Data transfer by laser beam light using parallel connection method

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**Abstract** In this paper we will discuss data transfer by using laser beam light .In general we have two methods of data transmission the first method that we will discuss and it called "Parallel method " the second one we will writing on it by the next paper it is called " series method " the general different between the two methods are the accuracy and the time to transmission the data. In this paper we will design and implementation of sending and receiving system by using parallel method.

**Keywords** laser communication, arduino with laser, laser light

## Introduction

Communication is transmission, reception, and processing of information using electronic circuits. Information is defined as knowledge can be in an analog form (continuous) such as human voice, video picture information, or in digital form (discrete steps) such as binary – coded numbers, alpha numeric codes, graphics symbols, microprocessor op-codes, or data base in information.

All the information must be converted to electromagnetic energy before it can be propagated through an electronic communication system. Fig (1) is a simplified block diagram of an electronic communication system

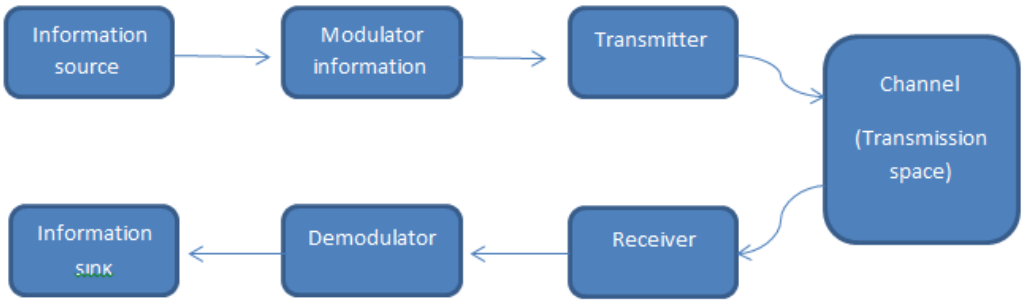


*Figure 1: block diagram of an electronic communication system*

Optical communication is one of the most promising ways to achieve highest receiver sensitivity, excellent spectral efficiency and longest transmission distance for next generation of optical communication system .

Communication underwater is very challenging. Unlike terrestrial communication links, radio frequencies and microwaves do not propagate through water. Acoustics communication links have been of keen interest for underwater applications in the past few decades, but provide limited bandwidth.

Laser based communication using blue-green lasers is a potential technique for high bandwidth underwater wireless communication because of its high data transfer rate, reasonably large range, small size, low power consumption, immunity to interference and jamming and covertness of transmission. Underwater communication system using blue, green laser may be used for transmitting any type of file (Video, Audio, PPT, DOC, PDF and EXE) from one platform to the other.

In this paper, red laser will be used for transmission a text message from one pc to other in free space.

**Experimental Work**

The completed system consists of two parts, first part capable of simultaneously transmitting information (transmitter). Second part is able to receive transmitted signals (receiver).The electronic circuits of the system is express in figs. (2) and (3).

The first part (transmitter) is an electronic circuit made by using laser diode, arduinonano.

The circuit is connected to PC by the usbcable as shown in fig. (2)

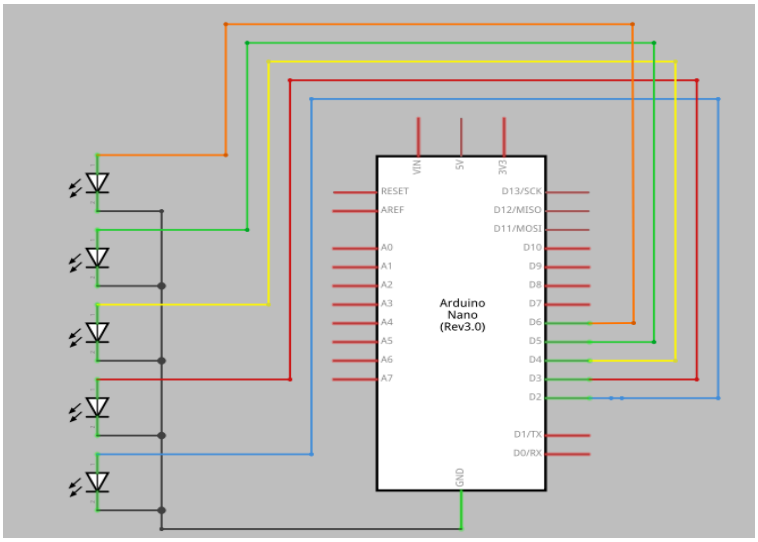


*Figure 2: The Transmitter Circuit*

The second part (receiver) is an electronic circuit. It is made of photodiode (as detector), arduinonano, resistors, and usb cable to connect the circuit with PC shown in fig. (3)

