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Light Intensity PWM Design as a Tool to Attract Fish in Microcontroller-Based Stationary Lift Net

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Abstract:.*Fishermen looking for fish in stationary lift net usually need a tool in the form of light. The types of light they use may come from neon, mercury, a pressurized kerosene lamp, and, which is commonly used, an LED. Fishermen who use LEDs as a tool to gather or attract fish use either one color of light only or more. As to switch the light off, some use an ON/OFF switch, some use a dimmer, and the rest use the PWM technique with a microcontroller. This research aimed to develop a PWM signal using a microcontroller by carrying out an experiment making a PWM program on the Arduino Uno microcontroller, a trial on the input using the push button switch and an LED as the indicator, a trial on the input using a 2X16 LCD as the indicator, and a trial on the output of the PWM program using an osciloscope as the indicator. The significance of this research includes, first, it develops a varied PWM signal program for three LED colors, which can be used to engineer a microcontroller to adjust the intensity of LED light as a tool to attract fish in stationary lift net-aided fishing. Second, it makes it easier for fishermen using stationaty lift net to instal and use LED light-aided tools. Third, the PWM regulator for LEDs helps reduce fish-catching operational costs and it is easy to use.*
Keywords*: PWM technique, Stationary Lift Net, LED regulator, microcontroller, dimmer.*

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I. Introduction

Pulse Width Modulation (PWM) can be used to generate or modify sinusoidal wave [1,2] to control [3], modify characteristics of a generator [4, 5], actuate and adjust induction motors [6, 3], minimize total harmonic distortion, and increase the output voltage on the inverter [7], compensate for magnetization surge currents on the transformer [8, 9], function as a switch [10], second harmonic injection [11], engineer and adjust LED lighting for net-aided fishing [12].

Light Intensity is necessary for stationary lift net-aided fishing, as a tool to attract or collect fish, or to identify fish behavior patterns [13]related to light-aided fishing [13, 14, 16,15, 17], LED engineering on net [19], and the effect of light on the catch [18, 19].

Microcontrollers were used as a tool to process the program, control wind energy [22] function as Automatic Fish Feeders [23], adjust the frequency meter [24], the design stage, analysis and testing, the fishing prototype can do the fishing automatically making it easier for fisherman to do their job [25], the design & implementation of "Intelligent Aqua-tronix" which deals with the automationof fish pond and fish tank by effective utilization of electronic technology to maintain fish health, reduce labor work and enhance fish production [26], design smart water heaters [27]Smart Wheeled Robotic (SWR) as well as a tool that is able to automatically avoid obstacles [28].

This research aimed to generate a PWM signal using a microcontroller, i.e.: 1). an experiment to develop a PWM program on the Arduino Uno microcontroller, 2). a trial on the pulse-supplying input of the push button switch using an LED as the indicator, 3) a trial on the input using a 2X16 LCD as the indicator, and 4) a trial on the output of the PWM program using an osciloscope as the indicator. This research generated novelty in terms of PWM combination used to produce LED light colors, especially by generating color spectrums to attract fish in stationary lift net-aided fishing.

The significance of this research includes, first, it develops a PWM program that can be used to engineer a microcontroller to adjust the intensity of LED light as a tool to attract fish in stationary lift net-aided fishing. Second, it makes it easier for fishermen using stationaty lift net to use LED light-aided tools. Third, the PWM regulator for LEDs helps reduce fish-catching operational costs and it is easy to use.

II. Materials And Methods

Tools and Materials

Table 1. Tools and Materials

Tools	**Function**
Power Supply	Voltage source of the circuit
Osciloscope	See PWM output
Microcontroler Arduino Uno	Language C program processor tool
Push Button Switch	Input of Pulse
LED	Indicator of Pulse Output
Project Board	to put components
Kabel Jumper	Connection between components
Software	**Function**
Arduino Ide	Making of program
Proteus	Design of circuit and PCB

III. Research Method

This research employed the method of laboratory experiments, especially by developing a program using C Language with software Arduino IDE, preparing the arrangement using software Proteus, and testing out the program and arrangement in terms of their input, process, and output using an LED, LCD, and Osciloscope as the indicators.

a. Experiment to develop a program for the Arduino Uno microcontroller
b. Trial on the pulse-supplying input of the push button switch using an LED as the indicator
c. Trial on the input using a 2X16 LCD as the indicator
d. Trial on the output of the PWM program using an osciloscope as the indicator

