International Journal of Scientific Research in Science, Engineering and Technology
Print ISSN: 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)
doi : https://doi.org/10.32628/IJSRSET207510

Design Development of Helmet Visor for Effective Vision

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Article Info
Volume 7 Issue 5
Page Number: 88-92
Publication Issue :
September-October-2020

Article History
Accepted : 05 Sep 2020
Published : 15 Sep 2020

ABSTRACT

Motorcyclists use helmets for safety, and visors are used to prevent dirt particles from entering into the eyes. Visors can also be used to reduce the intensity of light. However, some of the presently available visors are not suitable for light intensity reduction, while some are too expensive to afford by all. This project investigates the effect of developed helmet visor on visibility by practical experiments and finds a suitable alternative for the standard helmet visor. The values obtained from the experiments are validated against analytical calculations.

Keywords: Helmet visor, Acrylic visor, luminous Intensity, LDR

I. INTRODUCTION

A helmet visor is a surface that protects the eye from sunlight and other bright light incidents on the eyes. In the past, the visors were opaque like a mask, and as the time passes, visors with transparent surfaces made of polycarbonate have been developed.

Types of modern transparent visors include:

- The transparent or semi-transparent front part of a motorcycle crash helmet
- Police riot-squad helmets.
- Safety face-shields used for construction type applications.
- An eye-shield to protect the eyes from sunlight on a flight helmet.

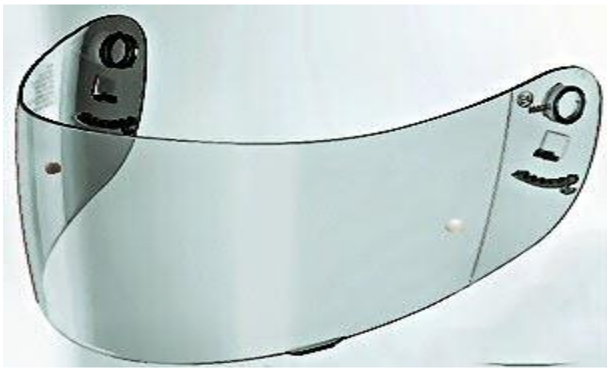

Figure 1: standard helmet visor

MOTORCYCLE HELMET VISOR:

When riding a motorcycle, one needs to be careful by taking necessary precautions such as keeping a helmet to protect the head. A visor's helmet is essential because a visor is a surface that protects the eyes from dust, dirt, and the bright light. Riding a motorcycle is much more dangerous than driving a car. It is observed that the percentage of accidents is rising every year. Studies have shown the number of those injured has gone up by 12% in the past year. Visors available in the market are of plastic material. Having a visor with complete transparency also makes the rider difficult to ride during sunny days. So, the visor must be tinted with transparency.

II. DESIGN AND MATERIAL

Initially, a new design of helmet visor is made using Autocad, considering the importance of a visor and helmet's aesthetic and functional features. The shape of the helmet visor was similar to a truncated semi Do-decagon. Six different faces act like reflectors with six normal faces to reflect the incident light so that the intensity of light reaching the eye would be significantly reduced. Acrylic is chosen as a material for manufacturing helmet visor. Acrylic is a transparent plastic material with extraordinary stiffness, strength, and optical clarity. Superior weathering properties are an added advantage. Later the initial design is developed as there was some disturbance invisibility of objects. The final design of the helmet visor has overcome the disturbance invisibility.

