Shri Vithal Education & Research Institute's

COLLEGE OF ENGINEERING, PANDHARPUR

P.B.No.54, Gopalpur - Ranjani Road, Gopalpur, Pandharpur - 413304, **District:** Solapur (Maharashtra)
Tel.: (02186) 216063, 9503103757, **Toll Free No.:** 1800-3000-4131 **e-mail.:** coe@sveri.ac.in
Website.: www.sveri.ac.in (Approved by A.I.C.T.E., New Delhi and Affiliated to Solapur University, Solapur)
NBA Accredited all eligible UG Programmes, **NAAC** Accreditated Institute,ISO 9001:2015 Certified Institute.
Accredited by The Institution of Engineers (India), Kolkata and TCS, Pune.

Ref.:-   Date:-

1.3.3 Number of the student studied course on experimental learning through Project Work / Internship

Programme Name: M.Tech. Computer Science & Engineering			
Programme Code: 1-1408968341			
Year of offering: 2019-2020			
Sr. No.	Name of the Course that include experiential learning through project work/field work/internship	Course code	Number of the student studied course on experiential learning through project work/field work/internship
1.	Dissertation Phase I : Synopsis Submission Seminar		12
2.	Dissertation Phase II : ICA		
3.	Dissertation Phase II : Progress Seminar		05
4.	Dissertation Phase III : Progress Seminar		
5.	Dissertation Phase IV : Final presentation and submission of report		
6.	Final Submission of the Dissertation and Viva-voce		

PRINCIPAL,
College of Engineering
PANDHARPUR

Department of Computer Science and Engineering

List of Students Undertaking

Dissertation Phase-I: Synopsis Submission
Dissertation Phase-II: ICA
Dissertation Phase-II: Progress Seminar

Class: M. Tech-II

Academic Year-2019-20

Roll. No.	Name of Student
1	Ms. Kanchan Ichchharam. Chouhan
2	Ms. Akshta Sunil Jadhav
3	Mr. Khade Naganath Buvasaheb
4	Ms. Korke Snehal Rajendra
5	Ms. Vidya B. Maskar
6	Mr. Krishna Bharat Pise
7	Mr. Tushar Ramdas Bhosale
8	Mr. Shamsundar S. Bhimade
9	Ms. Ashwini S. Palkar
10	Mr. Saurabh M. Sirdeshmukh
11	Ms. Dhanashri V. Galande
12	Mr. Daiwan R Karade

P.G. Co-ordinator

HOD
Department of Computer Science & Engg
SVERI's C.O.E. Pandharpur

Department of Computer Science and Engineering

List of Students Undertaking

Dissertation Phase-I: Synopsis Submission
Dissertation Phase-II: ICA
Dissertation Phase-II: Progress Seminar
Dissertation Phase-III: Progress Seminar
Dissertation Phase-IV
Final Submission of the Dissertation and Viva-Voce

Class: M. Tech-II   Academic Year-2019-20

Roll. No.	Name of Student
1	Ms. Kanchan Ichchharam. Chouhan
2	Ms. Akshta Sunil Jadhav
3	Mr. Khade Naganath Buvasaheb
4	Ms. Korke Snehal Rajendra
5	Ms. Vidya B. Maskar

P.G. Co-ordinator

HOD,
Department of Computer Science & Engg
SVERI's C.O.E. Pandharpur

पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ, सोलापूर
Punyashlok Ahilyadevi Holkar Solapur University, Solapur
केगाव, सोलापूर - ४१३ २५५, महाराष्ट्र (भारत)

दुरध्वनी : ०२१७-२७४४४७६१/६२/६३/ (११ लाईन्स), फॅक्स : ०२१७-२३५१३०
संकेतस्थळ. http://su.digitaluniversity.ac/www.sus.ac.in ईमेल bcudpgbutr@sus.ac.in

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

विस्तारीत क्रमांक - १२३ , १२८, १२५

Ref No. PAHSUS/ARD/Ph.D.-I/2019/ 8307

Date: 31 OCT 2019

To,
The Principal,
SVERI's College of Engineering, Pandharpur,
Tal-Pandharpur, Dist-Solapur-413304.

Subject   :- Approval of M.E./M.Tech. Computer Sci. and Engineering Dissertation Title.
Reference :- RRC Meeting Dated 27/09/2019

Sir/Madam,

With reference to above Subject, I am directed to inform you that, Research & Recognition

Committee has accorded approval to the title of M.E./M.Tech. Computer Science and Engineering

Dissertation, as mentioned overleaf.

You are requested to bring the approval to the notice of concerned guide and students.

Thanking you.

Yours Faithfully,

(Assistant Registrar)
Research Development (Ph.D.-I)

Copy to :-
The Director,
Board of Examinations and Evaluation,
P.A.H., Solapur University, Solapur.

College of Engineering
Pandharpur.
Inward No...887
Date -......04)11)2019

To, HOD CSE
Please inform it to
your students and
respective guide.

P.A.H. SOLAPUR UNIVERSITY, SOLAPUR

Statement showing who have applied for M.E./M.Tech. Dissertation in subject of : Computer Science and Engineering   RRC Date: 27/09/2019

Sr. No.	Name of Students and Address	Batch	Name of Guide and Address	Topic of Research work	Recommendations of RRC (with reason)
1	Mr. Krushna Bharat Pise SVERI's College of Engineering, Pandharpur, Dist-Solapur-413304	M.Tech. July, 2018	Prof. S.M. Shinde SVERI's College of Engg. Tal-Pandharpur, Dist-Solapur	Supply chain management system using blockchain technology	Approved
2	Mr. Tushar Ramdas Bhosale SVERI's College of Engineering, Pandharpur, Tal-Pandharpur, Dist-Solapur-413304	M.Tech. July, 2018	Prof. S.M. Shinde SVERI's College of Engineering, Tal-Pandharpur, Dist-Solapur	Performance evaluation of predictive and prescriptive analytics on big data	Approved with Inclusion of Liteature review problem statement & proper methodology Suggestion: Problem statement has to be speaifed, Liteature review not in defail it should have papers refered & inference from them. System architecture has to be incluned methology is not properly given.
3	Ms. Vidya Balkrishna Maskar SVERI's College of Engineering, Tal-Pandharpur, Dist-Solapur	M.Tech. July, 2018	Prof. V.D. Jadhav SVERI's College of Engg. Tal-Pandharpur, Dist-Solapur	Clustering of fruits images based on color and shape using machine learning	Approved
4	Mr. Shamsundar S. Bhimade SVERI's College of Engineering, Tal-Pandharpur, Dist-Solapur	M.Tech. July, 2018	Prof. A.M. Dyade SVERI's College of Engg. Tal-Pandharpur, Solapur	Data sharing with fine-grained access control using block chain technology	Approved with inclusion of system architecture Suggestion : System architecture should be included in synopsis
5	Ms. Kanchan I Chouhan SVERI's College of Engineering, Pandharpur, Tal-Pandharpur, Dist-Solapur-413304	M.Tech. August, 2018	Prof. V.D. Jadhav SVERI's College of Engineering, Tal-Pandharpur, Dist-Solapur-413304	Implementation of smart voting through UID verification by using face recognition	Approved with change in title Suggestion title: Smart Voting through UID Verification using face Recognition
6	Mr. Naganath B. Khade SVERI's College of Engineering, Pandharpur, Tal-Pandharpur, Dist-Solapur-413304	M.Tech. August, 2018	Prof. S.M. Shinde SVERI's College of Engineering, Tal-Pandharpur, Dist-Solapur	Effective networking intrusion detection system using machine learning	Approved with suggestion for inclusion of system architecture Suggestion: Include system architecture / Block diagram in synopsis
7	Ms. Ashwini S. Palkar SVERI's College of Engineering, Pandharpur, Dist-Solapur-413304	M.Tech. July, 18	Prof. S.M. Shinde SVERI's College of Engg. Tal-Pandharpur, Dist-Solapur	Multilevel trust in privacy preserving data market by achieving data truthfulness	Approved

P.T.O.

Statement showing who have applied for M.E./M.Tech. Dissertation in subject of : **Computer Science and Engineering**   RRC Date:27/09/2019

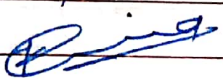| Sr. No.	Name of Students and Address	Batch	Name of Guide and Address	Topic of Research work	Recommendations of RRC (with reason)
8	Mr. Sourab M. Sirdeshmukh SVERI's College of Engineering, Pandharpur, Tal-Pandharpur, Dist-Solapur-413304	M.Tech. July, 2018	Prof. P.A. Satarkar SVERI's College of Engineering, Tal-Pandharpur, Dist-Solapur	Agriculture soil analysis, classification and crop suitability recommendation using machine learning	Approved
9	Ms. Snehal R. Korke SVERI's College of Engineering, Pandharpur, Tal-Pandharpur, Dist-Solapur-413304	M.Tech. July, 2018	Prof. A.M. Dyade SVERI's College of Engineering, Tal-Pandharpur, Dist-Solapur	Detecting phishing websites using machine learning	Approved with suggestion for inclusion of system architecture Suggestion: System architecture/ Block diagram should be included in synopsis
10	Ms. Akshata Sunil Jadhav SVERI's College of Engineering, Pandharpur, Tal-Pandharpur, Dist-Solapur-413304	M.Tech. August, 2018	Prof. P.A. Satarkar SVERI's College of Engineering, Tal-Pandharpur, Dist-Solapur	Performance improvement in Li-Fi based network	Approved
11	Ms. Dhanashri V. Galande SVERI's College of Engineering, Pandharpur, Tal-Pandharpur, Dist-Solapur-413304	M.Tech. August, 2018	Prof. A.M. Dyade SVERI's College of Engineering, Tal-Pandharpur, Dist-Solapur	Healthcare management system using blockchain technology	Approved with suggestion for inculsion of system architecture Suggestion: Inclusion of System architecture in Synopsis
12	Ms. Namrata B. Dhavare SVERI's College of Engineering, Pandharpur, Tal-Pandharpur, Dist-Solapur-413304	M.Tech. August, 2018	Prof. P.A. Satarkar SVERI's College of Engineering, Tal-Pandharpur, Dist-Solapur	Problem solving using VLC through Li-Fi networking	Approved with suggestion for inculsion of system architecture Suggestion: Inclusion of Block diagram or System architecture in Synopsis
13	Ms. Sonali Satish Kachare SVERI's College of Engineering, Pandharpur, Tal-Pandharpur, Dist-Solapur-413304	M.Tech. August, 2015	Prof. A.M. Dyade SVERI's College of Engineering, Tal-Pandharpur, Dist-Solapur	Proposed hybrid RSA algorithm for cloud computing	Approved with suggestion for inculsion of block diagram or system architecture in synopsis
14	Mr. Daiwan R. Karade SVERI's College of Engineering, Pandharpur, Tal-Pandharpur, Dist-Solapur-413304	M.Tech Aug. 2018	Prof. V. D. Jadhav SVERI's College of Engineering, Pandharpur, Tal-Pandharpur, Dist-Solapur-413304	Design of an Expert System for farmers by using data analysis and data mining concepts	Approved with change in Title Suggested title : An Expert System for Grop Predichan Using Machine Learning

The following staff member were present for synopsis presentation of our M.tech students @ 11.30 am on wednesday, 28/08/2019 at Dept. seminar Hall.