IV. Block Diagram

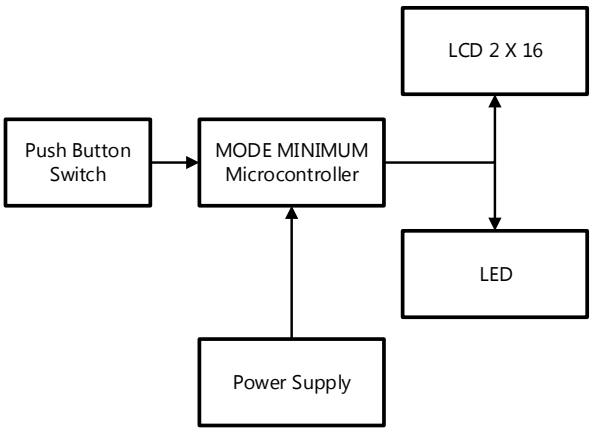

Figure 1. Block Diagram Illustrating the Design of Light Intensity

As illustrated in the block diagram above, overall, the arrangement consisted of the input, process, and output, i.e. the Push Button Switch as the input, the microcontroller as the processor and LCD, and the LED as an indicator for the PWM signal output. The part that received power supply or voltage was the microcontroller, which amounted to 9 Volt DC while voltage for the input and output was taken from the output voltage of the Arduino uno microcontroller, i.e. by 5 Volt DC.

Hardware Design

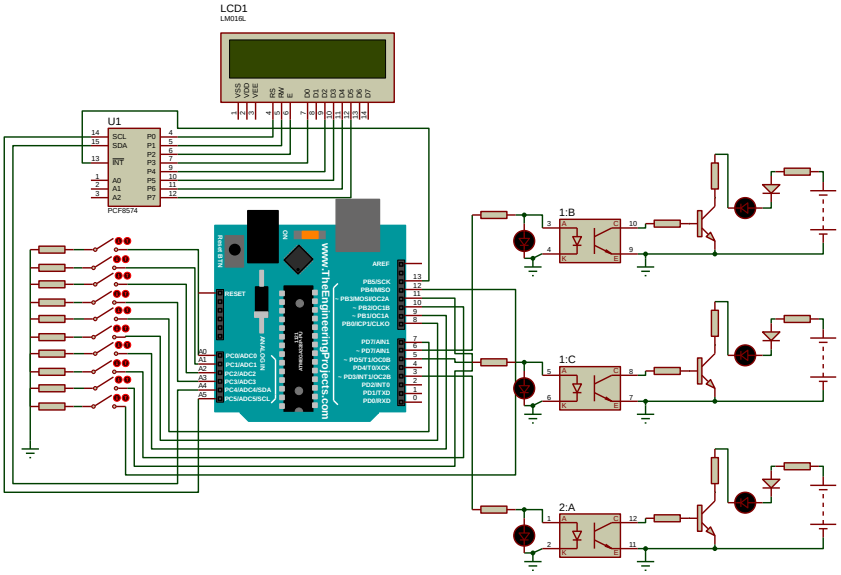

Figure 2. PWM Arrangement Design

This hardware design was developed to carry out a simulation before developing the actual arrangement. Using the right arrangement that had been proved during the simulation will enable the arrangement to work with only a very small level of error, thus the percentage for the actual arrangement develop to be successfully work normally may reach 99%. This arrangement design can measure input using an LED and LCD as indicators and measure output using a digital oscilloscope as the indicator.