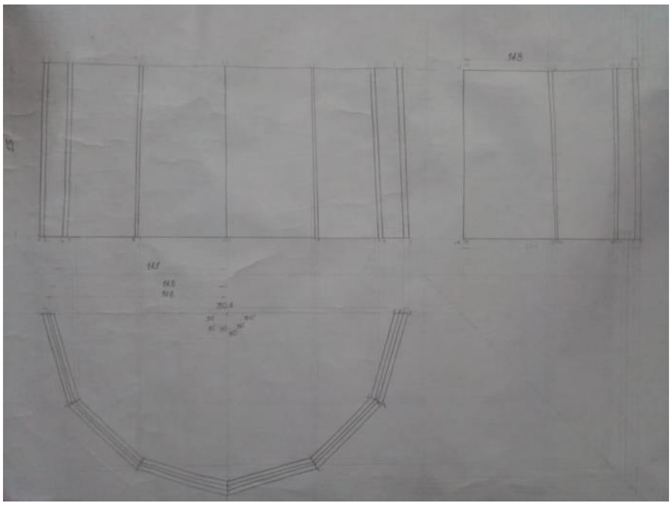

Figure 2: Initial design of helmet visor

Figure 3: Final prototype of a helmet visor

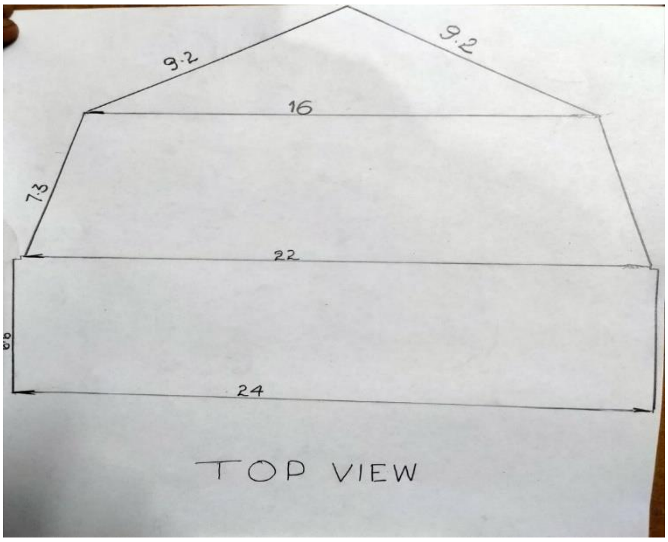

Figure 4: Top view of a developed helmet visor

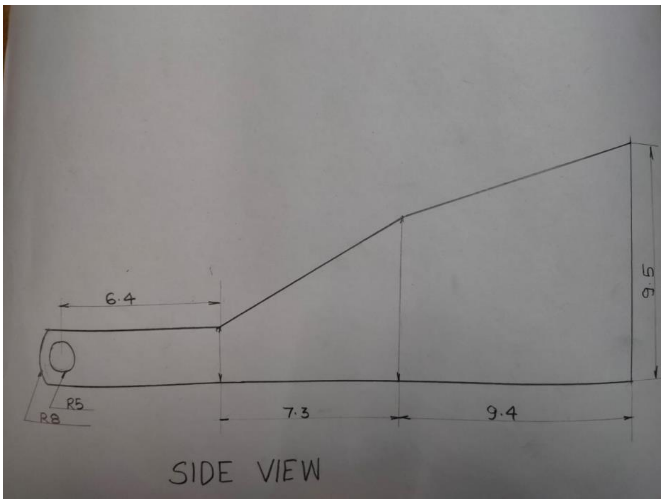

Figure 4: Side view of a developed helmet visor

III.EXPERIMENTATION PROCEDURE

Testing of helmet visor is done using an experimental setup which constitutes of:

Node MCU's (Wi-Fi module)	2
Breadboard	1
LDR	2
10K ohm resistors	2
Power source, a light source	1

Table 1: Apparatus of experiment

The distance was approximately 10 feet between the eye and light source. The Wi-Fi module is connected to the phone via a hotspot. The setup is placed dark room, so as simulate the night time of a day. The two LDR sensors would give fluctuating readings due to their sensitivity.

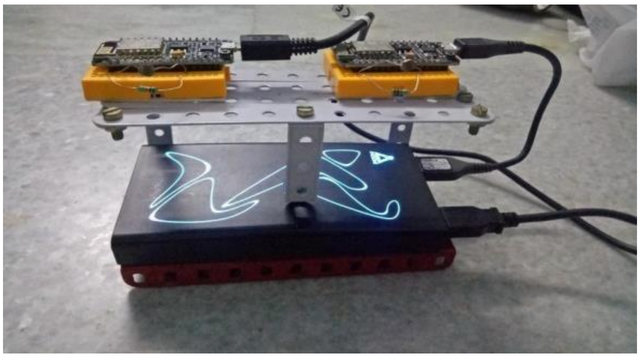

Figure 5: Experimental setup

Different experiments were conducted using this setup. The same test conditions were used for all experiments.

IV. CALCULATION

According to Lambert's law

$$I=I_0e^{-\alpha x} \quad \text{----(1)}$$

$$\alpha = \frac{2.303*A}{x}$$

Where I= intensity of light after passing through a medium

I_0= intensity of light hitting on the object surface.

X= thickness of the material

A= absorbance

α= Absorption co-efficient

The intensity of light incident on the object surface is inversely proportional to the square of the distance between the object and light.

$$I\alpha\frac{1}{d^2}$$

$$\frac{I_1}{I_2}=\frac{{d_2}^2}{{d_1}^2} \quad \text{----(2)}$$

Where d_1= distance between light and visor (m)

d_2= distance between light and eye (m)

I in candela/m2

$$\frac{I_1}{170}=\frac{(3.1)^2}{(3.04)^2}$$

$$I_1 = 175.85 \text{ lumens}$$

Now placing the visor at distance d1, we can understand the intensityI_1=175.85 lumens is the light intensity that hits the visor. (I_1= I_0=175.85).

$$I = Ie^{\frac{-2.303(0.004+0.9)(0.2+0.01)}{(0.2+0.01)}}$$

$$I = 55.08 \text{ lumens}$$

Here I = intensity of light passing after passing through the visor. Now the actual intensity of light hitting the eye.

$$\frac{I_1}{I_2}=\frac{{d_2}^2}{{d_1}^2}$$

$$\frac{55.08}{I_2}=\frac{(3.1)^2}{(3.050)^2}$$

I_2 = 53.31 lumens (final intensity of that reach eye)

The theoretical percentage of reduction in light intensity = $\frac{170-53.31}{170} * 100 = 68.64\%$

V. RESULTS AND DISCUSSIONS

a. Experiment 1: A light source in front of an unaided eye

Sensor 1		Sensor 2
180		160
179		159
180		160
179		159
180		160
Avg.	180	160

Table 2: LDR sensor 1 and sensor 2 reading for experiment 1

b. Experiment 2: The helmet visor is placed in between the unaided eye and light source.

