

DESIGN AND DEVELOP A SYSTEM TO ENHANCE THE RANGE OF LI-FI

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This Report Presented in Partial Fulfillment of the Requirements for the Degree
of Master of Science in Computer Science and Engineering.

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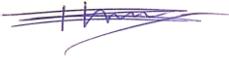
3rd June, 2021

APPROVAL

This Project/internship titled “**Design and Develop a System to Enhance the Range of Li-Fi**”, by A. H. M. Abu Faisal Naeem, ID No: 201-25-859, to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on June 3, 2021.

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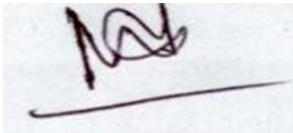
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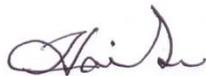


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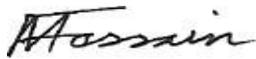
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DECLARATION

I declare that, this thesis report is prepared by myself by own, **A. H. M. Abu Faisal Naeem ID: 201-25-859** to the department of Computer Science and Engineering, Daffodil International University, under the supervision of **Professor Dr. Md. Fokhray Hossain**, Assistant Dean & Professor, Department of CSE, Daffodil International University.

I furthermore declare that neither this thesis report nor any part of this thesis report has been submitted to any other university for the purpose of receiving a degree or diploma.

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ACKNOWLEDGEMENT

To begin, I would like to offer my heartfelt gratitude to "Almighty" for his particular blessing, which has enabled me to successfully complete my research.

To make a report and deal with working in the real world is difficult if don't have the support of others surrounding by me. Therefore, I owe my deep indebtedness to and am glad for it to **Professor Dr. Md. Fokhray Hossain**, Assistant Dean & Professor, Department of CSE, Daffodil International University, Dhaka. He guided me to finish this task successfully. His never-ending patience, scholarly direction, persistent encouragement, constant and energetic supervision, constructive criticism, helpful suggestions, and reading numerous substandard drafts and revising them at every level enabled this research to be completed.

I would like to convey my heartfelt gratitude to Professor **Dr. Touhid Bhuiyan**, Professor and Head of the Department of Computer Science and Engineering, as well as other faculty members and staff members of Daffodil International University's CSE department, for their assistance in completing my thesis.

I'd want to express my gratitude to every one of my Daffodil International University classmates who participated in this conversation as part of their course work.

Finally, but most importantly, I want to convey my thanks to my parents for their love, support, compassion, and inspiration.

ABSTRACT

Data transmission plays important part in our daily life. Without passing data in a day is quit impossible in this development world where data plays very critical role. Li-Fi ushers new being of data transfer via wireless technology. Li-Fi is stands for Light Fidelity. Li-Fi simply put, it uses visible light to exchange data. Light can pass free space and cannot pass rock-solid prosperities like walls of room, stones etc. From different research, Li-Fi can covering range of it nearly 10 miters and near so. As it discussed that, covering area of Li-Fi nearly 10 miters which is not good enough to use in household or office or big halls like auditorium or conference room. For that reason, need to design new system that help out to solve the problem and improve the covering area. For set up Li-Fi System, LED are setting up with Li-Fi router. LED lights reaching place are the covering area. To enhance the range of Li-Fi, need to reach LED light more area. For that, this research tries to design and develop new system by using concave mirror and changing positon of LED. In new designed system, mirror try to improve covering distance that normally at present covered by Li-Fi and better position help to minimize the use of LED, which is proved both theoretically and mathematically by this research.

TABLE OF CONTENTS

CONTENTS	PAGE
Approval	i-ii
Declaration	iii
Acknowledgement	iv
Abstract	v
Contents	vi-vii
List of Figures	viii
List of Tables	ix
CHAPTER	
CHAPTER 1: INTRODUCTION	(01-03)
1.1 Background of The Research	1
1.2 Aim of The Research	1
1.3 Problem Statement	2
1.4 Research Methodology	2
1.5 Proposed System	3
1.6 Conclusion	3
CHAPTER 2: REQUIREMENT ANALYSIS	(04-05)
2.1 Introduction	4
2.2 Existing system	4
2.3 New system requirement analysis	5
2.4 Conclusion	5
CHAPTER 3: SYSTEM DEVELOPMENT	(06-12)
3.1 Introduction	6
3.2 Overview of thesis	6
3.3 Use Of Mirror in System	6
3.3.1 Convex Mirror	7
3.3.2 Concave Mirror	7
3.4 Electromagnetic wave: Light	7
3.4.1 Luminous Flux and Luminous intensity	8

3.4.2 Light Projection	9
3.5 New LED Positioning	10
3.6 Techniques of improving angles	11
3.7 Conclusion	12
CHAPTER 4: MATHEMATICAL RESULT ANALYSIS	(13-17)
4.1 Introduction	13
4.2 Mathematical Result	13
4.3 Increasing Covering Greater Area	15
4.4 Conclusion	17
CHAPTER 5: SYSTEM'S IMPACT IN LIFE	(18-19)
5.1 Introduction	18
5.2 Impact on Society	18
5.3 Impact on Environment	18
5.4 Ethical Aspects	18
5.5 Sustainability Plan	19
5.6 Conclusion	19
CHAPTER 6: SWOT ANALYSIS	(20-21)
6.1 Introduction	20
6.2 SWOT Analysis	20
6.2.1 Strength Analysis	20
6.2.2 Weakness Analysis	20
6.2.3 Opportunity Analysis	21
6.2.4 Threat Analysis	21
6.3 Conclusion	21
CHAPTER 7: CONCLUSION	(22)
7.1 Conclusions	22
7.2 Further Suggested Study	22
REFERENCES	(23-24)