Software Design

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```
void setup(){
pinMode (led1, OUTPUT);
pinMode (led2, OUTPUT);
pinMode (led3, OUTPUT);
pinMode (up1, INPUT_PULLUP);
pinMode (down1, INPUT_PULLUP);
pinMode (up2, INPUT_PULLUP);
pinMode (down2, INPUT_PULLUP);
pinMode (up3, INPUT_PULLUP);
pinMode (down3, INPUT_PULLUP);
pinMode (up4, INPUT_PULLUP);
pinMode (down4, INPUT_PULLUP);
pinMode (up5, INPUT_PULLUP);
pinMode (down5, INPUT_PULLUP);
Serial.begin(9600);
  lcd.begin (20,4); //LCD untuk ukuran 16x2
  lcd.setCursor(0, 0); //baris pertama
  lcd.print("led1  led2  led3");
  lcd.setCursor(5, 1); //baris kedua
  lcd.print("READY");
  delay(500);
   lcd.setCursor(5, 1); //baris kedua
  lcd.print("     ");
}
```

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```
void loop(){

  if ((!digitalRead(up1))&&(pbup1==false)&&(val1<250))
   val1=val1+5;
   Serial.print("led1 :");
   Serial.println(val1);
   pbup1=true;
   delay(5);
  }
  if ((!digitalRead(down1))&&(pbdown1==false)&&(val1>0))
   val1=val1-5;
  Serial.print("led1 : ");
  Serial.println(val1);
  lcd.clear();
  lcd.setCursor(0,1);
   pbdown1=true;
   delay(5);
  }
   if(digitalRead(up1)){
     pbup1=false;
     delay(5);
}
 if(digitalRead(down1)){
pbdown1=false;
 delay(5);
```

a) Input and output program b) RGB process program for switching on and off

Figure 3. PWM Software Design

Figure 3 illustrates a program design using C Language with software Arduino IDE. Part a) constitutes the program to determine the input and output used on the Arduino unomicrocontrollerpin while part b) is the programto examine the way an LED is switched ON or OFF at each PWM step. Using this work program, the LED can be switched ON and OFF freely, where each LED can be combined with other LEDs forming a combination with either two LEDs or three LEDs.

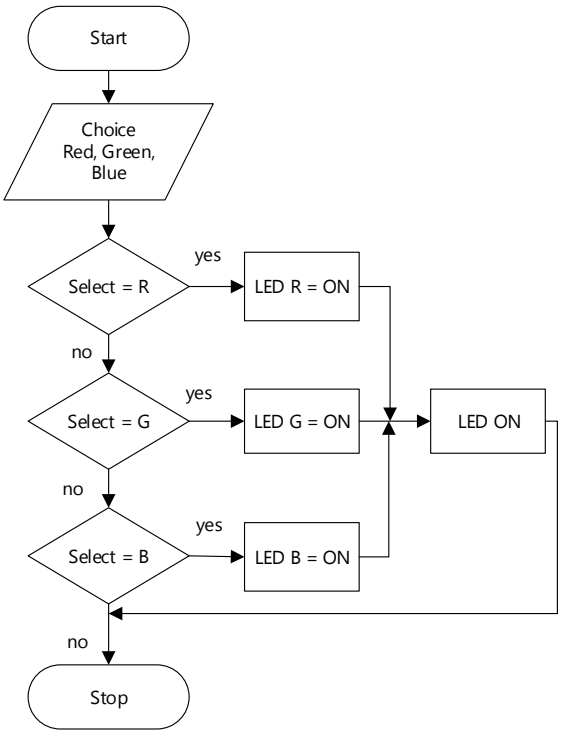

Figure 4. Flowchart on How to Switch the RGB LED on

In Figure 4, the flowchart shows that LEDs will be switched on if there are data given to each LED. The data in this program were R or red, G or green, and B or blue. If the data are in the forms of R, G, and B options, the RGB LED will light up, if it receives only one data, two data or three data, it will light up according to the incoming data.