Name of faculty members:

1) Dr. N.D. Karande
2. Prof. P.A. Satarkar
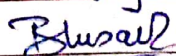
① Name of the student: Koushna Bharat Pise

Project title   : Supply chain management
Sign   system using Blockchain
Signature   :   Technology

② Name of the student :- Me. Sham Sadashiv Bhimade
Project Title :- Data shareing with fine-gerained
                    Access control using block chain Technology

signatuee : B.
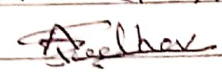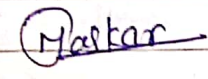
③ Name of the Student :- Mr. Tushar Ramdas Bhosale
Project Title : Performonce Evoluation of
                  Predictive and Prescriptive Analytics
              on Big Data
Signature : Bhosale
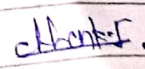
(4) Name of student :- Mr. Nagenath Burasaheb Khade.
Project Tittle : Effective Networking Intrusion
Detection system using machine
learning.
signature : Khade

(5) Name of student : Ms. Saurabh Manohar Sindeshmukh
Project Title : Agriculture soil Analysis, Classifica-
tion & crop suitability Recommenda-
tion using Machine Learning.
signature : Sukh

(6) Name of student :- Ms. Jadhav. Akshata Soni
Project title :- Performance Improvement
in Li-fi based Network
sig :- Jadhav

(7) Name of student :- Ms. Vidya Balkrishna Maskar

project title :- Clustering of fruits image
based on color and shape
using machine Learning.

Sign - Maskar

(8) Name of student - Ms. chouhan kanchan Iccharam

project title - Smart voting through UID
verification by using
face Recognition.

sign - chouhan.

8) Name q Student : Miss Kaeshare Sonali Satish

Project Title : Proposed hybrid RSA algorithm
for cloud computing ✓

Sign : [signature]

⑨ Name of Student : Ms. Korke Snehal Rajendra

Project Title :- Detecting phishing websites
using machine learning.

Sign :- Korkes.R

⑩ Name of student : Ms. Galande Dhanshri Vitthal

Project Title : Healtcare management system
using Blockchain technology

Sign : Galande.

⑪ Name of student : Namrata Baliram dhavane

project Title : solving problems using VLC
Through Li-Fi Networking.

Sign : Manraj

⑫ Name of student : Ashwini sudarshan palisor
project Title : Multilevel trust in privacy preserving
data market by Achieving data
Truthfullness.

sign : Aspalla

Following staff members were present for DP-III and DP-IV Presentation of our M.Tech student on online mode (google meet) on 22/08/2020 at 1:30 pm time. in ASL lab.

Name of faculty / student	sign
Prof. P. A. Satarkar	

Name of student - / Akshata Sunil Jadhav.

Title of project - Performance Improvement in Li-fi based network

Sign -

Date. - 22/08/2020

following staff members were present for DP-III and DP-IV presentation of our M.Tech student on online mode (google meet) on. 24/08/2020

→ Name of faculty / student   sign.

1) Proof. S.M. Shinde.   Shinde

2) Mrs. V. M. Sale   Sale

Name of student - Khade Naganath Buvasaheb

Title of project - Effective Networking Intrusion
                   Detection System using Machine learning

Sign KhadeNB
Date. 24/08/2020

Following staff members were present for DP-III and DP-IV presentation of our M-Tech student on online (google meet) on 23/08/2020

Name of faculty   sign

1) Prof - A.M. Dyade .   AD 00

Name of student - 1 Snehal Rajendra Korke

Title of project - Detecting fizing websites using machine learning

Date — 23/08/2020

Sign. KorkeSR.
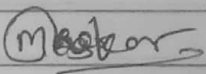
Following staff members were present for final DP-III & DP-IV presentation of our M.Tech student on online mode (google meet) on 21/08/2020

→ Name of faculty / student   sign

1) Proof. V.D. Jadhav   JV

Name of student — / Vidya. B. Maskar.
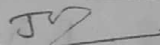
Title of project — clustering of fruits image based on colour and shape using machine learing

sign Maskar
Date 21/08/2020

following staff members were present for DP-III and DP-IV presentation of our M.Tech student on online mode (google meet) on 21/08/2020
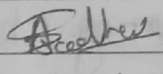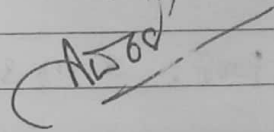
Name of faculty / student   sign

　　1) Prof. V. D. Jadhav   JV

Name of student - /Kanchan I. Chouhan
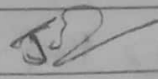
Title of project - Smart voting through UID verification by using face recognition

Sign   chhank I.
Date   21/08/2020
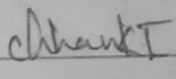
Following staff members were present for final presentation and viva-voce of our M.Tech student at 12.00 pm. in ASL Lab CSE Dept. on Saturday 21/11/2020 an online mode (google meet)

Sr. No.	Name of faculty members.	Sign
1)	Prof. N. D. Jadhav.	
2)	Prof. A. C. Admuthe	
3)	mr. V. M. Sale	
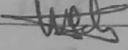
Name of student :- / Kanchan I. Chouhan

Title of project - Smart voting through UID
varification by using face recognition.

Sign.   ChhankI

Date - 21/11/2020.
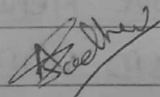
following staff members were present for final presentation and viva-voce of our M.Tech student at 01.00 pm in ASL Lab CSE Dept. on Saturday 21/11/2020 online mode (google meet)

Sr. No.	Name of faculty	Sign.
1)	Prof. P. A. Satarkar	
2)	Prof. A.C. Admuthe	
3)	Mr. V.M. Sale	

Name of student:- / Akshata S Jadhav

Title of project :- Performance improvement in Lifi based network

Sign

Date   21/11/2020

following staff members were present for final presentation and viva-voce of our M.Tech student at 12.00 pm in ASL Lab CSE Dept. on Monday 23/11/2020 online mode (google meet)

Sr.No.	Name of faculty members	Sign
1)	Prof S.M. Shinde	Shinde
2)	Prof - S.V. Patil.	
3)	Pro. N.M. sale.	sale

Name of
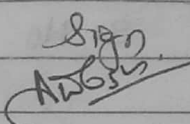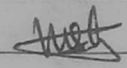
Name of student - Mr. Khade N.B.

Title of project - Effective Networking Intrusion Detection systems using machine learning.

Sign. Khade NB

Date - 23/11/20

following staff members were present for final presentation and viva-voce of our M.Tech student at 6.00 pm. in ASL lab CSE Dept. on Monday 23/11/20 online mode (google meet)

Sr. No.	Name of faculty member	Sign
1)	Prof. A.M. Dyade	Absent
2)	Prof. S.D. Khatavkar.	
3)	Mr. V.M. Sale	

Name of student - Ms. Snehal B. Korke

Title of project - Detecting fishing websites using machine learning

Sign - Korke S.R.

Date - 23/11/20

following staff members were present for final presentation and viva-voce of our M.Tech students on online mode (google meet) at 5.00 pm. on 01/12/20

Sr. No.	Name of student member.	Sign
1)	Prof. N.D. Jadhav.	J
2)	Dr. N.D. Karande	
3)	Mr. V.M. Sale.	

Name of student -- Ms. Vidya B. Maskar

Title of project - clustering of fruit image based on color and shape using machine learning

Sign (Maskar)

Date 01/12/20

SVERI's COLLEGE OF ENGINEERING, PANDHARPUR

CERTIFICATE

This is to certify that the synopsis entitled

"Smart Voting through UID Verification using Face Recognition"
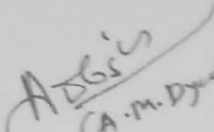
Has been submitted by

Miss. Kanchan Iccharam Chouhan

is hereby scrutinized and approved by **Computer Science and Engineering Departmental** PG synopsis approval committee and forwarded to Punyashlok Ahilyadevi Holkar Solapur University authorities for approval of PG synopsis.

Prof. V. D. Jadhav

(Guide)

(Mr. S. M. Shinde)

(Examiner-I)

(A. M. Dyade)

(Examiner-II)

(Panel of PG Dissertation Report Approval Committee)

Prof. V. M. Sale

P.G.Co-Ordinator

Dr. B. C. Melinamath

Head, CSE. Dept

Dr. B. P. Ronge

Principal

SVERI's COLLEGE OF ENGINEERING, PANDHARPUR

CERTIFICATE

This is to certify that the disseratation entitled

"Performance Improvement in Li-Fi based Network"

Has been submitted by

Miss. Akshata Sunil Jadhav

is hereby scrutinized and approved by **Computer Science and Engineering Departmental** *PG disseratation approval committee and forwarded to Punyashlok Ahilyadevi Holkar Solapur University authorities for approval of PG disseratation during the academic year 2019-20.*

(Prof. P. A. Satarkar)

Guide

(S. M. shinde)

Examiner-I

Examiner-II

(Panel of PG Dissertation Report Approval Committee)

(Prof. V. M. Sale)

P. G. Co-ordinator

(Dr. B. C. Melinamath)

Head, CSE. Dept.

(Dr. B. P. Ronge)

Principal

SVERI

SVERI's COLLEGE OF ENGINEERING, PANDHARPUR

CERTIFICATE

This is to certify that the synopsis entitled

"Effective Networking Intrusion Detection System Using Machine Learning "

Has been submitted by

Mr. Naganath Buvasaheb Khade

is hereby scrutinized and approved by **Computer Science and Engineering**

Departmental PG synopsis approval committee and forwarded to

Punyashlok Ahilyadevi Holkar Solapur University authorities for approval of

PG synopsis.
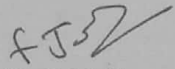
Prof. S. M. Shinde

(Guide)
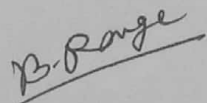
(Examiner-I)

(Examiner-II)

(Panel of PG Dissertation Report Approval Committee)

Prof. V. M. Sale

Dr. B. C.Melinamath

Dr. B. P. Ronge

P.G.Co-Ordinator

Head, CSE. Dept

Principal

SVERI

SVERI's COLLEGE OF ENGINEERING, PANDHARPUR

·CERTIFICATE
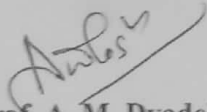
This is to certify that the dissertation entitled

"Detecting Phishing Websites using Machine Learning"
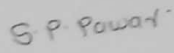
Has been submitted by

Miss. Snehal Rajendra Korke
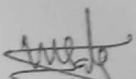
is hereby scrutinized and approved by **Computer Science and Engineering Departmental** *PG dissertation approval committee and forwarded to Punyashlok Ahilyadevi Holkar Solapur University authorities for approval of PG disseratation during the academic year 2019-20.*

(Prof. A. M. Dyade)

Guide
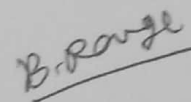
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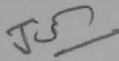
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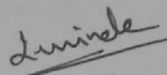
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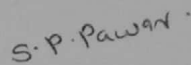
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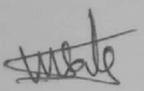
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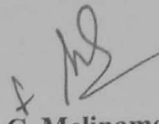
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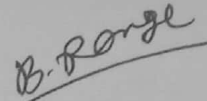
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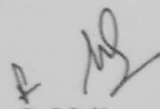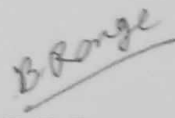## Statement of Grade for Faculty of Science & Technology-Master of Technology-Regular-Choice Based Credit System-Computer Science & Engineering-M.Tech.-II-Sem-IV
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7079302	Dissertation Phase-II ICA	3.00	O	10.00	30.00	E,X
7079303	Dissertation Phase-II Progress Seminar	3.00	O	10.00	30.00	E,X
7079304	Big Data	3.00	O	10.00	30.00	E,X
7079310	Cost Management of Engineering Projects	3.00	A+	9.00	27.00	E,X
Sem-III	**Credit: 15.00**	**EGP: 147.00**	**SGPA: 9.80**	**Status: Pass**		
7079401	Dissertation Phase-III Progress Seminar	3.00	O	10.00	30.00	E,C
7079402	Dissertation Phase-IV	6.00	O	10.00	60.00	E,C
7079403	Final Submission of the Dissertation and Viva-Voce	6.00	O	10.00	60.00	E,C
Sem-IV	**Credit: 15.00**	**EGP: 150.00**	**SGPA: 10.00**	**Status: Pass**		
Sem-III (Seat No: 825113 Exam Event: Oct-2019)						
	Total Credit: 15.00	EGP: 147.00	SGPA: 9.80	Status: Pass		
M.Tech.-I (Seat No: 960607 Exam Event: Mar-2019)						
	Total Credit: 44.00	EGP: 396.00	SGPA: 9.00	Status: Pass		
Cumulative	Total Credits : 74.00	Total EGP: 693.00	SGPA : 9.36	CGPA : 9.36	Status : Pass	
	Grand Total : 1937/2350	Equivalent Percentage : 82.43 %	Grade : A+ (Very Good)	Ordinance : Not Applied		