LIST OF FIGURES

FIGUREURES	PAGE
Figure 3.1: Light reflection from Mirror to Mirror	7
Figure 3.2: Image of Convex Mirror	7
Figure 3.3: Image of Concave Mirror	8
Figure 3.4: Different Types of Solid angle	9
Figure 3.5: Projection of Light	9
Figure 3.6: Household light Projection	10
Figure 3.7: New Ways of light Set up	11
Figure 3.8: New Positioning of LED	11
Figure 4.1: Proportion Between Sizes	14
Figure 4.2: Proportion Between Sizes of Images	14
Figure 4.3: Cone with Different Angels	15
Figure 4.4: Comparisons of Area and Volume	16

LIST OF TABLES

TABLE	Page
Table 1.1: Li-Fi vs Wi-Fi	2

CHAPTER 1

INTRODUCTION

1.1 Background of The Thesis

We are living in the age of science and technology and technology is advancing day by day. Use of large number product invented by different technology, that uses and developments in technology. After the invention of Wi-Fi, after researching a new system of communication in wireless, it's named as Li-Fi. Li-Fi is new way of wireless communication. Every data transition happens through a media and visible light is the medium that use Li-Fi for data transmission. Because of light, data transmission through light faster and more secure than other wireless data transmission. Light is used every household work so it very possible to increase the user. Wi-Fi cover fixed ranges, similarly Li-Fi covers fixed amount of range and Which is depends on LED lights reflection. Li-Fi cover the distances where light reflection is reach. To improve the covering distance of Li-Fi, light of LED light cover distance more. Try to work on it.

Living in era of developing new and faster technology that's make life more fastest and easier. New technology faces some problem to reaches for every people. If we look after the wireless communication system, most now use Wi-Fi but new technology Li-Fi invented. Li-Fi can solve some problem of Wi-Fi but as a technology Li-Fi had some problem. One of them is range of Li-Fi. The range of Li-Fi is only 10 merits. Because of low ranges, many of not attracted on Li-Fi. To solve the range problem of Li-Fi and make it more fixable to use.

1.2 Aim of The Research

It is period of wireless communication, Li-Fi is the another addition. By the different research it can say that, Li-Fi cover very small amount of area. Normally Li-Fi covers 10 minter of distance. Try to design and develop a system that enhance the range of Li-Fi. Different techniques are used for the problem solvation. This design system aim is to improve the covering area that present covers in Li-Fi. Using mirror, it reflects light more and the ranges of Li-Fi also increase and which in expected output of this research. By using LED is another option but LEDs cost and decrease the LED life. By using mirror and it properties, try to increase the angles of LED and the covering range of Li-Fi is increased.

1.3 Problem Statement

In communication system, wireless communication is popular communication system. Wi-Fi is the most popular in present world but the new progression of Wi-Fi is Li-Fi. Comparison between Wi-Fi and Li-Fi:

Table 1.1: Wi-Fi Vs Li-Fi

Wi-Fi	Li-Fi
Wi-Fi routers are the device that use in Wi-Fi system to pass data.	LED bulbs are used for data transmission in Li-Fi system.
Wi-Fi covering area is up to 32 meters.	Li-Fi covering area is up to 10 meters.
Frequency of Wi-Fi up to 5Ghz.	10,000 times the radio frequency spectrum of Li-Fi
Component of Routers, Modems and access points.	LED driver and photo detector equipment used in Li-Fi system .
Used in internet browsing using Wi-Fi hotspot.	Used in airlines, under sea explorations areas.

From the table, Li-Fi had number of advantages like speed, security and most of them is using place which is very explorations areas. But use in real life, ranges take very important part. But problem is range is only 10 miters and it is very small. For use in real life, needs more coverage. So covering range of Li-Fi is a problem [1][2][3].

1.4 Research Methodology

For research, it can use be LED, lens and mirror. If use LED, use 2 ways. Supplying more current and more voltages to the LEDs. But both are decreases LED lifetime. But for research, number of option is open, but for proposed system is use mirror because it is available in market more and price is affordable. This new design system focus on, enhance the coving area. For that, from properties of solid thins that area is increased by the increased of angles created by that property. So try improving large are then improve the angle.

1.5 Proposed System

Lights that, use in household are setup in upper portion which is called ceiling of house. For Li-Fi, light set up plays important role in newly proposed system. The light is projected in the shape of a cone if it is setup with ceiling. Set up LED in such way that light will cover hall room. For making this happen need concave mirror which help to get large image from real image. It will also help minimize the use of LED. To improving the covering area with less LED need to raise the angle that produce by the cone. From the equation, $A = \text{angle} \times r^2$ where A define the area and “r” is declared radius. From the equation, area fully depend on the angles. More improvement in angle that cover more area and that will happen by the help of mirror. If it helps theoretically this research will go on and mathematical result proven later [6].