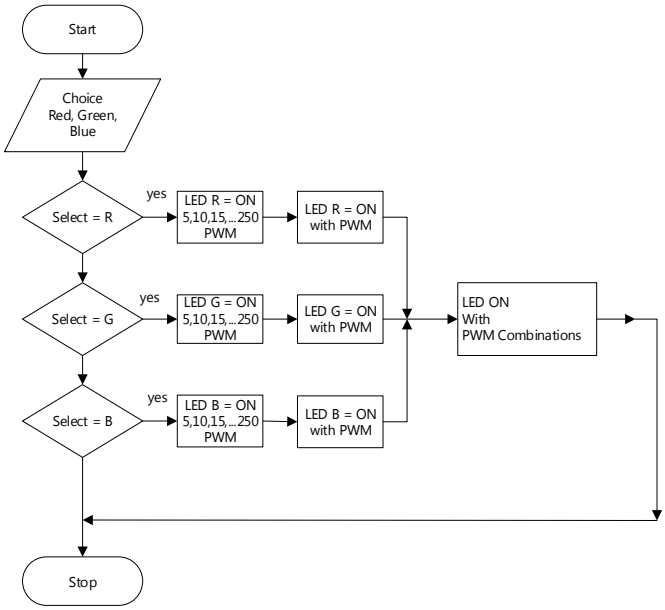

Figure 5. Flowchart on the Way the LED with PWM Combination Works

In Figure 5, the flowchart illustrates the process to switch LEDs on using various PWM combinations from Red, Green, and Blue LEDs. First, press the push button switch of the Red LED selection button with 5 PWM, then data will be received by the micro and it will turn on the Red LED with light intensity compatible with 5 PWM. Second, press the push button switch of the Green LED selection button with 95 PWM, then data will be received by the micro and it will turn on the Green LED with light intensity compatible with 95 PWM. Third, press the push button switch of the Blue LED selection button with 200 PWM, then data will be received by the micro and it will turn on the Blue LED with light intensity compatible with 200 PWM. From the process

above, it is revealed that data for the red, green, and blue LEDs are equal to 5 PWM, 95 PWM, and 200 PWM, respectively. As a result, the LED color switched on depends on the size of each PWM.
LED Light can be switched on using various PWM combinations. In this case, the light produced can be adjusted to the target fish to be caught using stationary lift net-aided fishing.

Data Collection
In this research, the data were collected by conducting a PWM experiment by testing out the software and hardware developed, which means that it did not perform any statistical analysis.

V. Results And Discussion

The design developed is presented in Figure 6 below. Figure a is the hardware input with 10 Push Button Switches, Figure b is part of the processor, i.e. the Arduino uno microcontroller, Figure c is the output section consisting of three LEDs (red, green, and blue), and Figure d is the output section, i.e. a 2X16 LCD

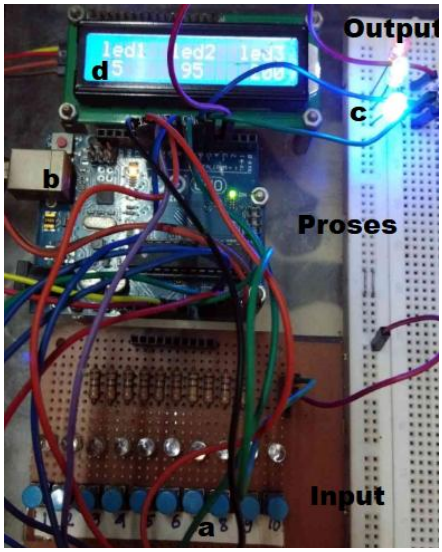

Figure 6. PWM-Regulating Hardware

Testing results for the input section, i.e. PWM Pulse Supplier, Push Button Switch as the primary tool with Red, Green, and Blue LED Indicators.

Table 2. Testing Results for PWM Supply to HPL

Push Button Switchs		RED Lamp	GREEN Lamp	BLUE Lamp
1	ON	ON	ON	ON
2	OFF	OFF	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	OFF	OFF
5	ON	OFF	ON	OFF
6	OFF	OFF	OFF	OFF
7	ON	OFF	OFF	ON
8	OFF	OFF	OFF	OFF
9	ON	ON	ON	ON
10	OFF	OFF	OFF	OFF

Table 2 above presents testing results for PWM supply using the push button switch smoothly, which can be applied to all LEDs, either individually or in combination.

Testing results for the input section, i.e. PWM Pulse Supplier, Push Button Switch as the primary tool with an LCD as the indicator

Figure 7. Output indicator using an LCD

Figure 7 presents testing results for the input section using the push button switch with ab LCD as the indicator. It shows that LED1 represents the Red LED, LED2 represents the Green LED, and LED3 represents the Blue LED, with RGB PWM values equal to 5 PWM, 95 PWM, and 200 PWM, respectively.

Output Testing Of The Pwm Program Using A Monitoring Osciloscope

The PWM signal output testing are illustrated in Figures 8 and 9, i.e. PWM signals with 5-PWM Red LED, 95-PWM Green LED, and 200-PWM Blue LED with voltage of 5 Volts each and signal step of 0.1 milli second.