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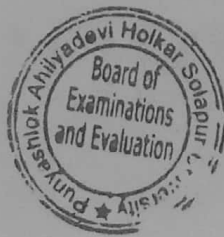
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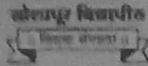
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7079303	Dissertation Phase-II Progress Seminar	3.00	O	10.00	30.00	E.X
7079304	Big Data	3.00	A+	9.00	27.00	E.X
7079310	Cost Management of Engineering Projects	3.00	A	8.00	24.00	E.X
Sem-III	Credit: 15.00	EGP: 141.00	SGPA: 9.40	Status: Pass		
7079401	Dissertation Phase-III Progress Seminar	3.00	O	10.00	30.00	E.C
7079402	Dissertation Phase-IV	6.00	O	10.00	60.00	E.C
7079403	Final Submission of the Dissertation and Viva-Voce	6.00	O	10.00	60.00	E.C
Sem-IV	Credit: 15.00	EGP: 150.00	SGPA: 10.00	Status: Pass		
Sem-III (Seat No: 825133 Exam Event: Oct-2019)						
	Total Credit: 15.00	EGP: 141.00	SGPA: 9.40	Status: Pass		
M.Tech.-I (Seat No: 960002 Exam Event: Mar-2019)						
	Total Credit: 44.00	EGP: 380.00	SGPA: 8.64	Status: Pass		
	Total Credits : 74.00	Total EGP : 671.00	SGPA : 9.07	CGPA : 9.07	Status : Pass	
Cumulative	Grand Total : 1825/2350	Equivalent Percentage : 77.66 %	Grade : A+ (Very Good)		Ordinance : Not Applied	

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7079303	Dissertation Phase-II Progress Seminar			3.00	O	10.00	30.00	E,X
7079304	Big Data			3.00	O	10.00	30.00	E,X
7079310	Cost Management of Engineering Projects			3.00	A	8.00	24.00	E,X
Sem-III	**Credit: 15.00**	**EGP: 144.00**	**SGPA: 9.60**	**Status: Pass**				
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	Total Credits : 74.00	**Total EGP : 674.00**	**SGPA : 9.11**	**CGPA : 9.11**			**Status : Pass**	
Cumulative	**Grand Total : 1806/2350**	**Equivalent Percentage : 76.85 %**		**Grade : A+ (Very Good)**		**Ordinance : Not Applied**		

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7079304	Big Data	3.00	O	10.00	30.00	E,X
7079310	Cost Management of Engineering Projects	3.00	A+	9.00	27.00	E,X
Sem-III	**Credit: 15.00**	**EGP: 147.00**	**SGPA: 9.80**	**Status: Pass**		
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Sem-IV	**Credit: 15.00**	**EGP: 150.00**	**SGPA: 10.00**	**Status: Pass**		

Sem-III (Seat No: 825138   Exam Event: Oct-2019)

	Total Credit: 15.00	EGP: 147.00	SGPA: 9.80	Status: Pass		

M.Tech.-I (Seat No: 960613   Exam Event: Mar-2019)

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Cumulative	Total Credits : 74.00	Total EGP : 689.00	SGPA : 9.31	CGPA : 9.31	Status : Pass	
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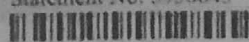
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Examination: Mar-2020

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7079310	Cost Management of Engineering Projects	3.00	B+	7.00	21.00	E,X
Sem-III	**Credit: 15.00**	EGP: 141.00	SGPA: 9.40	**Status: Pass**		
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7079402	Dissertation Phase-IV	6.00	O	10.00	60.00	E,C
7079403	Final Submission of the Dissertation and Viva-Voce	6.00	O	10.00	60.00	E,C
Sem-IV	**Credit: 15.00**	EGP: 150.00	SGPA: 10.00	**Status: Pass**		
Sem-III (Seat No: 825115 Exam Event: Oct-2019)						
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	Total Credits : 74.00	Total EGP : 683.00	SGPA : 9.23	CGPA : 9.23	Status : Pass	
Cumulative	Grand Total : 1878/2350	Equivalent Percentage : 79.91 %	Grade : A+ (Very Good)	Ordinance : Not Applied		

Abbreviations: Gr: Grade, SGPA: Semester Grade Point Average, CGPA: Cumulative Grade Point Average, EGP: Earned Grade Points, E: Exempted, C: Current Appearance, X: Past Performance, N: Not Exempted, UM: Unfair Means, FC: Fail in University Assessment, FR: Fail in College Assessment

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Department of Computer Science & Engineering

M.Tech. Project Sample Report

A.Y.: 2019-2020

A

DISSERTATION

ON

"Performance Improvement in Li-Fi based Network"

Submitted to

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Submitted by

Miss. Akshata Sunil Jadhav

In the partial fulfillment for the award of

M.Tech Computer Science and Engineering

Under the Faculty of Engineering and Technology

Under the Guidance of

Prof. P. A. Satarkar

Department of Computer Science and Engineering

SVERI's COLLEGE OF ENGINEERING, PANDHARPUR
2019-2020

SVERI's COLLEGE OF ENGINEERING, PANDHARPUR

CERTIFICATE

This is to certify that the disseratation entitled

"Performance Improvement in Li-Fi based Network"

Has been submitted by

Miss. Akshata Sunil Jadhav

is hereby scrutinized and approved by **Computer Science and Engineering Departmental** *PG disseratation approval committee and forwarded to Punyashlok Ahilyadevi Holkar Solapur University authorities for approval of PG disseratation during the academic year 2019-20.*

Prof. P. A. Satarkar

   (Guide)   **(Examiner-I)**   **(Examiner-II)**

(Panel of PG Dissertation Report Approval Committee)

Prof. V. M. Sale   **Dr. B. C. Melinamath**   **Dr. B. P. Ronge**

P.G.Co-Ordinator   **Head, CSE. Dept**   **Principal**

This dissertation entitled **"Performance Improvement in Li-Fi based Network"** being submitted by **Miss. Akshata Sunil Jadhav** to SVERI'S College Of Engineering, Pandharpur affiliated to Punyashlok Ahilyadevi Holkar Solapur University, Solapur is approved for the award of degree of **Master of Technology in Computer Science and Engineering.**

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DECLARATION

I certify that,

    a. The work contained in this project has been done by me under the guidance of my supervisor(s).

    b. The work has not been submitted to any other institute for any degree or diploma.

    c. I have followed the guidelines provided by the institutes in preparing the project report.

    d. I have conformed to the norms and guidelines given in the ethical code of conduct of the institutes.

    e. Whenever I have used materials (data, theoretical analysis, figures, and the text) from other sources. I have given due credit to them by citing them in the text of report and giving their details in the references. Further, I have taken permission from the copyrights owners of the sources, whenever necessary.

ACKNOWLEDGEMENT

I take this opportunity to express my deep sense of gratitude to my respected and complete guides **Prof. P. A. Satarkar Madam** for their valuable help and guidance, I am thankful to them for the encouragement to have given to complete the Project.

I am also great thanks to respect **Prof. B. C. Melinamath HOD (CSE)** and to respect Principal of our collage **Dr. B. P. Ronge**, **COE Pandharpur** for permitting to utilize all the necessary facilities of the institution. I am also thanks to all the other faculty & staff member of Computer Science Department for their kind co-operation and help.

Lastly, I like to express deep perception towards my M.Tech (CSE) classmates and indent less to my parents for providing to the moral support and encouragement.

Name of Students and Signature

(Jadhav Akshata Sunil)

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ABSTRACT

Light Fidelity (Li-Fi) is an Optical wireless communication (OWC) technology, which uses light from light emitting diodes (LEDs) as a medium to deliver network, mobile, high-speed communication in a similar manner to Wi-Fi. Li-Fi can be simply position to remain Wi-Fi but in its place of radio waves light is used as a medium.

Now, data is transmitting using light whose amount varies faster than human eye to capture. In its place of using modems, Li-Fi uses LED bulbs with transceiver. Data transmission in Li-Fi is about 100 times faster than Wi-Fi. OFDM stands and 4QAM,16 QAM ,32QAM,64QAM has been reported. BER v/s SNR curves are simulated to improve their performance using light fidelity network.

There are OFDM modulation technique using image transmit to transmission to receiver using QPSK and QAM or 4QAM, 16QAM, 32QAM, 64QAM using light fidelity network are improve their performance.

Keywords: Li-Fi, Simulink, OFDM, QPSK, 4QAM, 16QAM, 32QAM, 64QAM.

1. INTRODUCTION

1.1 Overview

The term was first used by Professor Harald Haas from University of Edinburgh, United Kingdom, in his TED global talk in 2011. Li-Fi knowledge rates as "one of 50 best inventions of 2011" on TED world site on the internet. The first project which explains the knowledge of Li-Fi was The D-Light project. It was funded from January 2010 to January 2012 at Edinburgh's Institute for Digital Communications by Professor Haas.

Here we show the history of Li-Fi:

- In 2011, Haas promoted this technology in TED global talk and helped start a company to market it.

- In October 2011, companies and industry sets formed the Li-Fi consortium, to promote high-speed optical wireless systems and to overcome the limited amount of radio-based wireless variety available by using a completely different part of the electromagnetic spectrum.

- In 2012, VLC technology exhibited by using Li-Fi Consortium.

- In October 2013, Chinese manufacturers work on Li-Fi development kits.

- In April 2014, the Russian establishment Stins Coman announced the development of a Li-Fi wireless local network called Beam Caster. Their current component transfers data at 1.25 Gbps.

What is Li-Fi :

Light Fidelity (Li-fi) or is a Visible Light Communications (VLC) system is a wireless communications travelling at very high speeds. Li-Fi usages common household LED (light emitting diodes) light bulbs to enable data transfer, boasting speeds of up to 224 gigabits per second.

The idea of Li-Fi was introduced for the first time by a German physicist Harald Hass in the TED (Technology, Entertainment, and Design) Global talk on Visible Light Communication (VLC) In July 2011, by referring to it as "data through illumination". Li-Fi can be supposed of as a light-based Wi-Fi i.e. in its place of radio waves it uses light to transmit data.

In place of Wi-Fi modems, Li-Fi would use transceivers that could be light a room as well as transmit and receive information.

Light Fidelity (Li-fi) or is a Visible Light Communications (VLC) system is a wireless communications travelling at a very high speeds. Li-Fi usages common household LED (light emitting diodes) light bulbs to enable data transfer, boasting speeds of up to 224 gigabits per second.