1.6 Conclusion

From newly design system, expected output is the covering area of Li-Fi is more than present. New proposed a model of enhance the distance of Li-Fi and mathematical calculation will find the result will be proving or not. For propose a method, use of Concave mirror and because of low cost and get better result. Use LED is another option but LEDs cost and decrease the LED life. Using mirror, it reflects light more and the ranges of Li-Fi also increase and which in expected output of this research.

CHAPTER 2

REQUIREMENT ANALYSIS

2.1 Introduction

Living era of science and technology, new systems and technology are invented. For making a system, require different types of material and different types of product. For making a useable and reliable system, research the requirement, which makes the system more faxable for the system as well as for the user who are more likely use the system. For that, requirement analysis plays important part of enhance the system and more useable for the user.

2.2 Existing System

Wireless communication is popular way of data communication. Most of familiar with Wi-Fi but new technologies are invented. Li-Fi is new ways of wireless communication. Li-Fi technology exchanging data via light which is visible. For data transfer, the Li-Fi system adheres to the visible light communications system. The Visible Light Communications system consists of two qualifying components: one device with a photodiode for receiving light signals and another light source with a signal processing unit for signal transmission. The optimum light source for a Visible Light Communications system is LED light bulbs. High rates of light output are required for Li-Fi systems. Semiconductors make up LEDs. LEDs have the ability to increase light intensity and switch swiftly. Li-Fi depends on photons which is emitted from visible light helps to transfer data, for that quality of LED is use in Li-Fi. If current apply light source and it varied, it will not good for light source but it does not effect in Li-FI system. When signals are received and demodulated, it converted binary data into videos, images and other multimedia things. Li-Fi is still new technology and it is only one room proposed technology. Li-Fi technology mainly depends on LED and two other components to stablish a Li-Fi system [12] [13] [14].

2.3 Proposed system requirement analysis

Li-Fi is existing system in wireless communication as well as new. So it has many of area of research. From the research, it is known that Li-Fi covers only 5-10 miters only. For that, research to improve the covering area of Li-Fi. For improve the covering area using the existing system but need some more equipment extra that will help to proposed a new system to enhance

the range of Li-Fi. For improve the covering range, research will also try to reduce the use of LED in system. For this research, number of option is open. For that, can use LED, mirror as well as lens [15].

Using reason and not use in the system is discuss bellow:

It is clear that, if light cover more area then the coving area of Li-Fi is also increased. For that first discussing ways of LED. From different research, by using LED, range of light is increased by increasing the intensity of LED. IF intensity of LED is Increased, the covering area will increase. For increasing the intensity follow 2 ways. One is increasing the supply of current in LED, the intensity will increase. Second way is supply more voltage in LED, it will also help to increase the intensity of LED. But those two ways will decrease the lasting of LED. Li-Fi system depend on LED. If it will be lasting less, it will cause another problem, that's why new system not depends on LED.

Another option is Lens. Lens are help to reflects light and cover more area. By using lens, the intensity of light will increase but problem is availability and cost. Lens are normally not available in big number and it cost also high. For that use of lens is not perfect for proposed system.

From different research, mirror is another option for increasing intensity. By using mirror, intensity of light is increased. Mirror is available in normal market and cost of mirror is more affordable and less then lens also. Mirror can reflects the light from the source that come towards.

2.4 Conclusion

Li-Fi is an existing system. Try to improve the system. For that some new equipment needed. But need to research which one is good for the system and which one has to face problem. It is also look after that future of the system what use in the system. By researching and looking after different things aspects mirror is the new equipment that is more useful and helpful to improve the system.

CHAPTER 3

SYSTEM DEVELOPMENT

3.1 Introduction

To improve the covering area of Li-Fi is the main cause of this research and the term "research subject" relates to the category of applied research or action research. Li-Fi is the new and improve technique for wireless data exchange system. As a result, there is no research or existing techniques to extend the covering area of Li-Fi. Try to propose a design that will help to build a system that raise the range of Li-Fi which it covering in present. To do so, need to know the basic properties about electromagnetic waves, light characteristics, mirrors, and lenses. By using those knowledge, design and develop a system that will help to enhance the range of Li-Fi. This newly proposed system will improve the covering range that present Li-Fi system covers.

3.2 Overview of Research

Number of paper on Li-Fi available in different journals. But most of the paper on basic view of Li-Fi and their functional view. But the research on the distance of Li-Fi which it covered and try to improve the range. There are 2 parts on research. First part proposed new technique increasing the range and then mathematical calculation. By mathematical calculation try to find out the mathematical result get. All the discription of prose method will discuss in chapter 3 and mathematical part in chapter 4.

3.3 Use of mirrors in system

For increasing the range need to increase the intensity. For that, different resources and study number of related paper, it finds that, for enhancing the range, need to raise the level of intensity in LED. For LED, two ways for increasing the intensity as follows,

- Increasing the supply level of current in LED
- Increasing the supply of voltage in LED

But the problem is that, it will reduce the lasting time of LED.

Intensity can be incremented via using variety of methods. For that, use lens and mirrors. But for this research use mirror over lens. By using both lens and mirror, intensity of light is

increased. But choosing from both of two is mirror. Because mirror is its available in the market more than lens and other is cost. Mirror is cheaper than lens.