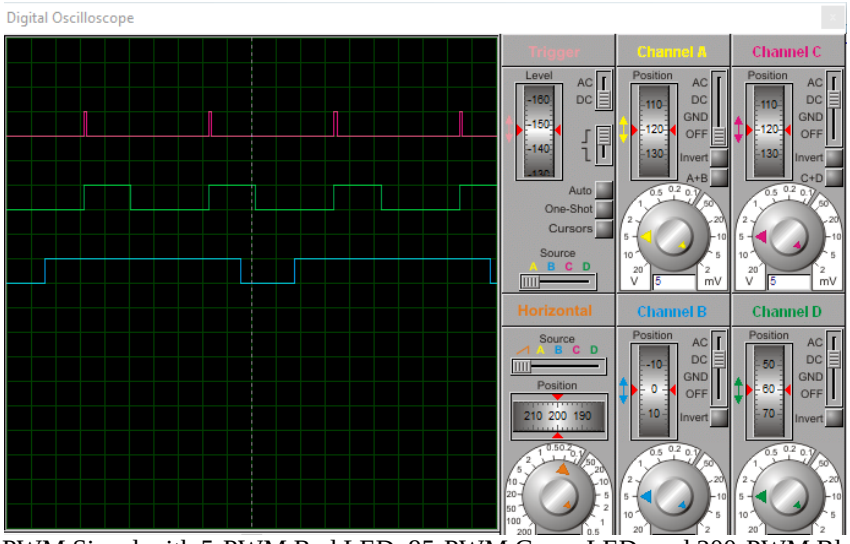

Figure 8. PWM Signal with 5-PWM Red LED, 95-PWM Green LED, and 200-PWM Blue LED

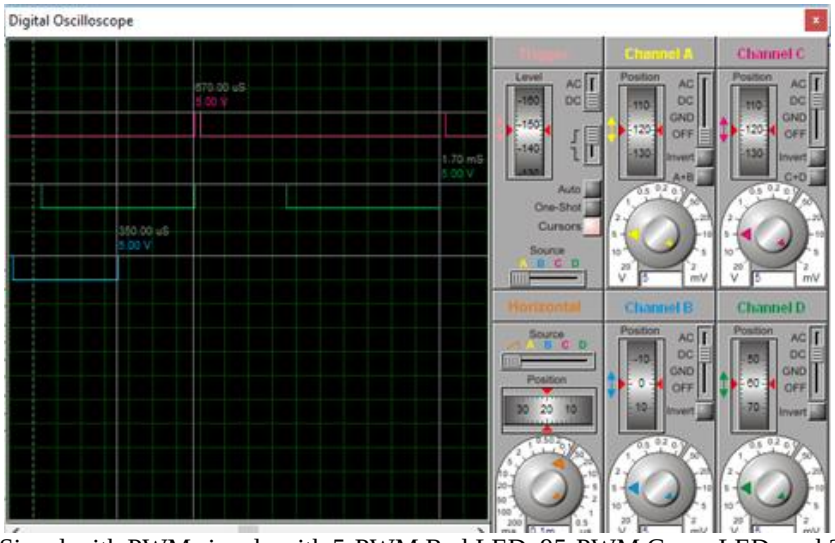

Figure 9. PWM Signal with PWM signals with 5-PWM Red LED, 95-PWM Green LED, and 200-PWM Blue LED with Voltage of 5 Volts Each and Signal Step of 0.1 Milli Second

Figures 8 and 9 illustrate the output of PWM signals generated using an oscilloscope, with the following values: Rred = 5 PWM, Green = 95 PWM, and Blue = 200 PWM, with each signal set at 5-Volt DC voltage and a step of 0.1 milli second.

Both figures show that all PWM signals of the red, green, and blue LEDs can be set from 0 PWM up to 250 PWM, and the colors can be combined according to the user's needs.

VI. Conclusion

The design of Light Intensity PWM as a tool to lure fish on microcontroller-based stationary lift net can work normally as expected based on the results of the experiment as follows: first, the program developed and installed on the Arduino uno microcontroller run normally, using C Language with software Arduino IDE; second, based on the trial on the input of the push button switch's pulse supplier with LEDs as the indicator, it is revealed that it worked normally; third, the trial on the input with a 2x16 LCD as the indicator run normally; and, fourth, the trial on the PWM program output with an osciloscope as the indicator worked normally. Therefore, this light intensity PWM design can be realized and developed into the real design, i.e. development of the PWM output containing a 4-Volt voltage with a step of 0.1 milli second, that van be supported by high power by increasing the voltage and current for large load, which is High Power 50 Watt LED.

