Automatic Double Visor Helmet Design Based Arduino Nano

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Abstract: *Has been carried out a development on a double visor helmet that still uses the quick visor change button to automatically move up and down the additional visor. The research method used is a quantitative method by determining the percentage level of accuracy of the measuring instrument after calibration which aims to get the light intensity value according to the luxmeter measuring instrument. The working system in the design of the tool is an ldr sensor that receives light that produces a voltage in the form of analog which will be processed by Arduino Nano and produces digital output in the form of an additional visor opening/closing motion driven by a servo motor. The measurement results obtained in this study are the measurement of light intensity as a benchmark for glare and the results of additional visor responses. The working system of this double visor helmet is that when the sensor captures light intensity 53 lux, the additional visor will close, while when the sensor captures light intensity < 53 lux, the additional visor will open. The additional visor response is appropriate and safe to use while driving.*

Keywords: Arduino Nano, Luxmeter, Helm Double Visor, Quick Visor Change

1.Introduction

The community's need for transportation facilities at this time is very important. Given the high congestion on the highway, motorbikes are the right choice. Factors causing motorcycle accidents are still high; this is caused by human negligence. This negligence is an example of not using a helmet properly and correctly [1].

Helmet is one of the primary needs for motorcyclists as a safety tool. Previously, Indonesian helmet manufacturers were considered not to care about the safety and comfort of helmet users. It is proven by the complaints that come in regarding the accident then the helmet comes off, breaks which can cause head injury or even cause death [2]. However, currently the helmet industry in Indonesia is continuously innovating in creating safe and comfortable helmets [3].

One of the helmets that is produced is a double visor helmet, this helmet can be said to be a double visor because this helmet in addition to having a clear main visor, also has an additional dark colored visor that functions for driving during the day so as not to be dazzled. On the double visor helmet there is a quick visor change which functions to raise and lower the additional visor [4].

Based on this description, the author intends to develop an additional visor on a double visor helmet that still uses a quick visor change to matic so that it is more practical to use motorcycle riders who often ride during the day or night.. To develop additional visors, there were several studies conducted to determine the working system of double visor helmets, to determine the minimum light intensity range of the working system, and to determine the response of additional visors. On this research, it has several limitations such as the sensor used, namely the LDR sensor and the system works in the light intensity range that has been determined on the measurement data that has been carried out.

1.1 Arduino Nano

Arduino is a type of board that has a microcontroller chip as its main component. The microcontroller chip or IC serves to control the input and output processes in electronic circuits. Arduino used in this research is Arduino nano [5].

Arduino nano is an ATMega328 based microcontroller board. The Arduino nano has 14 digital input/output pins (6 of which can be used as PWM outputs), 6 analog inputs, a 16 MHz Crystal oscillator, a USB connection, and a reset button [6][7][8][9][10][11][12]. Arduino nano pictures can be seen as shown in Figure 1 below.

Figure 1: Arduino Nano

Arduino nano contains everything needed to support the microcontroller, easily connect it to a computer with a USB cable or supply it with an AC to DC adapter or use a battery to get started [13].

1.2 LDR Sensor (Light Dependent Resistant)

LDR (Light Dependent Resistant) is a type of resistor whose resistance value varies due to the intensity of the light absorbed. The working principle of this LDR is when it gets light its resistance drops, so that when the LDR gets the greatest light intensity, the resulting voltage is high. The LDR sensor used can be seen as shown in Figure 2 below.

Figure 2: LDR Sensor

When the light is dim, the LDR becomes a poor current conductor or can be said to have a large resistance. Meanwhile, when the light is bright, the LDR becomes a conductor or it can be said to have a small resistance [14].

1.3 Glare Outlook

The eyes have the ability to adapt when conditions change from dark to light or vice versa. The ability to adapt to dark or light depends on the condition of a person's retina.