Sensor 1		Sensor 2
170		152
171		154
170		153
171		153
170		152
avg	170.4	153.12

Table 3: LDR sensor 1 and sensor 2 reading for experiment 2

On comparing the values of experiment 1 and experiment 2, we calculated the reduction of light intensity.

Sensor 1	Sensor 2
$\left(\frac{180-170.4}{180}\right)*100 = 5.3\%$	$\left(\frac{160-153.12}{160}\right)*100 = 4.3\%$

c. Experiment 3:Helmet visor with a cellophane sheet on the outer surface

Sensor 1		Sensor 2
82		82
81.5		80
82.7		83
83.7		80.5
83.6		79
Avg.	82.62	80.92

Table 4: LDR sensor 1 and sensor 2 reading for experiment 3

On comparing the values of experiment 1 and experiment 3. The reduction of light intensity was calculated.

Sensor 1	Sensor 2
$\left(\frac{180-82.62}{180}\right)*100 = 54.10\%$	$\left(\frac{160-80.92}{160}\right)*100 = 41.4\%$

d. Experiment 4: Helmet visor with windshield sunshades sheet on its outer surface.

Sensor 1		Sensor 2
88		73.5
86		75
90		72
82		73
87		71
avg	86.67	72.94

Table 4: LDR sensor 1 and sensor 2 reading for experiment 4

On comparing the values of experiment 1 and experiment 4, we calculated the reduction of light intensity.

Sensor 1	**Sensor 2**
$\left(\frac{\mathbf{180-86.67}}{\mathbf{180}}\right)*\mathbf{100} = \mathbf{51.85\%}$	$\left(\frac{\mathbf{160-72.94}}{\mathbf{160}}\right)*\mathbf{100} = \mathbf{58.41\%}$

Experiment for the second design of helmet visor

e. Experiment 5: The helmet visor is placed in between the unaided eye and light source.

Sensor 1		Sensor 2
100		90
99		89
100		90
99		89
100		90
avg	100	90

Table 4: LDR sensor 1 and sensor 2 reading for experiment 5

On comparing the values of experiment 1 and experiment 5, we calculated the reduction of light intensity.

Sensor 1	Sensor 2
$\left(\frac{180-100}{180}\right)*100 = 44.45\%$	$\left(\frac{160-90}{160}\right)*100 = 43.75\%$

f. Experiment 6: helmet visor with windshield sunshades sheet on its outer surface

Sensor 1		Sensor 2
100		89
99		90
100		90
100		90
99		89
average	100	90

Table 4: LDR sensor 1 and sensor 2 reading for experiment 6

On comparing the values of experiment 1 and experiment 6, we calculated the reduction of light intensity.

Sensor 1	Sensor 2
$\left(\frac{180-100}{180}\right)*100 = 44.45\%$	$\left(\frac{160-90}{160}\right)*100 = 43.75\%$

VI. CONCLUSION

From the above results, the following statements can be made:

1. There is a notable change in the reduction of light intensity in both designs of the visor.
2. The reason to choose green colour is that the percentage reduction is in an acceptable range, and green is a colour to which a human eye has the highest sensitivity. The colour perception of the eye depends on rods and cones present in the eyeball. In those, about 65% are sensitive to green colour, that is why green appears as a pleasant colour. The idea of a green colour cellophane sheet was good, but there was a problem in sticking it to the visor.
3. Windshield sunshades have given better results when compared to the green cellophane sheet.
4. The helmet visor has given better results in regular human life as well.

VII. REFERENCES

[1]. Visors of Protective Helmets for Motorcycle Riders – Specification.

[2]. Hsin-His Lai, Hsinfu Huang, "Evaluation of visibility of tinted helmet visor for motorcycle riders" International Journal of Industrial Ergonomics. DOI: 10.1016/j.ergon.2008.02.013

Cite this article as :

Hitesh Reddy Ramireddy, Sadige Akhil Prasad, Gajjalakonda Prudhviraj, "Design Development of Helmet Visor for Effective Vision", International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Online ISSN : 2394-4099, Print ISSN : 2395-1990, Volume 7 Issue 5, pp. 88-92, September-October 2020. Available at doi : https://doi.org/10.32628/IJSRSET207510

Journal URL : http://ijsrset.com/IJSRSET207510