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Spectrum

In Li-Fi visible light communication spectrum is used to pass on information as there does much extra exiting in this spectrum, and it has the potential to pass on higher bandwidth.
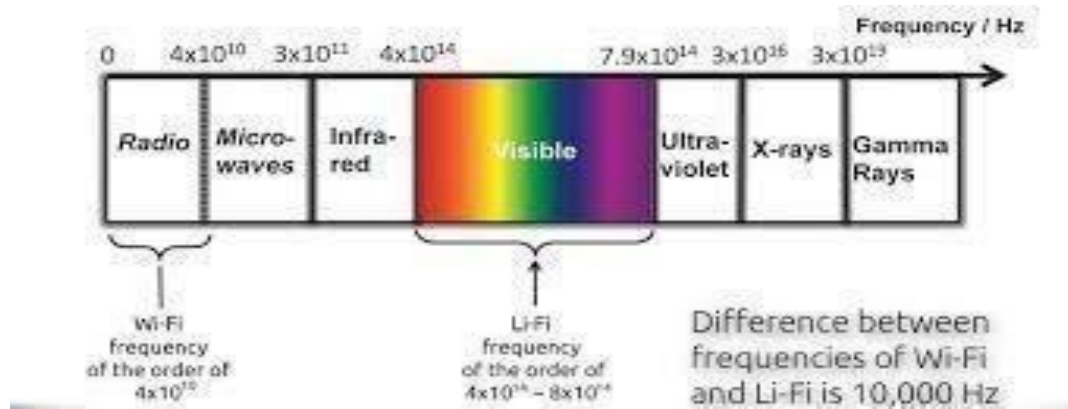
Fig 1: light spectrum for Wi-Fi or Li-Fi

There are light distribution follows:

- Gama rays can't be used as they could be dangerous.
- X-rays have similar health issues.
- Ultraviolet light is good for place without people, but otherwise dangerous for the human body.
- Infrared, due to eye safety regulation, can only be used with low power.

LED:

In this Technology, LED can be used to transfer binary coded information quickly by using visible part of spectrum. Total number of the world's light bulbs is projected at about 14 billion which can be used to obtain data transmission if we replace with LEDs

Speed:

For Wi-Fi we have rate restrictions for data transfer. Although, Li-Fi can offer enormously high-speed of the internet, and we can download massive files in just few seconds of time. The Speed for Li-Fi is 10,000 folds more than Wi-Fi larger than 1 Gbps can be achieved.

How Li-Fi Works?

There working of Li-fi as following. There are two basic components are used: LED Light Source & Light sensor (Photo-detector). The light basis is effort at one end and detector on another end. When LED bulb is on it starts glowing and the light sensor senses the light from light source and receives signals in the form of binary signals i.e. 1 or 0. When some data is transmitted over the network from the internet to the user device, it transmits over the network and flashing of LED bulb is an indication of the message and then photo detector sense light and receive the message and forward to its destination end as shown in.
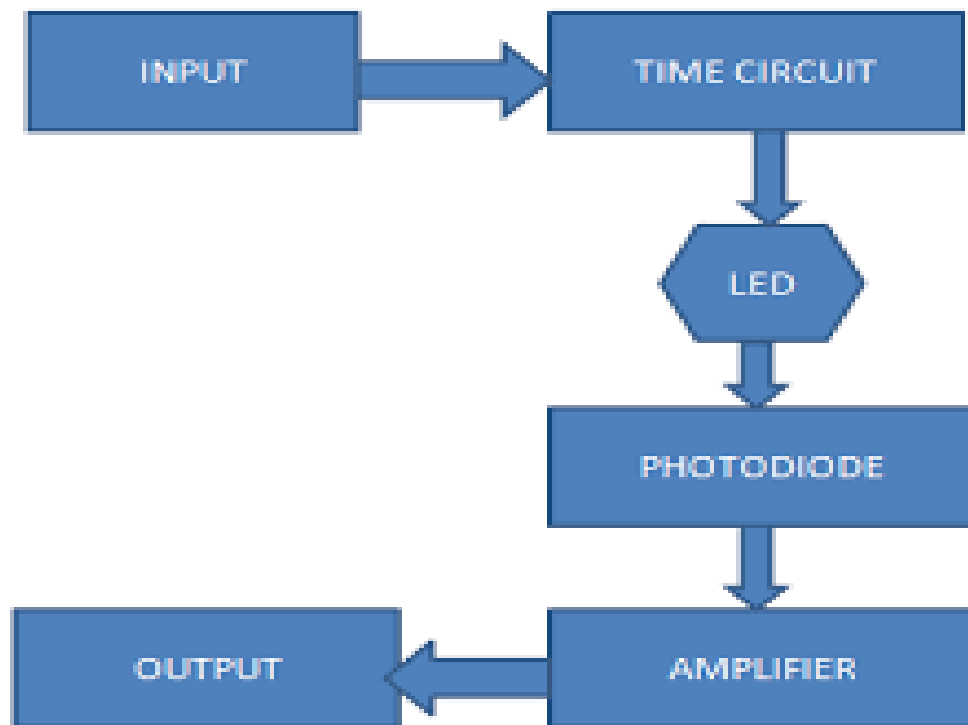
Fig 2:Main component of Li-Fi

▪ LED Lamp

▪ Photo Detector(Light Sensor)

- End-user Devices (Laptop, Computer, Mobile etc.)

- Optical Wireless Communication Protocols(OWC)

- Radio Frequency Signal's Amplifier

- Line of Sight Mechanism

More the brighter LED bulb, More frequently data will transmit light signals over the network and highly reliable.

1.1.2 Li-Fi Network

In light- Fidelity might be a wireless communication expertise, that is uses light to communicate information then situation among procedures.

Now this real-world passé Li-Fi is a light communiqué method that is skilled and transferring data at great quickness finished the visible light communication (VLC). On dealings of its completion users, the expertise are related to Wireless Fidelity the key procedural transformation existence that Wireless Fidelity uses to radio rate to communicate information. The area is struck by number of light fixtures, which deliver light for radiance. Every graceful is focused through a Li-Fi modem before a Li- Fi chip and, then, similarly works as per a visual improper location otherwise access point (AP). The optical wireless network positions are related to the core network by great rapidity backhaul networks. The mild fixtures additionally have an included electromagnetic sensor to acquire indicators since the stations.

The revealing light illuminations are controlled at in elevation amounts.

The resultant great radio rate of recurrence flickers which remain abundant developed than the recharge amount of a Laptop display are not evident to resident of the area influence as fine as records dismiss to each light fixture using a quantity of dissimilar methods [6].
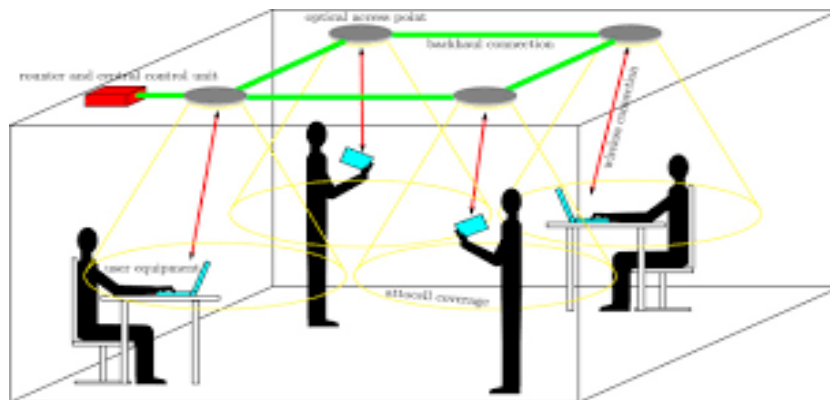
1.2 Comparison between LIFI and WIFI

The Li-Fi basically a visible light technology to achieve high speed wireless communication by using visible light to transfer data. Then similarly, to Wi-Fi which utilizes radio waves for transfer data.

Sr No	Parameter	LIFI	WIFI
1	Full Form	Light fidelity	Wireless fidelity
2	Operation	Transmits data using bits with help of light from LED Bulbs	Transmits data with help of radio waves with help of WIFI router
3	Security	Secure as light is blocked by walls.	Not secure as for RF signal dry walls are transparent
4	Interference	Do not have any Interference issue similar to radio waves	Has interference issue from nearby access points (routers)
5	Spectrum	The Spectrum range is 10000 times than Wi-Fi	It has radio spectrum range.
6	Frequency	100 times of Tera HZ	2.4GHz,4.9GHzand 5GHz
7	Speed	Fast speed internet	Comparatively slow speed
8	Cost	Cheap as LED lamps are used.	Quiet expensive.
9	System components	LED bulbs and light Detectors will form complete Li-Fi system.	Routers have to be to be installed devices Like laptops, PDAs, desktops are called as stations.

10	Data transmission rate	Very high rate of data transmission due to visible light spectrum	Transmission rate is slow as compared to Li-Fi as RF is used to communicate.
11	IEEE Standard	802.15.7	802.11b
12	Network Topology	Point To Point	Point To Multipoint

Advantages:

1. It is based on LEDs or other light sources for the transfer of data.
2. The Light has 10000 times wider bandwidth than radio waves.
3. There are data transmission using Li-fi is very cheap.
4. There are billions of light bulbs worldwide; they just need to be replaced with LEDs for proper transmission of data.

Disadvantages:

1. The use of high frequencies (400-800Hz) limits it to very short distances & point to Point communication only.
2. A high speed moving object and to provide data in a remote area where there are trees.
3. They are only works if there is direct line of sight (LOS) between the transmitter and receiver.

Future Scopes

1. We usages MOSFET instead off BJT FOR high switching purposes
2. We usage CMOS sensor instead off LDR for greater response
3. It is possible to achieve more than 10Gbps of speed, theoretically, which would allow a high-definition film to be downloaded in just 30 seconds.

Application:

There are some future applications of Li-Fi:

1. Learning Systems: The Li-fi is the latest technology that can provide fastest speed Internet access.

2. Health Applications: The Li-fi can be used to accessing internet and to control medical equipment.

3. Underwater application: Underwater communication use of radio frequencies (RF) and use of sound waves is impractical due to strong signal absorption. The Li-fi can be working in such cases for underwater communication.

4. Adversity Management: Li-fi can be used as a powerful means of communication in times of disaster such as earthquake or hurricanes & tunnels, common dead zones for most emergency communications, pose no obstruction for Li-Fi.

5. Transportation Management: In transportation motions Li-fi can be used which will communicate with the LED lights of the cars which can help in managing the Transportation in a better method and the mishap numbers can be decreased.

6. Public internet access through street lamps: It means that the any light able to spread internet using visual light communication which helps us to low cost architecture for a hotspot.

7. Harmful Environments: The Li-Fi is a safe another to RF communication in environments such as mines and petrochemical plants which are vulnerable to electromagnetic interferences.

8. Airplanes: The RF waves can cause interference with the radio of the pilot. Consequently to overwhelm this difficult Li-Fi can be used. Likewise the passengers have to pay a huge amount of money for the "service "of dial-up speed Wi-Fi on the plane. Li-Fi could easily solve this problem.

11 Radio Broadcast:- A large amount of power is required by radio masts in order Broadcast and this makes them quite inefficient. LEDs on the other hand require very low power to operate & this means that Li-Fi also uses very little power.