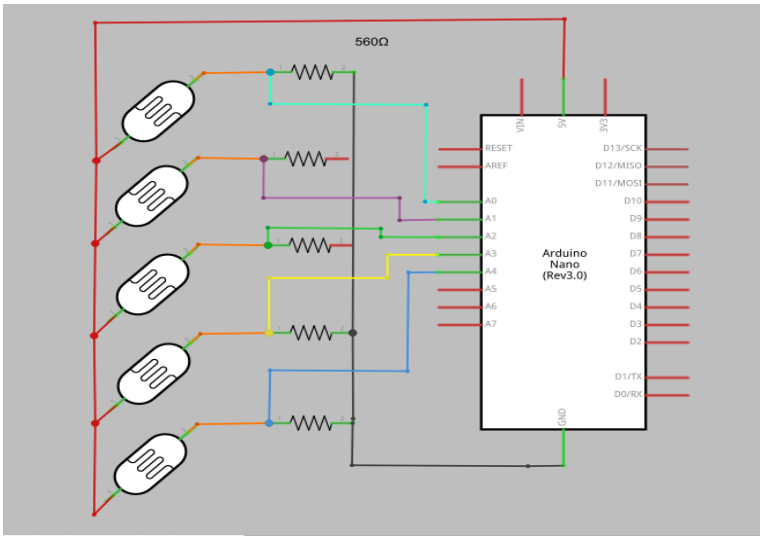


*Figure 3: The Receiver Circuit*

The data are sent via the serial port (usb cable) standard interface with a bit rate of 9600 Kbps from PC1 arduino to convert the data into TTL level (0/5 V) as a pulse. The intensity modulation on/off keying was the way to modulate this data using laser diodes that have 650nm wavelength. This laser source is used to convert the encoded data from electrical levels into output optical power levels transmitting through free space.

Laser as a communications medium has some unique properties compared to other forms of media. A line-of-sight laser beam is useful where wires cannot be physically connected to a remote location. A laser beam, unlike wires, also does not require special shielding over longer distances.

At the receiver side there is an optical receiver circuit which receives data using a photo diode and arduinonano used to convert the TTL levels (0/5 V) to data again.

**The sender code**

laser_sender

```
int ledArray [28][6] = {
  {'a',0,0,0,0,1},//a
  {'b',0,0,0,1,0},//b
  {'c',0,0,0,1,1},//c
  {'d',0,0,1,0,0},//d
  {'e',0,0,1,0,1},//e
  {'f',0,0,1,1,0},//f
  {'g',0,0,1,1,1},//g
  {'h',0,1,0,0,0},//h
  {'i',0,1,0,0,1},//i
  {'j',0,1,0,1,0},//j
  {'k',0,1,1,0,0},//k
  {'l',0,1,1,0,1},//l
  {'m',0,1,1,1,0},//m
  {'n',0,1,1,1,1},//n
  {'o',1,0,0,0,0},//o
  {'p',1,0,0,0,1},//p
  {'q',1,0,0,1,0},//q
  {'r',1,0,0,1,1},//r
  {'s',1,0,1,0,0},//s
  {'t',1,0,1,0,1},//t
  {'u',1,0,1,1,0},//u
  {'v',1,0,1,1,1},//v
  {'w',1,1,0,0,0},//w
  {'x',1,1,0,0,1},//x
  {'y',1,1,0,1,0},//y
  {'z',1,1,0,1,1},//z
  {' ',1,1,1,0,0},//space
  };
double ledRate = 50;
int lightUp[6]= {0,0,0,0,0,0};


void setup(){

  Serial.begin(9600);
  Serial.print("---");
  Serial.print("Transmitter is active");
  Serial.print("---");Serial.println();
  pinMode(12, OUTPUT);
  pinMode(11, OUTPUT);
  pinMode(10, OUTPUT);
  pinMode(9, OUTPUT);
  pinMode(8, OUTPUT);

  Serial.print("---");
  Serial.print("System test completed");
  Serial.print("---");Serial.println();
  Serial.println();

}
```

```
void loop()
{
  pinMode(12, OUTPUT);
  pinMode(11, OUTPUT);
  pinMode(10, OUTPUT);
  pinMode(9, OUTPUT);
  pinMode(8, OUTPUT);
  Serial.print("Waiting for message now:");
  Serial.println();
  while(Serial.available()==0){}
  String message = Serial.readString();
  Serial.print("Transmitting now:");
  Serial.println();Serial.println();
  //Message Breakdown
  int messageSize=message.length()-1;
  char messageBreakdown[100];
  for (int i=0;i<=messageSize;i++) {
  messageBreakdown[i]=message[i];
  Serial.print(messageBreakdown[i]);
  Serial.print(" ");
  for(int j=0;j <= 26; j++){
  if (messageBreakdown[i] == ledArray[j][0]){
  for(int k = 1;k<6;k++){
  lightUp[k]= ledArray[j][k];
  if (k == 5){
  if(lightUp[1] == 1){digitalWrite(8, HIGH);}
  else{digitalWrite(8, LOW);}
 if(lightUp[2] == 1){digitalWrite(9, HIGH);}else{digitalWrite(9, LOW);}
if(lightUp[3] == 1){digitalWrite(10, HIGH);}else{digitalWrite(10, LOW);}
if(lightUp[4] == 1){digitalWrite(11, HIGH);}else{digitalWrite(11, LOW);}
if(lightUp[5] == 1){digitalWrite(12, HIGH);}else{digitalWrite(12, LOW);}
 delay(50);}  }break; }  }
 digitalWrite(8, LOW);
 digitalWrite(9, LOW);
 digitalWrite(10, LOW);
 digitalWrite(11, LOW);
 digitalWrite(12, LOW);
 delay(50);     }
   digitalWrite(8, HIGH);
   digitalWrite(9, HIGH);
   digitalWrite(10, HIGH);
   digitalWrite(11, HIGH);
   digitalWrite(12, HIGH);
   delay(ledRate);
   digitalWrite(8, LOW);
   digitalWrite(9, LOW);
   digitalWrite(10, LOW);
   digitalWrite(11, LOW);
   digitalWrite(12, LOW);
   Serial.println();Serial.println();
}
```