Because mirrors reflect light from a source to an item, they can be used by positioning them at an efficient angle so that the light from the LED may be reflected and received by another mirror, and so on [4][5].

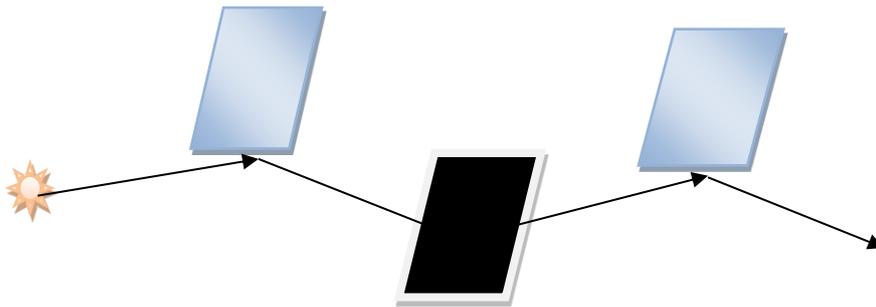


Figure 3.1: Light reflection from Mirror to Mirror

To solve this problem, spherical mirrors can be used. There are:

- Concave mirror
- Convex mirror.

3.3.1 Convex mirror

Convex mirror also called diverging mirror. Its reflective surface curves outwards towards the light source. Convex mirror does not give any real image [16] [17].

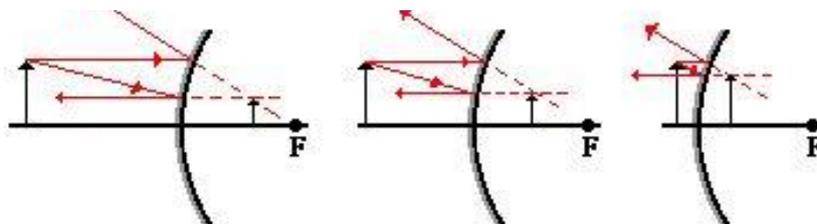


Figure 3.2: Image of Convex Mirror

From the figure 3.2, convex mirror shows that in each case, the images are as follows:

- Images are located behind the convex mirror
- The images are not real, it is only a virtual image
- The images are an upright image
- Image size decreases in size from main image [18] [19].

3.3.2 Concave Mirror

Concave mirrors are reflecting light from the source and inward to one focal point. For that, concave mirror produces a realistic and enlarged image. Light is focused using concave mirrors. Concave mirrors absorb light that falls on them and concentrate parallel incoming rays toward a focal [20].

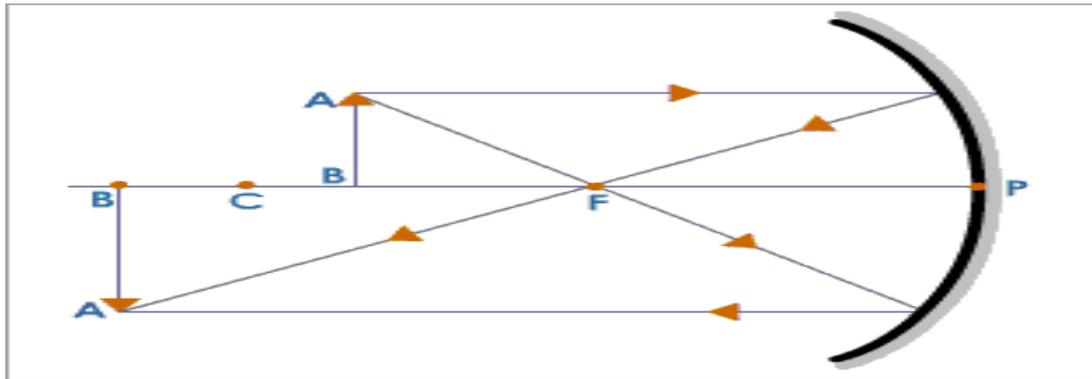


Figure 3.3: Image of Concave Mirror

From the figure 3.3, concave mirror show that in each case, the images are as follows:

- Image Location front the concave mirror.
- Images are real image.
- Images are near the main image.
- Size of image is bigger than the real [21].

3.4 Electromagnetic wave:

Waves that are formed when an electric field and a magnetic field vibrate together is define as Electromagnetic waves. On other way, are made up of oscillating magnetic and electric fields is Electromagnetic waves [22].

3.4.1 Luminous Flux and intensity:

A unit of measurement for the amount of visible light that has been realized is define as Luminous flux and it is measured in lumens (lm). It simply assessed the amount of energy carried by a specific light wave. Light at a wavelength of 555nm carries 1 watt of power = 683lm.

The amount of visible light emitted in unit time per unit solid angle is measured by luminous intensity. Candela is a unit of measurement for luminous intensity.

Solid angle: Solid angles are two-dimensional angle that's measured in steradians.