1.1.4 Visible Light Communication (VLC)

VLC is a data communication medium, which uses visible light between 400THz (375nm) as optical carrier for data transmission and illumination. Fast pulses are used for wireless transmission. Communication system components are:

- A high intensity white LED which acts as a communication source.
- A Silicon photo diode which shows good reply to visible wavelength Region.
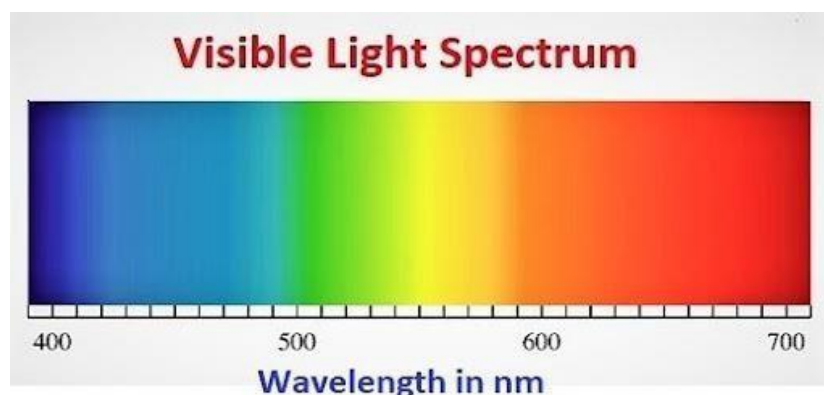
Fig 4 : Visible Light Communication

LED illumination can be used as a communication source by modulating the LED light appears constant to the human eye due to the fast flickering rate. The high data speed can be achieved by using high speed LED"s and appropriate multiplexing techniques each LED transmits at a different data speed which can be increased by parallel data transmission using LED arrays. Many different reasons exists for the usage of LED light in spite of fluorescent lamp, incandescent bulb etc. which are available [1].

1.1.5   Modulation Technique for Li-Fi

Li-Fi relies on electromagnetic radiation for information transmission. According to On–Off Keying Pulse Position Modulation, Pulse Amplitude Modulation, M-Quadrature Amplitude Modulation, Variable Pulse Position Modulation, Optical Spatial Modulation, Pulse Width Modulation, and Carrier – less Amplitude and Phase Modulation are single-carrier modulation. Orthogonal Frequency Division Multiplexing, Direct Current Optical Orthogonal Frequency Division Multiplexing, Asymmetrically Clipped Optical Orthogonal Frequency Division Multiplexing, Unipolar Orthogonal Frequency Division Multiplexing Pulse-Amplitude Modulated Discrete Multitude Modulation are multi-carrier modulation. Super position OFDM, Hybrid and other MCM are applied in Li-Fi [14].
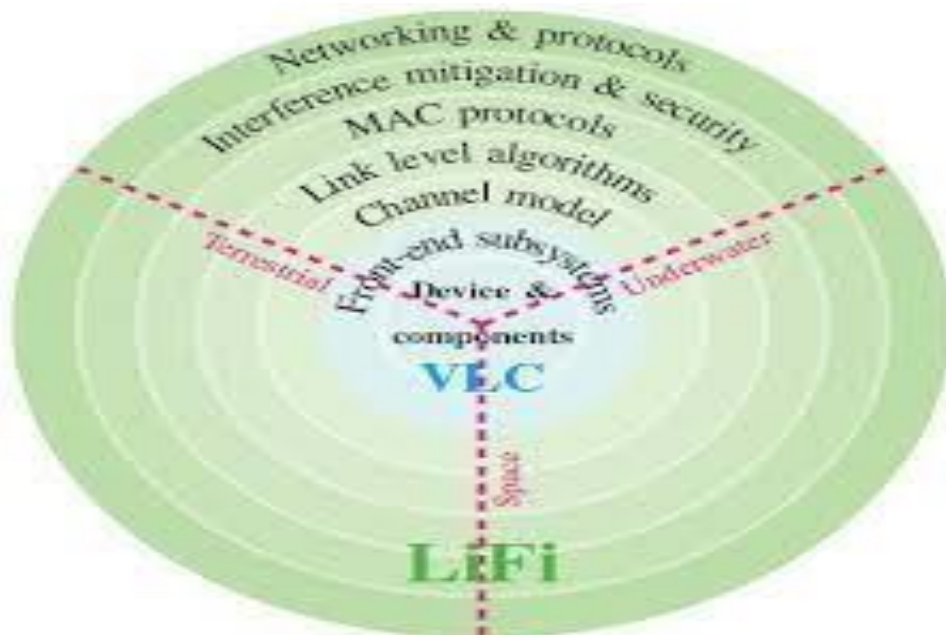
Fig 5 : Modulation Techniques for L-fi

A. Single carrier modulation

The single carrier modulation techniques in Li-Fi are visit appropriate to the low-to-moderate data rate applications. First proposed for IM/DD optical wireless communications in single-carrier modulation techniques is based on infrared Communications. The variety of LED flashes as "on" And "off" states are bits which are modulated into the light intensity. The illumination is controlled by the light intensity between the "on" and "off" states. Modulation techniques Such as On–Off Keying, Pulse Position Modulation, Pulse Amplitude Modulation, M-Quadrature Amplitude Modulation, Variable Pulse Position Modulation, Optical Spatial Modulation, Pulse Width Modulation, and Carrier – less Amplitude and Phase Modulation are implemented in Li-Fi.

1. On-Off Keying

OOK provides a useful trade-off between system performance and complexness and it is one amongst the well-known and simple modulation schemes .The presence and absence of the carrier wave can be represented digitally by the On-Off Keying techniques. The LED maintains a constant rate. The communication may vary at the time of low dimming levels of the LED bulbs.

Amplitude shift keying

Amplitude Shift Keying modulation technique denotes digital data as disparities in the amplitude of a carrier wave. ASK two different amplitudes of carrier frequency represent zero and one. This can call as On-Off Keying. The amplitude of a wave can be speckled based on the signal. Frequency and phase of the signal in ASK are persistent.

Frequency shift keying

Digital data is transmitted through discrete frequency variations of a carrier signal which is denoted as frequency modulation. FSK allows the changes in the frequency of a carrier signal whenever the digital information is transmitted. Frequency-Shift Keying has two binary states, logic zero (low) and one high and one (high) and a logic zero has described a wave at a selected frequency, and logic one is represented by a wave at a distinct frequency.

Phase shift keying

Phase-shift keying (PSK) is a digital modulation scheme that conveys data by modulating the phase of a carrier wave. In binary PSK signal with message symbol, 1and 0 are transmitted by two different phases two different phases. Symbol „0" is transmitted with 0 phase change in carrier signal and Symbol „1" is transmitted with the phase shift in the carrier.

Binary phase shift keying

BPSK is also usually referred to as Phase reversal keying, or 2PSK.BPSK is the best form of Phase-Shift Keying. BPSK uses two phases are separated by 180° which is called as 2-PSK. The signal state can change from 0 to 1 or 1 to 0, then the phase of the wave changes by 180 degrees. It is capable to modulate at 1 bit /symbol and it is more robust. The constellation diagram for BPSK is two constellation points wholly positioned on the in-phase. No projection on the quadrature.

Quadrature Phase Shift Keying

Quadrature Phase Shift Keying (QPSK) is a form of phase modulation technique, in which two information bits (combined as one symbol) are modulated at once, selecting one of the four possible carrier phase shift states. QPSK allows the signal to carry twice as much information as ordinary PSK using the same bandwidth.

In the QPSK it is based on BPSK is conversion of digital bits into a series of digit stream it convert them into bit pair. These decrease the data bits. The decrease the data bits rate half which allow space for other users Thus in QPSK, the carrier undergoes four changes in phase. Each phase conversion can represent two binary bits of data. The idea of this method is that the carrier can transmit two bits of data instead of one, so the bandwidth of the transmission has effectively doubled. If a digital signal is used as the input to a straight frequency modulator, the output will consist of a sine wave containing two distinct frequencies.

1   M-pulse amplitude modulation

PAM is a modulation technique where the amplitude of pulse varies equivalently with the amplitude of the analogical signal and the width and position of pulse are constant. The parameter M is the range of points in the signal constellation. It should be an even integer. A PAM modulation system in which the signal is appraised at regular intermissions and every sample is formed related to the amplitude of the signal at the moment of sampling .

2 M-quadrature amplitude modulation

QAM is a modulation technique where its amplitude is allowed to vary with the phase. The modulation of the amplitudes of two carrier waves conveys two digital bit streams which is called QAM. The two carrier waves are the identical frequency unit of phase with one another by 90 degrees is called as orthogonally quadrature The main advantage of QAM is blend of two amplitude modulated signals in the identical channel. In QAM, amount of the bandwidth is doubles, thus construction it more efficient. In, QAM there are many various points which will be used, they are a definitive value of phase and amplitude. This is often referred as a constellation diagram. The constellation points are generally organized in an exceedingly square grid. The constellation will have a square with the number of points adequate to an influence of two i.e. 4, 16, 32, 64 i.e. 4 QAM, 16QAM, 32QAM, 64QAM, etc. The process flow to simulate the single carrier modulation.

Pulse width modulation

In modulated signal (PWM), the width of pulses varies proportionally with the amplitude of the al and the amplitude, position of pulses are remains constant. Pulse Width Modulation is an approach of dropping the common power delivered by an electrical signal, by successfully chopping it up into distinct components. The period of time the signal is during in on the state as a percentage of the complete time to finish one cycle is referred to as duty cycle.

Multi carrier modulation

Multi-carrier modulation techniques such as OFDM can convert the frequency discerning fading of the communication channel into a smooth fading which is computationally effective. According to Multi-carrier Modulation includes Orthogonal Frequency Division Multiplexing, Direct Current Optical Orthogonal Frequency Division Multiplexing, Asymmetrically Clipped Optical Orthogonal Frequency Division Multiplexing, Unipolar Orthogonal Frequency Division Multiplexing, Asymmetrically Hybrid Optical Orthogonal Frequency Division Multiplexing, and Pulse-Amplitude-Modulated Discrete Multitude Modulation etc...,

Orthogonal frequency division multiplexing

The encrypting digital data on several carrier frequencies is referred as Orthogonal Frequency Division Multiplexing. OFDM is a frequency-division multiplexing (FDM) is employed as a digital multi-carrier modulation method . In the source, the serial data is transformed into parallel form and then the 16-QAM modulation is applied. IFFT is used to change the frequency into the time domain signal. Next AWGN noise can be passed to the channel. On the receiver side, FFT is applying to convert time domain into frequency domain signal. Demodulation is applied to it. Finally, the recovered signal is found again by passing its parallel to serial converter.

1.1.6 Architecture of Li-Fi

In a layered architecture, Li-Fi consists of three stage application layer, MAC layer, and Physical Layer. IEEE 802.15.7 explains solitary two standards, i.e. PHY and MAC layer.

A. Physical layer

Transmission and Reception, detection of the state of the channel whether it is idle or busy, activation and deactivation of optical transceiver are main responsible of PHY layer. The variants of every operation mode are shown in Table

Operation Mode	Category	Rate
PHY-I	LOW	11.6 Kbps – 266.6 Kbps
PHY-II	MODERATE	1.25 Mbps – 96 Mbps
PHY-III	CSK MODULATION	12 Mbps – 96 Mbps

B. Mac layer

The tasks performed by Medium Access Control [MAC] layer contain Mobility support, Dimming support, , Security support, Schemes for mitigation of flickering, Visibility support, Color function support, VPAN disassociation and association support, Network beacons generation if the device is a coordinator delivering a consistent link between two peer MAC entities. Peer to Peer, star, and broadcast are outlined in MAC layer.

- Peer to Peer- Two devices are communicated, one amongst them is acting as a coordinator.
- Star- Many devices are communicated. One is acting as a coordinator and its castoff as an illumination infrastructure.
- Broadcast-A co-ordinator sends data to many devices. Communication is a unidirectional way.

C. Propagation layer

Line Of Sight and Non-Line Of sight are the characterized by the propagation layer. The unclogged path is obtainable between the source and the destination is a LOS condition. In NLOS channel light is spread via reflections from walls and ceiling

1.2 Problem Statement

There are following issues are related problem statement of Li-Fi.

1. Li-Fi requires line of sight (LOS) and receiving device would not be shift in indoors.
2. A major challenge is how receiving device will transmit data back to transmitter.
3. Data transmission can be easily obstructed by opaque obstacles.