**The receiver code**

laser_reciever_rx §

```
int ledArray [29][6] = {
   {'a',0,0,0,0,1},//a
   {'b',0,0,0,1,0},//b
   {'c',0,0,0,1,1},//c
   {'d',0,0,1,0,0},//d
   {'e',0,0,1,0,1},//e
   {'f',0,0,1,1,0},//f
   {'g',0,0,1,1,1},//g
   {'h',0,1,0,0,0},//h
   {'i',0,1,0,0,1},//i
   {'j',0,1,0,1,0},//j
   {'k',0,1,1,0,0},//k
   {'l',0,1,1,0,1},//l
   {'m',0,1,1,1,0},//m
   {'n',0,1,1,1,1},//n
   {'o',1,0,0,0,0},//o
   {'p',1,0,0,0,1},//p
   {'q',1,0,0,1,0},//q
   {'r',1,0,0,1,1},//r
   {'s',1,0,1,0,0},//s
   {'t',1,0,1,0,1},//t
   {'u',1,0,1,1,0},//u
   {'v',1,0,1,1,1},//v
   {'w',1,1,0,0,0},//w
   {'x',1,1,0,0,1},//x
   {'y',1,1,0,1,0},//y
   {'z',1,1,0,1,1},//z
  {' ',1,1,1,0,0},//space
  {'.',1,1,1,0,1},//new char
  {'/',1,1,1,1,1},//skip
  };

  double cycleRate = 50;
  int sensorInput[6]= {0,0,0,0,0,0};
  int sensorPins[6] = {0,1,2,3,4,5};

void setup(){

  Serial.begin(9600);
  Serial.print("---");Serial.print("Receiver is active");
  Serial.print("---");Serial.println();
  Serial.print("---");Serial.println();
  //delay(1500);
  Serial.print("---");Serial.print("System test completed");
  Serial.print("---");Serial.println();Serial.println();

}

  int threshold[6] = {750,750,750,750,750,750};
  int fire = 0;
```

```
void loop(){
  fire = 0;
  for(int i=1;i<6;i++){
   fire = fire + analogRead(sensorPins[i]);
  }

  if(fire > 150);{
  //set array "sensorInput" == to the active pins
  for(int i=1;i<6;i++){
     if (analogRead(sensorPins[i]) > threshold[i]){
      sensorInput[i] = 1;
     }else{
      sensorInput[i] = 0;
     }
  }


  for(int i=0;i<29;i++){//vertical
    for(int j=1;j<6;j++){//horizontal
      if (ledArray[i][j] == sensorInput[j]){
        if(j == 5){
          if(ledArray[i][0]=='/'){
            Serial.println("");
          }else{
            Serial.print(char(ledArray[i][0]));
          }
          break;

        }
      }else{
        break;
      }
    }
  }
  delay(cycleRate);
  }

  delay(5);
}
```

**Discussion**

In this paper and in our experimental work we see that the best with a bit rate of 9600 Kbps from PC1 to the micro controller and the same bit rate from the receiver to the PC2 for this number of laser, we used five laser diode in the transmitter and five LDR as receiver, and we find that the accuracy and speed of transmission depend on the number of this laser diode but when we raise the number of laser beam the device will consume more power, larger microcontroller and more space. The result of transmitter data via space is perfect and it approximate to 90% and we use it to transmitter via water and it done. These properties give this technique preference in data transfer via water.

**References**

[1]. Wayne Tomasi, "Electronic communications system fundamental through advanced", Pentice Hall Career &Technology , 2nd edition, 1994

[2]. S. Y. Al-Dabagh, H. J. Kbashi, H. A. Hameed, "Implementation of optical coherent communication system between two computers", Baghdad Science Journal, Vol.7(1), 2010.

[3]. Jared Scott Everett, "Forward-Error Correction Coding for Underwater Free-Space Optical Communication", Master thesis, North Carolina 2009.

[4]. B. Woodward &H. Sari "Underwater speech communication with a modulated laser", Appl. Phys. B 91, pp.189-194 , 2008.

[5]. Ziad T. Al Dahan, Samar Y. Al Dabagh and Asmahan Assad. "Design and Implementation of Under Water Optical Communication System. IJAIEM. Volume 2, Issue 6, June 2013.