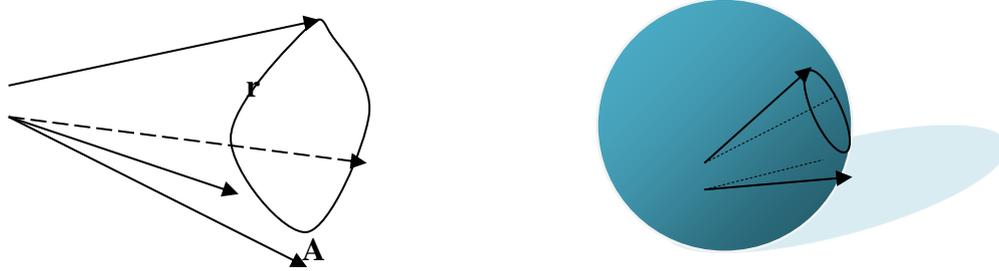


Figure 3.4: Different Types of Solid Angle

Angle = $\frac{a}{r^2}$, Where “A” define the area sphere and “r” is the radius.

Luminous intensity is defined by “luminous flux/solid angle”.

3.4.2 Projection of Light:

From light properties, light which is situated in ceiling projected in the form of a cone for visible light. Range of those visible light is less and level of intensity is low. Considering source of light which had no help of mirror back in the source.



Figure 3.5: Projection of Light

The outcome of light projecting that it will produce normal from cone. But using in mirror on LED and angels are created. Following angles create a discussion point. By those angels, it can happen only two point. One point is to process of speared those angels and results of those extended angles.

Equation of solid angles as bellow,

$$\text{Angle} = \frac{A}{r^2}$$

$$\text{or, } A = \text{Angle} \times r^2$$

It is possible to claim from the above equation that, as the angle is raised, the area increases. According to the equation, if the angle speared, more area can be covered.

For getting expected result, concave mirror being used for it properties of reflection of light and image creation. For that reason, concave is used for improving the angels that normally cover without use of mirror. As mentioned before, concave mirrors are reflecting light from the source and inward to one focal point. Concave mirror creates new image after reflection is inverted, as same as image and the size of the image is bigger than original one. If position of LED between the mirror's center of curvature and main focus, the LED's same image before reflection will be inverted and bigger than previous. Use of larger LED, which produce higher intensity and provides a wider angle of light projection, which instantly extends the covering area of a regular LED.

3.5 New LED Positioning:

The Li-Fi router in the ceiling is connected to the standard setup of household lighting for the setup of Li-Fi.

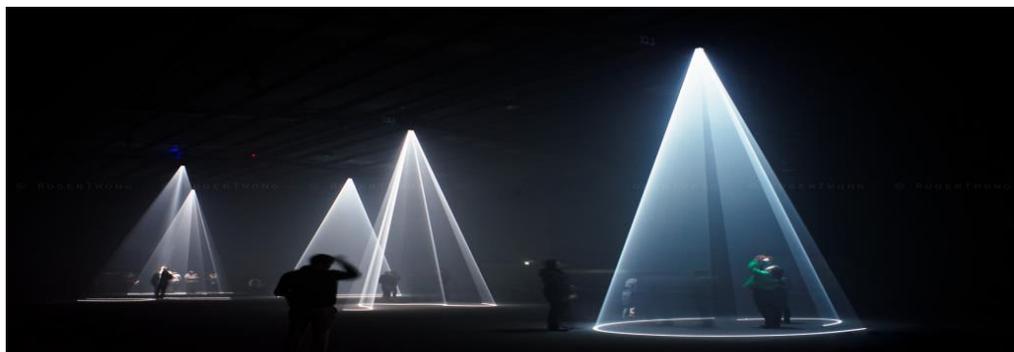


Figure 3.6: Household Light Projection

The light projection from the characteristics indicates that the ceiling will be in the shape of a cone. Propose a different technique to set the light attached to the router from before to reduce the number of LEDs. The LEDs must be mounted on the vertical wall of a normal rectangular.



Figure 3.7: New Ways of Light Set up

room, so that fewer LEDs are required to cover the entire space while projecting the previous amount of light.

3.6 Techniques of improving angles:

From figure 3.7, it can say that, positioning LED plays important role for forming new system. Perfect position ways help to use of LED is reduced the use by number. Concave mirrors reflect light from the source and inward to one focal point, according to their qualities. Because of this, concave mirror provides a realistic and stretched image. For getting better angel, it is beneficiary to use concave mirror. Using the previous equation,

$$A = Angle \times r^2$$

Now it can be considering that from the equation, larger angles will be covering more area.

It will minimize the LED number by increasing the angle and area. The same area can now be covered with a smaller number of LEDs than previous.

From the principle, light projection is seen in various figures, there is darker area near cone. When it is in practice, the darker areas near cone is depicted in various figures are no longer dark due to reflections from surrounding light covering those areas.



Figure 3.8: New Positioning of LED

From new position and wide angles of LED will provide two information and those are that enhancement of range in system and reduction of use LED in number. Li-Fi system will more covering distance and it will be the main point to design this new proposed system.

3.7 Conclusion

Positioning of light and the mirror help to enhance the range of Li-Fi and its theoretical process are discussing in this chapter. By using knowledge and using mirror with right positioning of LED will help to design a system that will enhance the covering range of Li-Fi. Using reasons and other important theoretical process and method is proposed. Proposed method will try to increase the current range of Li-Fi.