1.3 Choice of topic with Reasons of Li-Fi

1. The Light is useful to transmitting the data in Li-Fi.
2. It is high-speed which is 100 times faster than Wi-Fi, More Effectual, accessibility and security.
3. Light gets stopped up due to any object; therefore it provides greater security may be achieved.
4. Li-Fi is a class in Optical Wireless Communication.
5. A unique feature of Li-Fi is that it combines illumination and data communication.
6. The Aims of Li-Fi few areas, Distance, Cost and Traffic Updates.

2. TECHNICAL KEYWORDS

Wi-Fi	Wireless Fidelity
Li-Fi	Light Fidelity
OWC	Optical Wireless Comunication
OFDM	Orthogonal Frequency division multiplexing
PSK	Phase Shifting Keying
QPSK	Quadrature Phase Shifting Keying
QAM	Quadrature Amplitude Modulation
IFFT	Inverse Fast Fourier Transform
SNR	Signal-to-Noise Ratio
FFT	Fast Fourier Transform
AWGN	Additive White Gaussian Noise Channel
BER	Bit Error Rate

3. LITERATURE REVIEW

Farooq Aftab[1] el al, performed a work "Potentials and Challenges of Light Fidelity Based Indoor Communication System" Here author described the paper discusses key potentials of Li-Fi based indoor communication system and point out the challenges which indoor based Li-Fi network is facing under the knowledge of existing research work in the field of Li-Fi.

M. A. Hadi [2] el al, performed a work "Wireless Communication tends to Smart Technology Li-Fi and its comparison with Wi-Fi" Here author described the introduced a technique to cope up with this problem by sending data through an LED light bulb that varies in intensity even faster than the human eye can follow. Tend to the investing the "Li-Fi", or "Light Fidelity". Li-Fi is basically the subset of visible Light Communication (VLC), uses LED bulbs as hot-spots and provides higher data rates than Wi-Fi. It"s the same idea band behind infrared remote controls but far more powerful. Li-Fi is the term some have used to label the fast and cheap wireless-Communication system, which is the optical version of Wi-Fi.

Akash Gupta, Parul Garg [3] el al, performed a work "Hybrid LiFi - WiFi Indoor Broadcasting System" Here author described this paper we investigate the performance of hybrid Radio Frequency/Visible Light communication (RF/VLC) downlink system as indoor broadcasting system. This combination of RF and VLC systems have a significant merit, since the VLC system provides high data rates along with illumination and RF system provides pervasive coverage. The proposed heterogeneous system will augment the spatial throughput distribution of indoor VLC system.

Iness AHRIZ, Jean-Michel DOUIN [4] el al, performed a work "Performance Evaluations in Optical and Wireless Networks for CONDOR project" Here author described Wireless and optical networks are widely used nowadays. These networks offer a high throughput thanks to their optical link and allow the development of multiuser applications. Because the network performance is an important issue to provide services to a great number of users while assuring users" quality of service requirements, CONDOR (Contribution à la Diffusion de l"histOiRe du traitement de l"information à l"aide du réseau de demain) project aims to evaluate the wireless and optical networks" performances in terms of link quality, throughput, jitter and delay. Our

results show that a high throughput in optical and wireless networks supports a big load through the launched mobile applications while P2P wireless network connections upset some video applications.

Maged A. Esmail, Habib A. Fathallah [5] el al, performed a work "Indoor visible light communication without line of sight: investigation and performance analysis" Here author described in this paper, we investigate the possibility to establish VLC links in shadowed areas, i.e., where the line of sight is blocked or unavailable. First, we study the system performance in terms of received power, SNR, BER, and rms delay spread.

Wentao Zhang, Xiaohui Chen, Zihao Yu, Zhiyuan Li, Weidong Wang [6] el al, performed a work "Design and realization of indoor VLC-Wi-Fi hybrid network" Here author described Indoor wireless communication networking has received significant Attention along with the growth of indoor data traffic. VLC (Visible Light Communication) as a novel wireless communication technology with the advantages of a high data rate, license-free spectrum and safety provides a practical solution for the indoor high-speed transmission of large data traffic. However, limited coverage is an inherent feature of VLC. In this paper, we propose a novel hybrid VLC-Wi-Fi system that integrates multiple links to achieve an indoor high-speed wide-coverage network combined with multiple access, a multi-path transmission control protocol, mobility management and cell handover. Furthermore, we develop a hybrid network experiment platform, the experimental results of which show that the hybrid VLC-Wi-Fi network outperforms both single VLC and Wi-Fi networks with better coverage and greater network capacity.

Xiping Wu, Majid Safari, Harald Haas [7] el al, performed a work, "Access Point Selection for Hybrid Li-Fi and Wi-Fi Networks" Here author described Hybrid light fidelity(Li-Fi) and wireless fidelity(Wi-Fi) networks are an emerging technology for future indoor wireless communications. This hybrid network combines the high speed data transmission offered by visible light communication (VLC) and the ubiquitous coverage of radio-frequency (RF) techniques. While a hybrid network can improve the system throughput and user experience, it also challenges the process of access point selection (APS) due to the mixture of heterogeneous access points (APs). In this paper, the differences between homogeneous and heterogeneous networks regarding APS are discussed, and a two-stage APS method is proposed for hybrid Li-Fi/Wi-Fi networks.

Neha Chaudhary, Luis Nero Alves, Zabih Ghassemblooy [8] el al, performed a work "Current Trends on Visible Light Positioning Techniques" Here author described The paper briefly reviews conventional positioning methods based on Rx signal strength (RSS), time difference of arrival (TDOA) and angle of arrival (AOA). Then it focuses on the current research trends, relying on the machine learning techniques, sensor fusion and communication requirements.

Nasir Saeed, Abdulkadir Celik [9] el al, performed a work "Underwater optical wireless communications, networking, and localization: A survey" Here author described challenges for UOWCs and significantly reduce the attainable communication ranges which necessitates efficient networking and localization solutions. Therefore we provide a comprehensive survey on the challenges, advances and prospects of underwater optical wireless networks (UOWNs) from a layer by layer perspective which include physical layer, data link layer, Network layer, Transport layer, Application layer.

Damanjeet Kaur, Abirbhav Mukherjee [10] el al, performed a work, "Simulation of Dimmer Circuit for Daylight Harvesting" Here author described in this paper, a fuzzy based dimmer circuit model for daylight harvesting is proposed. The model incorporates the variable daylight intensity and number of occupants in a room. The dimmer circuit controls the switching ON and Off LEDs (light emitting diode) in a room corresponding the daylight intensity and occupants while the required level of illumination is maintained. The uncertainty in input variables are incorporated in the model with the fuzzy logic. The developed model is simulated in MATLAB and LABVIEW environment. The developed model is tested for different situations

Sergio Sandoval-Reyes [11] el al, performed work "Transmission and Reception of Images via Visible Light" Here author described In this paper an application based on VLC using OOK (On-Off Keying) modulation, to transmit color images from a Raspberry Pi computer (using Python as the programming language), and several modules (LEDs and a sensor light) from Little Bits.

Vyom Shah , Disha Purohit , Prajakta Samant [12] el al performed work "2D Image Transmission using Light Fidelity Technology" Here author described In this paper, Wi-Fi deals with wireless coverage within premises, whereas Li-Fi is perfect for high compactness wireless data coverage in controlled area and for mitigating radio interference issues. In Li-Fi basically we focus to transmitting multimedia data between two terminals using LEDs.

Aishwarya Hamand, Sunil Kuntawar [13] el al performed work "An Approach towards High-Speed Communication Using LI-FI Technology" Here author described In this paper designed a prototype Li-Fi system. We successfully achieved the output in the form of audio, data and b/w image. We create bride with IOT, so we can access the LI-FI technology from anywhere.

Ms. Bhagyashree M. Mishras, Dr. V. M. Deshmukh [14]   el al performed work "Image Encoding & Decoding Using Base64 Technique and its Wireless Transmission Using Li-Fi"Here author described in this paper Li-Fi is one of the advanced and fastest technologies among other available data transmission technologies in the world of data communication. The high bandwidth and immunity to interference ability of Li-Fi makes it unique from other available wireless technologies. It could be used in areas where high data transfer is much required and other wireless technologies are restricted due to their hazardous signal radiations. It could be useful in variety of application including audio transmission, video transmission, text transmission and image transmission. Li-Fi communication is also called as the Visible Light Communication (VLC) since we make the use visible light for transmitting the data from transmitter to receiver. In this article a prototype is designed to transfer a 2D image using UART serial communication from one PC to another PC using VLC.

Filip Čertík [15] el al performed work "USING MATLAB TOOLS FOR SIMULATION OF THE OPTICAL TRANSMISSION MEDIUM" Here author described in this paper includes a calculation part of nonlinear effects and a simulation part where the signal is examined in a real - time. This program deals with different types of modulation techniques and with characteristics of the optical environment.

4 TECHNICAL DETAILS

HARDWARE   REQUIREMENT

System: AMD E1- 1200 APU with Radeon (tm) HD   Graphics 1.40GHz Hard Disk: 250GB
RAM: min 4.00GB
Monitor: 15″″″ black color Mouse: Logitech

SOFTWARE REQUIREMENT

Operating System: Windows 10
Front-end: MATLAB R2017a
Back-End: Simulink

5 OBJECTIVES

1 To study Li-fi information achieves much faster rate of communication with direct line of sight.

2 To study various points to point to point communication improve wireless network performance.

3 To study various optical communication technique to communicate between sender and Receiver.

6. BASIC SYSTEM ARCHITETURE

6.1 Outline of System

1. Transmitter
2. Receiver
3. Modulation Technique

Explanation of Following System work

The system architecture consists of a transmit section and a receive section

Transmitter

The transmit section consists of the data as input the user sends image as converts to modulation technique Q PSK, 4QAM,16QAM,32QAM, 64QAM combine OFDM modulation based on data generate a stream 1s and 0s thereby encoding the data in binary.

Receiver

The Receiver section consists of the data as output decoding the received data is done at the receiver computer using MATLAB R2017a program. The received image as Q PSK, 4QAM, 16QAM, 32QAM modulation technique. The IFFT and FFT of the AWG channel use transmit data.

Modulation Technique (OFDM)

The demand for high-speed wireless technology and limited RF signals bandwidth is increasing day by day. There are new uses are emerging, not just in the wired systems, but also in the wireless mobile systems. At present-day, only low rate data services are available for mobile applications.

Though, there is a demand for high data rates for multimedia applications. OFDM is a technique of converting digital signal data on multiple carriers frequency, and it takes several low data rate frequency channels, and then combined them into one high data rate frequency channel.