This research, first, discovered a PWM signal program that can be used to design a microcontroller to adjust the light intensity of LEDs as a tool to lure fish in stationary lift net-aided fishing. Second, it makes it easier for fishermen using stationaty lift net to instal and use LED light-aided tools. Third, the PWM regulator for LEDs helps reduce fish-catching operational costs and it is easy to use.

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References

[1]. A. A. Qazalbash, A. Amin, A. Manan, and M. Khalid, "Design and implementation of microcontroller based PWM technique for sine wave inverter," POWERENG 2009 - 2nd Int. Conf. Power Eng. Energy Electr. Drives Proc., pp. 163–167, 2009.
[2]. T. D. Sudhakar and K. N. Srinivas, "Grid-connected inverter using fused converters," vol. 8, no. 1, pp. 68–85, 2016.
[3]. V. Vidhya and L. Parimala, "DESIGN OF FPEZ-SOURCE NETWORK WITH REDUCED SWITCHES FED INDUCTION MOTOR," Int. J. Adv. Sci. Tech. Res., vol. 2, no. 6, pp. 314–317, 2016.
[4]. A. Hakim, "Karakterisasi Unjuk Kerja Generator Gas HHO Tipe Dry Cell dengan Elektroda Titanium dan Penambahan PWM," J. Tek. ITS, vol. 1, no. 1, pp. 1–6, 2016.
[5]. L. Xiong et al., "Static Synchronous Generator Model: A New Perspective to Investigate Dynamic Characteristics and Stability Issues of Grid-Tied PWM Inverter," IEEE Trans. Power Electron., vol. 31, no. 9, pp. 6264–6280, 2016.
[6]. S. Ogasawara, M. Fujikawa, and H. Akagi, "A PWM rectifier/inverter system capable of suppressing both harmonics and EMI," Electr. Eng. Japan (English Transl. Denki Gakkai Ronbunshi), vol. 141, no. 4, pp. 59–68, 2002.
[7]. S. S. Dash, P. Palanivel, and S. Premalatha, "Performance Analysis of Multilevel Inverters Using Variable Switching Frequency Carrier Based PWM Techniques," in International Conference on Renewable Energies and Power Quality, 2012, vol. 1, no. 10, pp. 32–37.
[8]. K. Shinohara, K. Yamamoto, K. Iimori, Y. Minari, O. Sakata, and M. Miyake, "Compensation for magnetizing inrush currents in transformers using a PWM inverter," Electr. Eng. Japan (English Transl. Denki Gakkai Ronbunshi), vol. 140, no. 2, pp. 53–64, 2002.
[9]. L. Svilainis, "Comparison of the EMI performance of LED PWM dimming techniques for LED video display application," IEEE/OSA J. Disp. Technol., vol. 8, no. 3, pp. 162–165, 2012.
[10]. M Sudhakaran, M. Sudhakaran, and R. Seyezhai, "A Review of Various Carrier Pwm Techniques for Trinary Cascaded Multilevel Inverter," Middle-East J. Sci. Res. Innov. Eng. Technol. Manag. Appl., vol. 24, pp. 81–89, 2016.
[11]. S. Mondal and S. Chowdhuri, "Design of efficient second harmonics injection based solar inverter for standalone application," Front. Comput. Commun. Electr. Eng., pp. 345–352, 2016.
[12]. A. Cahyadi and X. You, "Rekayasa LED Ikan Melalui Pengaturan Lumensi Cahaya Berbasis Perangkat Lunak Versi Betha Arrangement Of Led Lumen Based On Pulse Width Modulation (Pwm) Betha Version To Attract The Schooling Fish," pp. 119–125, 2017.
[13]. Haruna, "Distribusi Cahaya Lampu Dan Tingkah Laku Ikan Pada Proses Penangkapan Bagan Perahu Di Perairan Maluku Tengah," Amanisal " PSP FPIK Unpatti-Ambon, vol. 1, no. 1, pp. 22–29, 2010.
[14]. M. Sulaiman, P. Pertanian, and N. Pangkajene, "Studi Tingkah Laku Ikan pada Proses Penangkapan dengan Alat Bantu Cahaya : Suatu Pendekatan Akustik Studi Tingkah Laku Ikan pada Proses Penangkapan dengan Alat Bantu Cahaya : Suatu Pendekatan Akustik," ILMU Kelaut., vol. 11, no. 1, pp. 31–36, 2006.
[15]. Sudirman, Mulyono. S. Baskoro, A. Purbayanto, D. R. Monintja, and T. Arimoto, "Profil Pencahayaan Dan Distribusi Ikan Pada Areal Penangkapan Bagan Rambo Di Selat Makassar," in Seminar Nasional Perikanan Indonesia, 2003, vol. 3, pp. 1–16.
[16]. G. Gustaman and F. Isnaini, "Efektifitas Perbedaan Warna Cahaya Lampu terhadap Hasil Tangkapan Bagan Tancap di Perairan