CHAPTER 4

MATHEMATICAL RESULT ANALYSIS

4.1 Introduction

By changing the position, the angles are increased. For the proposed method, if angles are increased, the covering range of Li-Fi increased. To prove it by mathematical, use the different mathematical equation and calculation needed. For that here, use the laws of solid angle, light properties, magnification laws and other equation related light.

4.2 Outcome Result

From the feature of concave mirror, “F” is denoted by focal length and consider $f = 12.5$ cm

$C = 2f = 2 \times 12.5 = 25$ cm, is the distance between the center and the curvature.

Knowing the physics of concave mirrors, it is known that LEDs must be placed between the center of curvature and the main focus to achieve a realistic and larger image.

Consider, the LED is set at a certain distance, $u = 22.5$ cm.

Height of LED, $h = 11.25$ cm

Knowing that, h' is the size of image and v is denoted by the image of distance, magnification tells us that,

$$m = \frac{h'}{h} = -\frac{v}{u} \dots\dots\dots (1)$$

Now, to find the distance v , know that,

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

$$\text{or } \frac{1}{v} = \frac{1}{f} - \frac{1}{u}$$

$$\text{or } = \frac{1}{12.5} - \frac{1}{22.5}$$

$$\text{or } = 0..3556$$

Or $v = 28.125$ cm

From the mathematical calculation, 28.125cm is the distance of image and get the image front of LED is 5.625 cm.

Now, placing the value of v , u and h in equation (1) get,

$$\frac{h'}{h} = -\frac{v}{u}$$

$$\text{or } h' = -\frac{vh}{u}$$

$$\text{or } = -\frac{28.125 \times 11.125}{22.5}$$

$\text{or } = -13.90$ cm, getting $-$ (minus) sign means, producing image is opposite than the real.

Solving the equation say that, new Image that produce its height is 13.90 cm and image is larger one than the size of LED is 2.625 cm.

Because of the concave mirror's features, a larger LED can project light at a greater angle than a smaller one, and a larger LED has more intensity. The enhanced image of LED will provide more angle and intensity in this case.

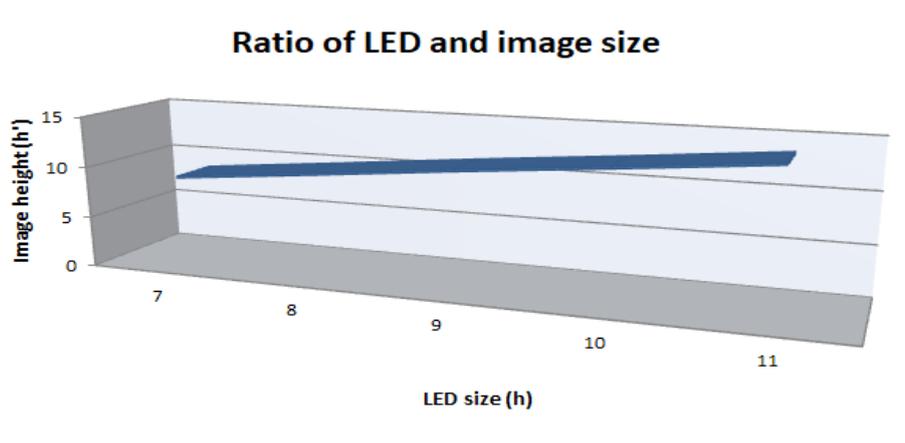


Figure 4.1: Proportion Between Sizes

From the figure 4.1, The image's height remains greater than the real LED size, as can be seen. The enhanced image is also built 5.625 cm ahead of the real LED, which enhanced the LDE's range of coverage. Simply put, it expands the range.

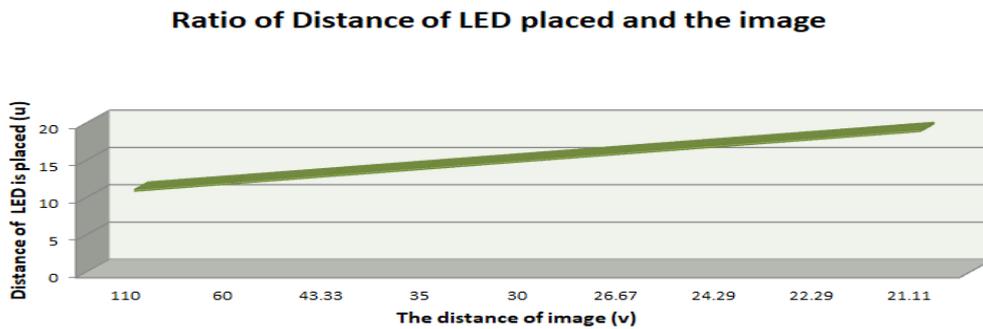


Figure 4.2: Proportion between Sizes of Image

Above figure 4.2 tell that, the concave mirror always delivers more space where the LED is put, as can be seen.

4.3 Increasing Covering Greater Area:

The shapes of light projection are a cone and inside a sphere of radius R, which is also the side of the cone, according to the characteristics of light and light projection.

Assume that, "h" denoted the height of cone's and "r" is defined as base of radius and define volume of the cone is,

$$V = \frac{\pi r^2 h}{3}$$

A 2D circle with radius r is a cone's base area. The radius of the base grows in lockstep with the angle.

Consider that, Two cones of equal height but distinct angles, implying differing base radius.