6.2 System Architecture

```
┌──────────┐     ┌──────────────┐     ┌──────────┐
│          │     │ Modulation   │     │          │
│ Data In  │────▶│ QPSK, QAM    │────▶│  IFFT    │
│          │     │              │     │          │
└──────────┘     └──────────────┘     └──────────┘
                                                  │
                                                  ▼
                                          ┌──────────┐
                                          │          │
                                          │  AWGN    │
                                          │ Channel  │
                                          │          │
                                          └──────────┘
                                                  │
                                                  ▼
┌──────────┐     ┌──────────────┐     ┌──────────┐
│          │     │ Demodulation │     │          │
│ Data Out │◀────│ QPSK, QAM    │◀────│   FFT    │
│          │     │              │     │          │
└──────────┘     └──────────────┘     └──────────┘
```
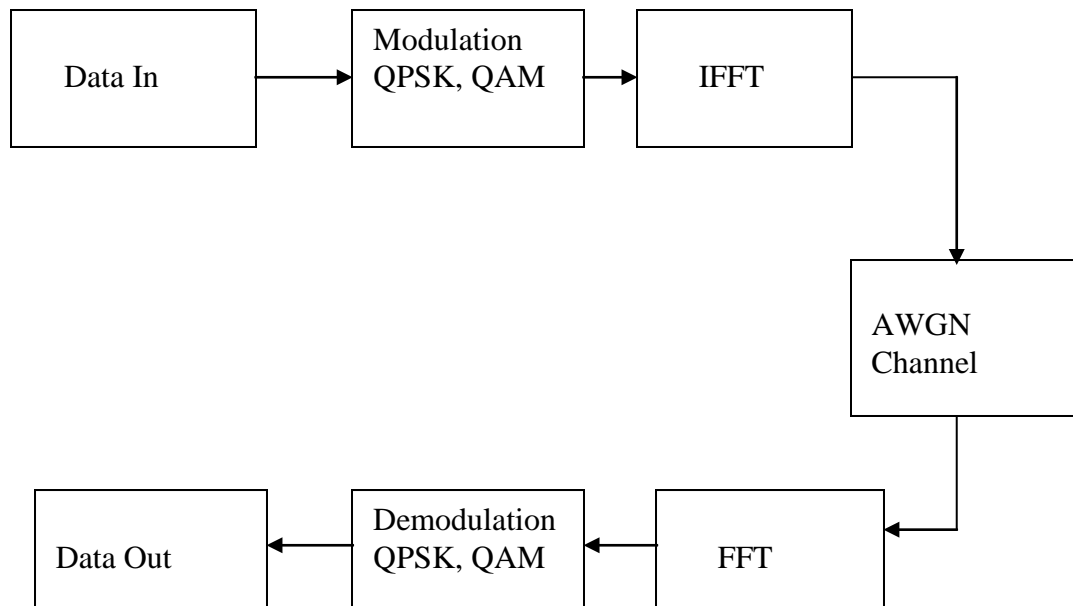
Fig 6: Basic Simulation platform of optical transmission system transmitter and receiver.

7. DESIGN AND ANALAYSIS

7.1 Methodology

The methodology of Light Fidelity network uses visible light communication for ending data, it is necessary to modulate the data into a signal which can be transmitted. These signals consist of light pulses. Some common modulation techniques used in Li-Fi is discussed below.

7.1.1 Modulation Technique

In the digital modulation techniques generally used for Li-Fi are summarized, and some special issues and requirements are discussed. In principle, Li-Fi also relies on electromagnetic radiation for information transmission. There are two Modulation Technique Single carrier modulations and other of Multi-carrier Modulation. In the uses of Li-Fi is Multi-carrier Modulation Technique.

7.1.1.1 OFDM

Orthogonal frequency-division multiplexing (OFDM) is a modulation technique of encoding digital data on multiple carriers frequencies. This remains a new method to communicate in which an added element is added to square 2D amplitude/phase modulation (APM) techniques such as quadrature amplitude modulation (QAM) and pulses shift keying (PSK). Not like the modern OFDM modulation technique, the Sub-carrier Index Modulation Orthogonal frequency-division multiplexing technique splits the serial bit stream into two bit sub-streams of the same length. The important knowledge is to use the sub- carrier index to convey information to the receiver. The Orthogonal allows for efficient Modulator and demodulation implementing using the FFT algorithm on receiver side, and other sender side the time computer the IFFT or FFT transform has to take the time for each side.

7.1.1.2QAM

In this digital modulation processes connected intimate of analog modulation approaches extensively used in modern communication to transmit information.as a QAM is a Data transmission as a 16QAM, another transfer to 64QAM, 64QAM .It is higher data rate can be achieved but at the cost of the margin many data migrate between the difference order of QAM, 16QAM,32QAM etc. dependent upon link condition. Then a QAM order increase so the increase so distance between the differences and there is a higher possibility of data error being introduced. There are shown constellation diagram of QAM.

7.1.1.3QPSK

In the QPSK it is based on BPSK is conversion of digital bits into a series of digit stream it convert them into bit pair. These decrease the data bits. The decrease the data bits rate half which allow space for other users Thus in QPSK, the carrier undergoes four changes in phase. Each phase conversion can represent two binary bits of data. The idea of this method is that the carrier can transmit two bits of data instead of one, so the bandwidth of the transmission has effectively doubled. If a digital signal is used as the input to a straight frequency modulator, the output will consist of a sine wave containing two distinct frequencies.

7.1.2 Channel Model

Additive White Gaussian Noise (AWG) is the information random radio noise characterized by a wide incidence range in regard to a signal in a communications channel. Average Signal-to-Noise Ratio (SNR). In this optical wireless communication system uses the AWG channel model in which the only impairment to communicate is a linear addition of wide band or white noise with a constant spectral density, and a Gaussian distribution of amplitude the influence of Signal-to-noise ratio (SNR) of communication signal and channel coding on the Bit-Error Rate Performance is performed using prototype. The relative position of transmitter with respect to receiver on the improve performance in optical wireless communication.

7.1.3 Comparison between Wi-Fi vs. Li-Fi

Parameter	Li-Fi	Wi-Fi
Speed	1-3.5 Gbps	54-250 Mbps
Range	10 Meters	20-100 Meters
IEEE Standards	802.15.7	802.11b
Spectrum Range	100000 times than Wi-Fi	Radio spectrum Range
Network Topology	Point To Point	Point To Multipoint
Data Transfer Medium	Used light as a carrier	Use radio spectrum
Frequency Band	100 times of Tera Hz	2.4 GHz

7.2 Proposed Algorithms

Algorithm 1: The simulation process for BER Analysis.

1. Initialize the system parameters, and let $t = 0$, $n = 0$, $N = 106$.
2. While $(t \leq N)$ do
3. Compute the channel gain h by using (7).
4. Randomly generate an OOK modulated signal $X = P * (rand(1, 1) > 0.5)$.
5. Generate a random number Z1 for the
6. input-dependent noise, which follows $N(0, \varsigma2\sigma2)$.
7. Generate a random number Z0 for the
8. input-independent noise, which follows $N(0, \sigma2)$.
9. Compute $y = rh\, X + \sqrt{rhX}Z1 + Z0$.
10. Compute the optimal detection threshold $\eta*$ by using (14).
11. If $y \geq \eta*$ then
12. $n = n + 1$;
13. End If
    12. $t = t + 1$;
14. End While
15. Compute the BER by using $BER = n/N$.

7.3 Data Flow Diagram

The DFD is also called as bubble chart. It is a simple graphical formalism that can be used to denote a system in terms of input data to the system, various handling carried out on this data, and the output data is generated

By this system.

The data flow diagram (DFD) is one of the record essential Modeling tools. It is used to model the system components. These com Opponents are the system process, the data used by the process, an external

Entity that interacts with the system and the information flows in the system. DFD demonstrations how the information moves through the system and how it is modified by a series of transformations? It is a graphical technique that Depicts information flow and the transformations that are applied as data Moves from input to output.

7.3.1 DFD Level 0

The system designer makes context level DFD, which shows only the interaction between system and system environment. According to follow diagram after node deployment in system, data can be sender to receiver node.

```
┌─────────────────────────────────────────────────────────────┐
│                                                               │
│   ┌──────────────┐      ┌──────────────┐      ┌──────────────┐│
│   │ Input        │─────▶│ Message      │─────▶│ Output       ││
│   │              │      │              │      │              ││
│   └──────────────┘      └──────────────┘      └──────────────┘│
│                                                               │
└─────────────────────────────────────────────────────────────┘
```
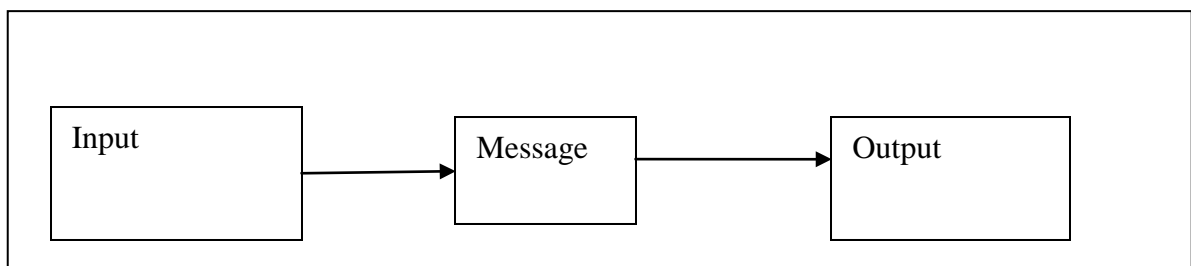
Fig 7: Basic Data Flow Diagram

7.3.2   DFD Level 1

```
┌─────────────────────────┐
│      Transmitter        │
└─────────────────────────┘
             │
             ▼
┌──────────────────────────────────────────────────────┐
│ Li-Fi Modulation Technique: Multi-carrier Modulation  │
│ OFDM (QPSK, QAM)                                       │
└──────────────────────────────────────────────────────┘
             │
             ▼
┌──────────────────────────────────────────────────────┐
│ Implemented image transmission in MATLAB R2017a Using │
│ Simulink. Give the values parameter of improve        │
│ performance for QPSK and QAM.                          │
└──────────────────────────────────────────────────────┘
             │
             ▼
┌──────────────────────────────────────────────────────┐
│ Implemented image transmission and receiver through   │
│ OFDM Modulation (QPSK, QAM) technique modulation and  │
│ demodulation                                          │
└──────────────────────────────────────────────────────┘
             │
             ▼
┌──────────────────────────────────────────────────────┐
│ Calculate Bit Error Rate By changing multiple values  │
│ Simulate BER value . Calculate symbol                 │
└──────────────────────────────────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│        Receiver         │
└─────────────────────────┘
```

7.4 Sequence Diagram

A sequence diagram is a designed representation of behavior as a series of Sequential steps over time. It is used to describe work flow. Sequence diagram is basically interaction diagram. Following sequence diagram shows sequence of different steps involved in various functionalities throughout the system.