Glare itself is divided into two types, namely discomfort glare and disability glare. Discomfort glare causes discomfort in the eyes (visual discomfort). Visual discomfort will be more pronounced if exposure to bright visible light occurs for a long period of time. Meanwhile, in disability glare, a person will experience temporary blindness due to exposure to very bright visible light or commonly known as flash blindness. Flash blindness occurs because the pigment of vision turns white upon exposure to bright light. This pigment will turn white so as to form a scotoma or a temporary blind area in the person's field of view [15].

1.4 Servo Motor

Servo motor is a DC motor equipped with a control system. This control system will provide feedback on the motor rotation position from 0 to 180 degrees. In addition, this motor also has a relatively strong torque. The servo motor wiring system consists of 3 parts, namely vcc, gnd, and signal. Giving PWM to the servo motor will make the servo move at a certain position then stop (position control) [16]. Motor servo pictures can be seen as shown in Figure 3 below.

Figure 3: Servo Motor

A servo motor consists of a DC or AC motor, a series of gears, a potentiometer, and a control circuit [17]. The servo motor works is controlled by a PWM signal from the encoder/potentiometer. The signal width of the given will determine the angular position of the rotation of the servo motor shaft [18].

2.Research Method

2.1 Circuit Schematic

The circuit scheme used can be seen in Figure 4. The use of IC 7805 in the circuit so that the input voltage to the servo motor is not more than 5V, because the supply voltage required for the servo motor is 5-6 V.
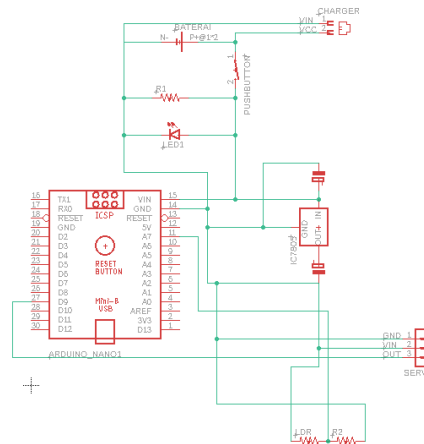

Figure 4: Circuit Schematic

2.2 Design Schematic

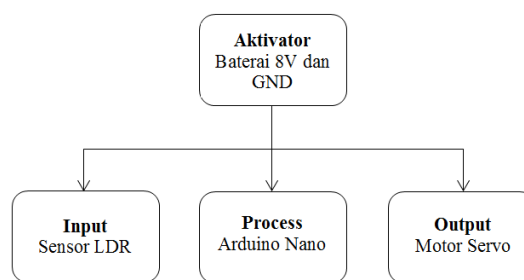The design scheme used in this research can be seen in Figure 5.

Figure 5: Design Schematic

A battery with a voltage of 8V which acts as an activator serves to activate the circuit. Then the LDR sensor as an input reads the light intensity captured by the sensor in the form of analog data. Furthermore, the analog data is processed on the Arduino Nano which can convert the data into digital data that will be issued on the Arduino PWM pin which is connected to the servo motor, so that the motor can move as an output which will open/close the additional visor.

3.Result and Discussion

3.1 Correlation Data Result

Based on the research that has been carried out, the correlation data between the sensor and the lux meter measuring instrument is obtained as shown in table 1.

Table 1: Correlation Data

Voltage (mV)	Light Intensity (lux)
35	54
47	93
51	102
64	161
77	220
94	295
106	342
116	351
126	405
141	483

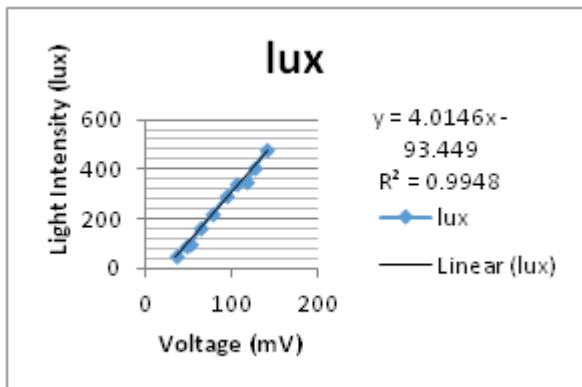From the table obtained a linear graph as in figure 6 below.