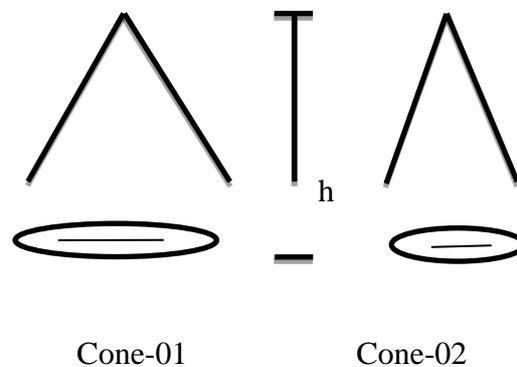


Figure 4.3: Cone with Different Angles

Consider for cone 01, h denoted as height and r define radius of the cone,

Height of cone, $h = 16\text{cm}$

Cones radius, $r = 6\text{cm}$

From equation, area, $A = \pi r^2$

$$\text{or } A = 3.1416 \times (6)^2$$

$$\text{or } = 113.0976 \text{ cm}^2$$

And volume $V = \frac{\pi r^2 h}{3}$

$$= \frac{3.1416 \times 6^2 \times 16}{3}$$

$$= 603.1872 \text{ cm}^3$$

Considering cone 02, but change is only radius but height is as previous,

Height, $h = 16\text{cm}$

radius, $r = 3\text{cm}$

Using previous equation $A = \pi r^2$

$$\text{or } A = 3.1416 \times (3)^2$$

$$= 28.2744 \text{ cm}^2$$

And $V = \frac{\pi r^2 h}{3}$, “V” denoted as volume

$$= \frac{3.1416 \times (3)^2 \times 16}{3}$$

$$= 150.7968 \text{ cm}^3$$

It can be deduced from solving above equation, that as it rising the angle, the area and volume will rise more as well. It can have said that, by using a mirror to acquire a wider angle, the angle will widen, covering more area and, in 3D, covering more room space. As a result, the Li-Fi range is automatically raised.

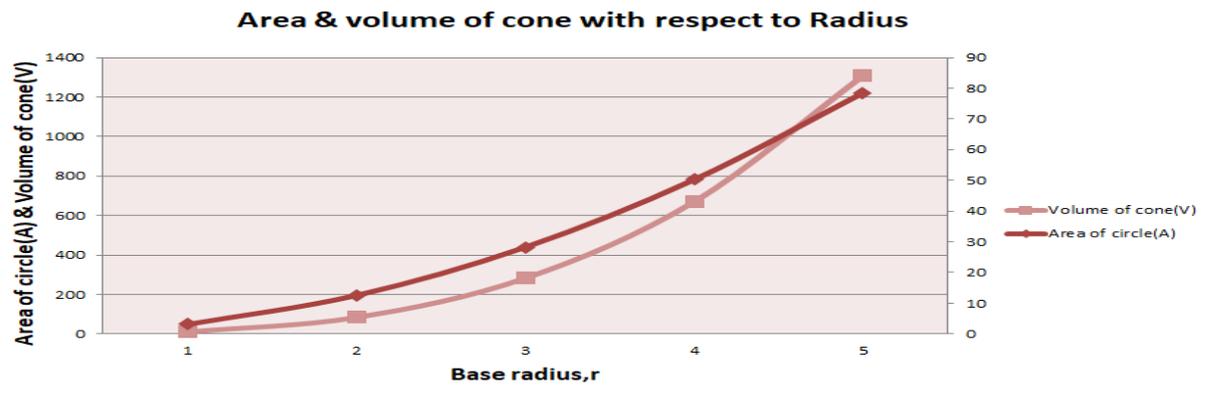


Figure 4.4: Comparisons of Area and Volume

Considering the figure 4.4. it will clear that, it can be observed that as the radius increases, so does the area and volume, and therefore the angle. As a result, it is evident that the angle will cover more space.

4.4 Conclusions

Enhancing the covering area of Li-Fi, proposed method in theoretical in previous and try to prove in mathematical ways. Find out the image and its length and comparing with normal position, find out the better and bigger image and find mathematical solution that's help to prove the mathematical solution of research.

CHAPTER 5

SYSTEM'S IMPACT IN LIFE

5.1 Introduction

Communication system is part of daily life. We use different communication system for communicate with others. Li-Fi is new technology of wireless communication. As a new technology, get some advantages as well as faces different problem. In this chapter, try to find out the impact in our life, society as well as environment.

5.2 Impact on Society

Now age of technology. There is new technology invented and replace by old. Wireless communication or Wi-Fi used most. But in Wi-Fi faces number of problem. Security, speed and many others. So solve this problem there is new technology, the update of Wi-Fi is Li-Fi. Li-Fi is more secure than Wi-Fi. If replace by Li-Fi than can get more speed and keep our data safe and sound. The use of Li-Fi also increase. The safety of data and private information will increase also. Li-Fi can used such places where Wi-Fi is also not used or use is not better like airplanes as well as traffic light. In Li-Fi because of use LED which can use in our home that's also save money for connection [7].