Sungsang Sumatera Selatan," Maspari Journa, vol. 04, no. 2, pp. 92–102, 2012.
[17]. A. Susanto, "Pemetaan daerah perikanan lampu (light fishing) menggunakan data viirs day-night band di perairan Pandeglang Provinsi Banten water Banten Province," Depik, vol. 4, no. 2, pp. 69–78, 2016.
[18]. Sudirman, Mulyono.S.Baskoro, A. Purbayanto, D. R. Monintja, M.Jufri, and T. Arimoto, "Light Adaptation Process Of Retinal Russell`S Scad (Decapterus Ruselli) In Fishing Process Of Bagan Rambo In Makassar Strait," J. Ilmu-Ilmu Perair. dan Perikan. Indones., vol. 10, no. 2, pp. 85–92, 2003.
[19]. . Mawardi and M. S. Baskoro, "Rekayasa Lampu Led Celup Untuk Perikanan Bagan Apung Di Perairan Patek Kabupaten Aceh Jaya Propinsi Aceh (Submerged Led Lights Engineering for Liftnet Fisheries in Patek Waters Aceh Jaya District Aceh Province)," J. Teknol. Perikan. dan Kelaut., vol. 6, no. 1, pp. 51–67, 2015.
[20]. dan Yuli Andriani, "Pengaruh Perbedaan Warna Cahaya Lampu Terhadap Hasil Tangkapan Cumi-Cumi (Loligo spp) Pada Bagan Apung Di Perairan Palabuhanratu Kabupaten Sukabumi Jawa Barat," J. Perikan. Kelaut., vol. VI, no. 21, pp. 116–124, 2015.
[21]. M. J. Rudin, R. Irnawati, and A. Rahmawati, "Perbedaan Hasil Tangkapan Bagan Tancap dengan Menggunakan Lampu CFL dan LED Dalam Air (Leda) di Perairan Teluk Banten (Differences of Fixed Lift Net Catch Result by Using CFL Lamps and Underwater LED in Banten Bay Water)," J. Perikan. dan Kelaut., vol. 7, no. June, pp. 167–180, 2017.
[22]. K. O. Lin, H. M. Tun, Z. M. Naing, and W. K. Moe, "Microcontroller Based SPWM Single-Phase Inverter For Wind Power Application," vol. 6, no. 04, pp. 4–7, 2017.
[23]. A. S. Lehman, J. Sanjaya, J. Prof, and M. P. H. N. Bandung, "Automatic Fish Feeder Using Microcontroller," Semin. Nas. Teknol. Informasi, Komun. dan Ind. 9 Fak. Sains dan Teknol. UIN Sultan Syarif Kasim Riau, pp. 18–19, 2017.
[24]. M. Ehikhamenle and R. O. Okeke, "Design and Development of 2 . 5KVA Inverter Adopting a Microcontroller Based Frequency Meter," Int. J. Eng. Mod. Technol., vol. 3, no. 1, pp. 1–14, 2017.
[25]. A. Maslan, J. E. Chandra, and C. E. Suharyanto, "Automatic Based Sensor MAXSONAR Design Bagan Fishing Tool Using Arduino-WR," Int. J. Sci. Eng. Res., vol. 8, no. 7, pp. 519–522, 2017.
[26]. R. Gavali, B. Mandekar, and R. Pathan, "Intelligent Aqua-tronix," Int. Res. J. Eng. Technol., vol. 4, no. 3, pp. 1235–1238, 2017.
[27]. H. Jaya, K. Erwansyah, B. Andika, and H. Jaya, "Rancang bangun pemanas air pintar berbasis mikrokontroler," J. SAINTIKOM Vol., vol. 16, no. 1, 2017.
[28]. A. Saefullah, S. Sadi, and Y. Bayana, "Smart Wheeled Robotic (SWR) Yang Mampu Menghindari Rintangan Secara Otomatis," vol. 2, no. 40, pp. 314–335, 2009.

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