Figure 6: Correlation Graph Between Sensor and Luxmeter

From the graph, we get an equation to calibrate the tool so that the output produced by the sensor corresponds to the output produced by the luxmeter measuring instrument with units of lux.

3.2 Accuracy Calculation Result

Based on the equations that has been obtained on the graph, the comparison data between the sensor and luxmeter is obtained to determine the percentage level of accuracy of the tool. The data can be seen in table 2 below.

Table 2: Comparison Data between Sensor and Luxmeter

Sensor (lux)	Luxmeter (lux)	Results
35	35	Appropriate
49	49	Appropriate
80	80	Appropriate
110	110	Appropriate
121	121	Appropriate
129	130	Not Appropriate
139	139	Appropriate
157	157	Appropriate
229	227	Not Appropriate
246	246	Appropriate

So, the percentage level of accuracy obtained is 80%.

3.3 Measurement Data Result

In the measurement results there are 2 data is a measurement data from several light source variables that maybe encountered while driving, and measurement data from light bulbs whose brightness can be adjusted using an AC 220V

dimmer with a distance between the light bulb and the sensor is 46 cm. The measurement data from the light source variable can be seen in table 3 below.

Table 3: Measurement Data

Variable	Light Intensity (lux)
Night	28
Overcast morning	44
Overcast afternoon	50
Bulbs lamp	117
Morning	130
Overcast noon	161
Bulb far light	183
LED lamp	187
LED far light	210
Afternoon	217
Noon	224

While the measurement data from the light bulb can be seen in table 4 below.

Table 4: Measurement Data Bohlam Light

Power (W)	Light Intensity (lux)
0	0
1	25
2	28
3	33
4	38
5	43
6	49
7	53
8	58
9	60
10	64
11	67

The data from the measurement of the light bulb is carried out because according to the author, the data from the measurement of the light source variable is still not accurate.

3.4 Visor Response Result

The results of the visor response are based on the research that has been carried out, the data obtained are as in table 5 below.

Table 5: Visor Response Result

Situation	Visor Response
Daylight	Close
Motorcycle headlight	Stay open
The reflection of the motorcycle light from the motorcycle rearview mirror	Stay open

Based on the table it can be seen that the additional visor will remain open when the sensor catches a glimpse of light, this makes the helmet safe to use while driving and does not interfere with the driver.

3.5 Discussion

Based on the results of research and calculations that has been carried out, the equation of the linear graph obtained is y = 4.0146x - 93,449. This equation is used in the Arduino program so that the output of the measuring instrument used

is the same as the output of the luxmeter. The measuring instrument has an 80% accuracy rate. From these measuring instruments, it can be seen the light intensity of several variables as in table 3. In the range of overcast afternoon light intensity with the light bulb looks very far away, then the measurement data for the light bulb is taken whose brightness can be adjusted using an AC 220V dimmer with the distance between the light bulb and the sensor is 46 cm.

Based on the two measurement data that has been obtained from the research, it can be seen that the minimal light that dazzles the eyes is found in light bulbs with a light intensity range of 53-117 lux. After obtaining the intensity range, the automatic double visor working system requires the minimum light intensity as a benchmark for the Arduino program command to move the visor. The minimum light intensity used as a benchmark is 53 lux, which means that when the sensor captures a light intensity of more than 53 lux, the additional visor will close. Likewise, when sensor captures a light intensity of less than 53 lux, the additional visor will open. The response speed of the additional visor when closing/opening is appropriate and there is no delay. However, when the sensor catches a glimpse of light, the additional visor does not close. This is useful so that the helmet does not endanger the driver.

4. Conclusion

Based on a research has been carried out, can be concluded that the system working on a minimum light intensity range around 53-117 lux with the level of accuracy measure the instrument used is 80%. So this automatic double visor system works is, when the sensor captures a light intensity of 53 lux, the visor will close. Then, when the sensor catches the light intensity < 53 lux, then the visor will open. For the response on the visor can still be said to be safe to use, even though the visor doesn't close when exposed to a glimpse of light.

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