5.3 Impact on Environment

The whole world is now exposed with various levels of "Effects of Electromagnetic Fields" and the level of the fields will increase everyday by the advance of science and development and invention of new technology's. By the increasing use of wireless network, the mobile operators are install a big number of RBS. That's hits negative effect in human health. But in case Li-Fi, use LED and LED are normally used in house and office. So if LI-Fi used is increased the health effect will decrease [8][9].

5.4 Ethical Aspects

Li-Fi is a networking system. This system has no ethical aspect. It works on ways. But priority is safety and security of data and speed faster. In ethical side of networking, make using network more safe and secure. Data that using for different things, make if more secure and sound.

5.5 Sustainability Plan

To make system work properly and developing need sustainability plan. Our research only based on exiting system which has some limitation and try to solve this limitation and improve the existing system. To solve this problem, this research proposed a method and mathematical calculation that's try to prove the method which is proposed that can test in real life and sustainability plan is to test in real life in future.

5.6 Conclusion

Every develop system has impact in real life. Li-Fi is new developed system and it has impact in life, society and environment. Before use the system, learned the impact in life, society and environment. Then the system will have plan of action and executing this will make system in proper useable.

CHAPTER 6

SWOT ANALYSIS

6.1 Introduction

To develop a system, should focus on different things. To starting of build up a system, find out the possible ways of built the system and facing problems. By SWOT analysis, it is easy to find out strength of a system as well as weakness of system and the opportunity of system and the threat of the system. By SWOT analysis, it is more easy to find out those things and find the focusing thing of the system to build the system.

6.2 SWOT Analysis

SWOT analysis means discussing about the strength, weakness, opportunities and threats of any project, research work or any system develop. The reason for SWOT analyzing that, a system when it is built, facing problem and take caring area. It will help to find out the area which need more focused need and strength of the system. SOWT also help to work a system more organizing ways. By analyzing process regularly, find out the efficiency of system [10] [11].

6.2.1 Strength Analysis

Most of familiar with wireless communication. In wireless communication system, Li-Fi is the updated technology bring new era of data transfer and receive. Li-Fi use visible light for exchanging data. It is fasted and transmitted data fast than normal wireless communication. The speed range of Li-Fi, normal speed up to 15 Gbps and from different research suggest that speed reach up to 200 Gbs and it is more than Wi-Fi. Using area is another strength of Li-Fi, the place where Wi-Fi use not safe or not use in like traffic light, airplane etc. By theatrical, implementation of Li-Fi is cheaper than Wi-Fi [23] [24] [25].

6.2.2 Weakness Analysis

In era of advancing technology, new and updated technology are invented. In wireless communication, Li-Fi is new technology of this section. Li-Fi is new technology. As per research, the data passing through light but light can't pass through solid property. By using Li-Fi data can't pass through solid property. Li-Fi covers only 5 to meters but it is very little for real life [31].

6.2.3 Opportunity Analysis

Li-Fi in new system in area of networking. In new system, there terms and different things are not available all over. There is huge opportunity in working on Li-Fi. It is new area of wireless communication system. Number of research is possible on Li-Fi in this area of networking system. Work on security, data passing ways, speed and also implement in real life. Data passing through solid property is area of research [26].

6.2.4 Threat Analysis

In this modern era, new technologies are invented. For new technologies also have different problems. Li-Fi is new system and working process system. It probably better to say that, it is early days of research on Li-Fi. Li-Fi data pass through light. The threat is that data can't pass through solid component. The system installation in real life also threat. Make it more useable and reach in real life. It only covers 5 to 10 meters. Covering range of is not so big. Proposed method testing and set up is also threat [29] [30].

6.3 Conclusion

By SWOT analysis, it is easy to know about the system. If try to test Li-Fi in real life, it is easy to say what is strength and area of working and what type of problem facing. Li-Fi speed and security its strength and distance is its weakness. Increasing range of Li-Fi one of the area the can work on future and testing in real life facing difficulties [27].

CHAPTER 7

CONCLUSION

7.1 Conclusions

As it known that, the Li-Fi system not covering long distance. The use of Li-Fi will increased and the use of Li-Fi will speared all over the world. But when use of Li-Fi is speared all over the word, people face problem which Li-Fi speared in present. For this type of problem, people lose their interest in Li-Fi. This problem solvation will make Li-Fi system more popular among all over that word. To solve this problem, this research proposed system, where use of concave mirror is more beneficiary. Concave mirror and LED's are important part of this system. Right position LED and concave mirror, that will perfect for the system that will help to enhance covering area. Placement of LED plays important role in new proposed system. Perfect placing gives more angel and more coverage. More coverage will enhance the area of covering. Because of using concave mirror, possibility of getting big image with more angels. The image is getting from concave mirror with is full of light that will improve the covering because light is reached, the range of covering area. In present, by Li-Fi is develop for single but for big room need more LEDs. Designing method will applicable for big rooms as well as save the use of less LEDs and it is main aim of this research [28].

7.2 Further Suggested Study

It is discussed and proposed a method of enhancing the rage of Li-Fi. In present, it is known that, light source from LED is the main media for data passing for Li-Fi system. Lights are used only within room. Wireless communication like Wi-Fi routers are used for the more are coverage. So find ways for this problem. Light pass only free space but in front of rock solid this that cannot pass through. Try to find different ways for this situation. Newly design system that will test in real life. Increasing intensity level place important part and try to find different method which is easier than it is another point to research.

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