Transmitter	OFDM Modulation Technique	Receiver

Send to Message

Received to message
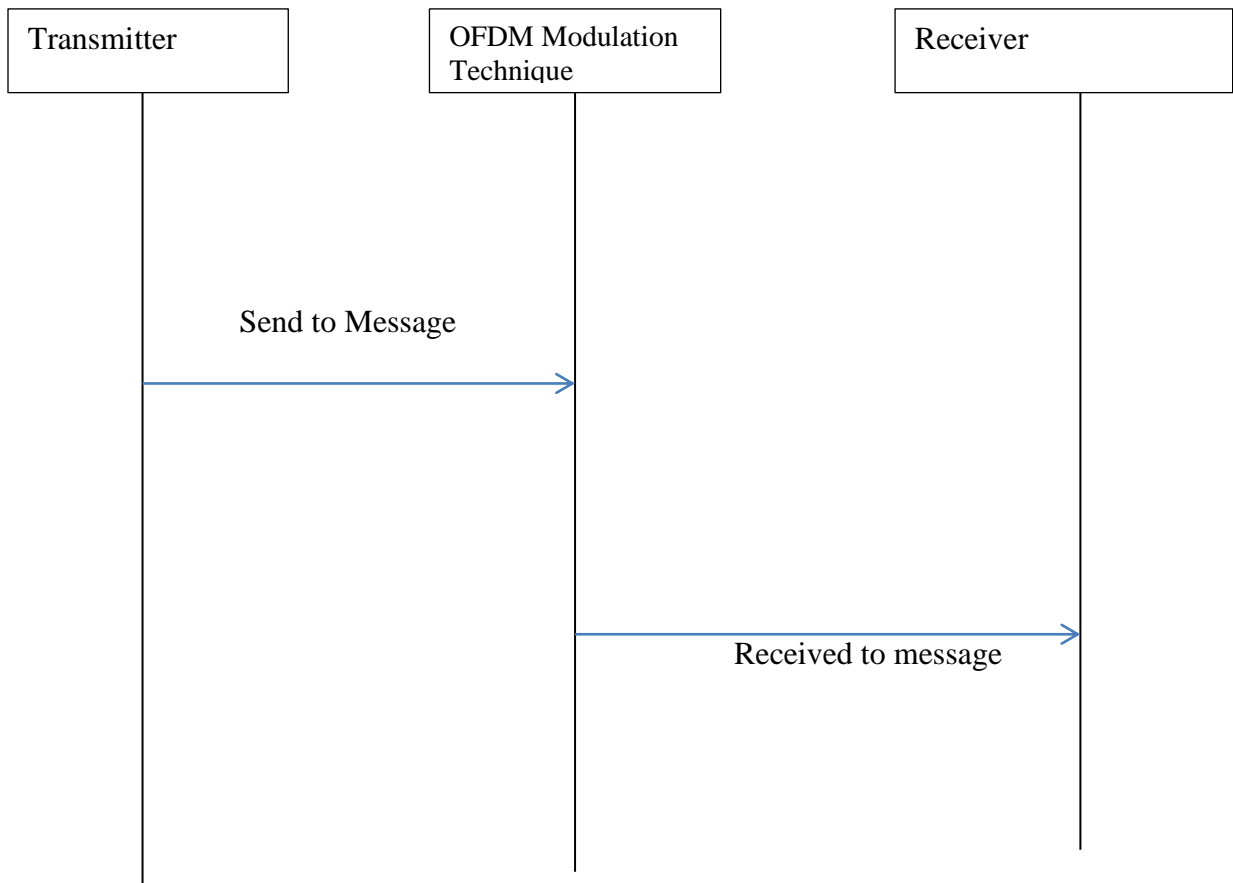
8. IMPLEMENTATION

8.1 Implementation Information

In Light Fidelity network understanding concept of optical communication network. However,, to clear study made far to compare the performances of WI- FI and Li-Fi models with OFDM as a common statistical multiplexing scheme. To understand the impact of OFDM on Wi-Fi and Li-Fi models. A simple communication model is taken and its performance improvement in light fidelity network studied with Li-Fi and Wi-Fi configuration parameters such as BER and SNR of both the schemes are compared. MATLAB R2017a software is used for the implementation of the model. The following sections describe the details of the model.

Transmitter Section

The following steps are followed in the transmission side

Step1: The input data is a JPEG/ BMP image. The image is converted into binary data bits with the help of the serial to parallel converter.

Step 2: The Converted data is then provide for into the modulation technique where there are 4 types of modulation schemes 1.PSK, 2.QPSK, 3.QAM i.e. 4QAM, 32QAM, 64QAM embedded. Anyone of the scheme can be chosen. This Modulator is adaptable for both Light and RF signal. Based upon the signal transmitted the modulation scheme is adopted. Compare to other modulation techniques, the bit error rate for BER system decrease monotonically and produce a smaller bit error rate than any other modulation scheme. Therefore the QAM is chosen in our experiment. However for comparisons all modulation schemes.

Step 3: A Hybrid Inverse Fast Fourier Transform (IFFT) converts the frequency domain data set into samples of the corresponding time domain representation of the data. Specifically, the IFFT is useful for OFDM because it generates samples of a waveform with orthogonal frequency components that satisfying orthogonal conditions.

Step 4: Adding cyclic prefix is just prefixing of a symbol with a repetition of the end and also eliminates the inter symbol interference from the previous symbol.

Receiver Section

The following steps are followed in the Receiver side

Step 1: Removal of cyclic prefix portion which is added in the transmitter side is removed in this block in order to obtain the original transmitted image.

Step 2: A hybrid Fast Fourier transform (FFT) algorithm converts a signal from its original domain (often time or space) to a representation in the frequency domain and vice versa.

Step 3: Demodulate the signal to baseband (RF/Light)

Step 4: Convert the parallel data stream into the serial data and thus create the OFDM signals by sequentially and reconstructs the original image.

Channel model

Additive White Gaussian Noise (AWG) is the information random radio noise characterized by a wide incidence range in regard to a signal in a communications channel. Average Signal-to-Noise Ratio (SNR). In this optical wireless communication system uses the AWG channel model in which the only impairment to communicate is a linear addition of wide band or white noise with a constant spectral density, and a Gaussian distribution of amplitude the influence of Signal-to-noise ratio (SNR) of communication signal and channel coding on the Bit-Error Rate Performance is performed using prototype.

The relative position of transmitter with respect to receiver on the improve performance in optical wireless communication.
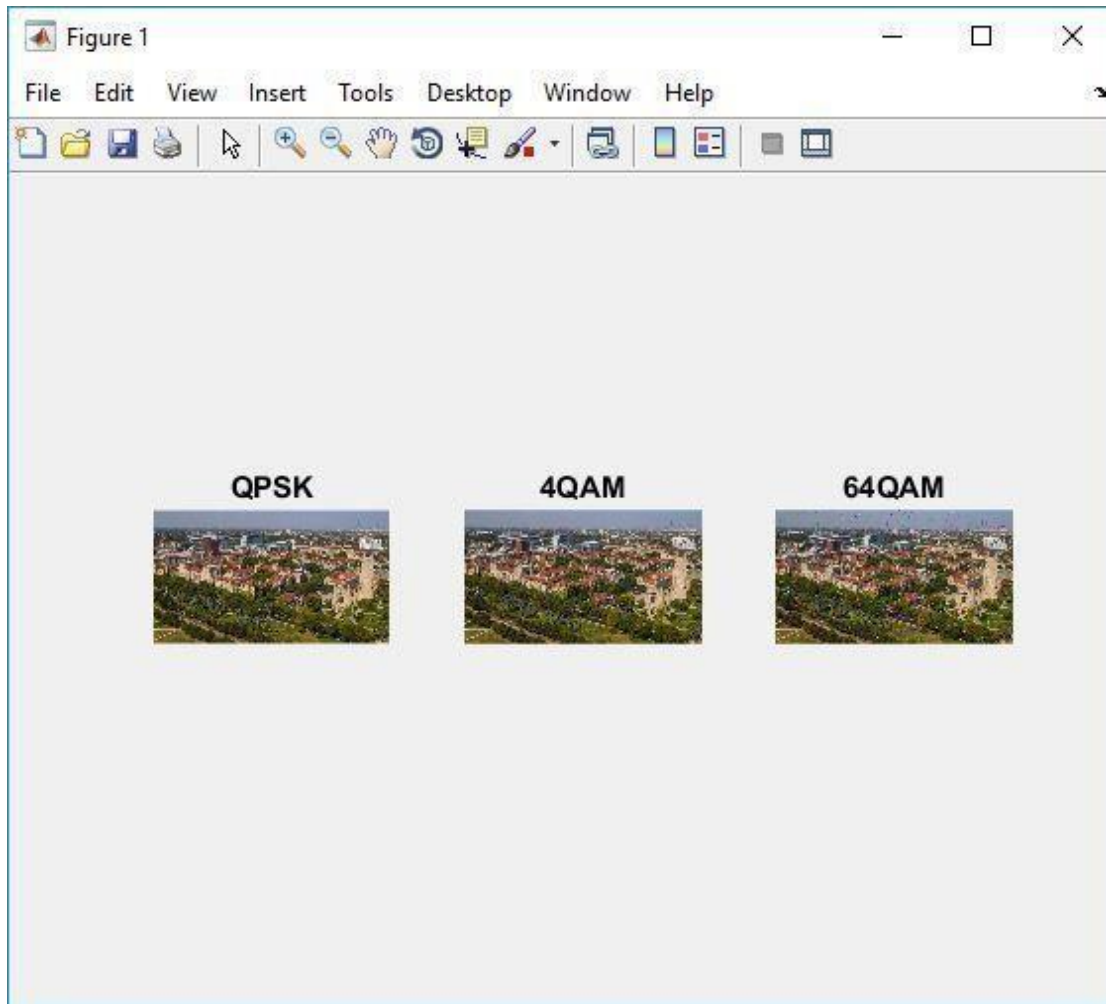
8.2   Screenshot

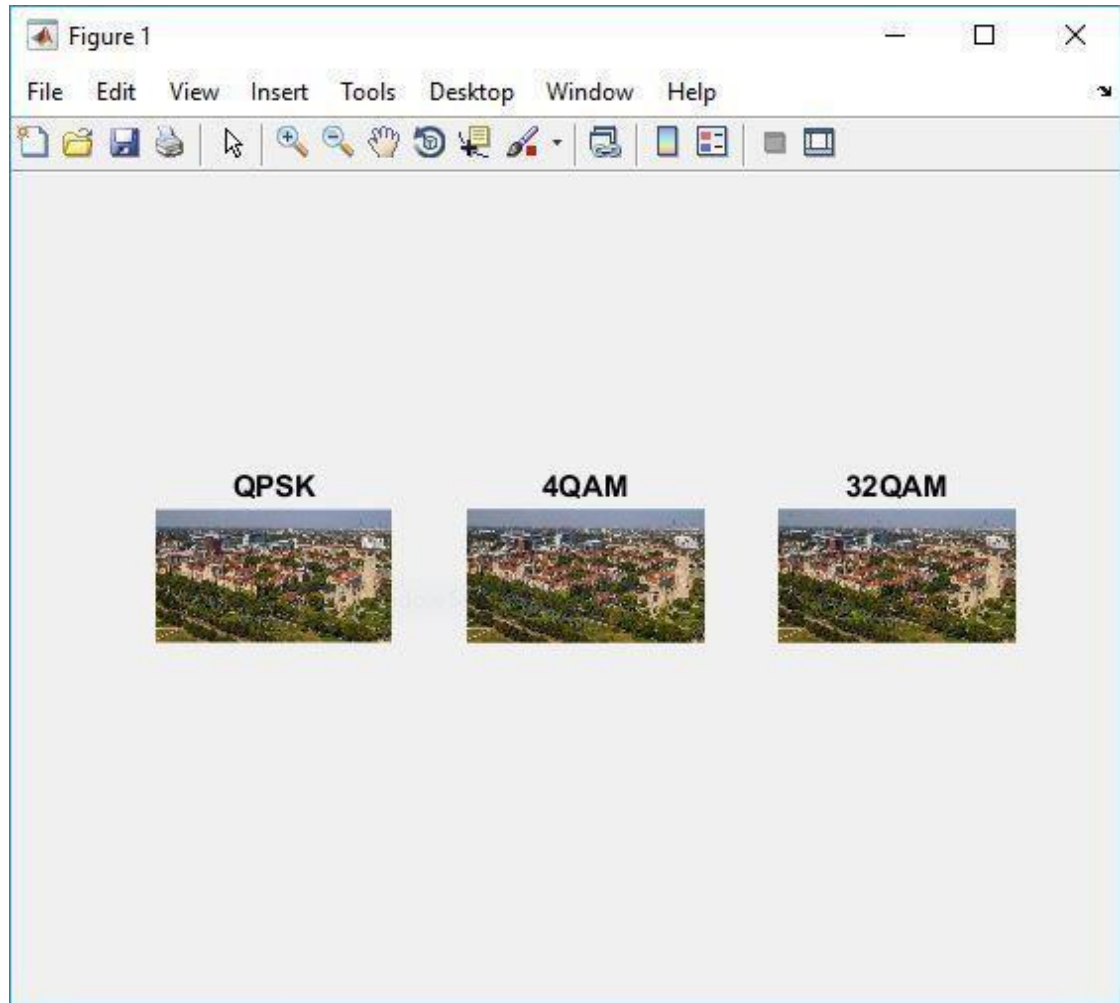Fig 1: Implementation Module OFDM Simulate combine QPSK with 4QAM, 64QAM

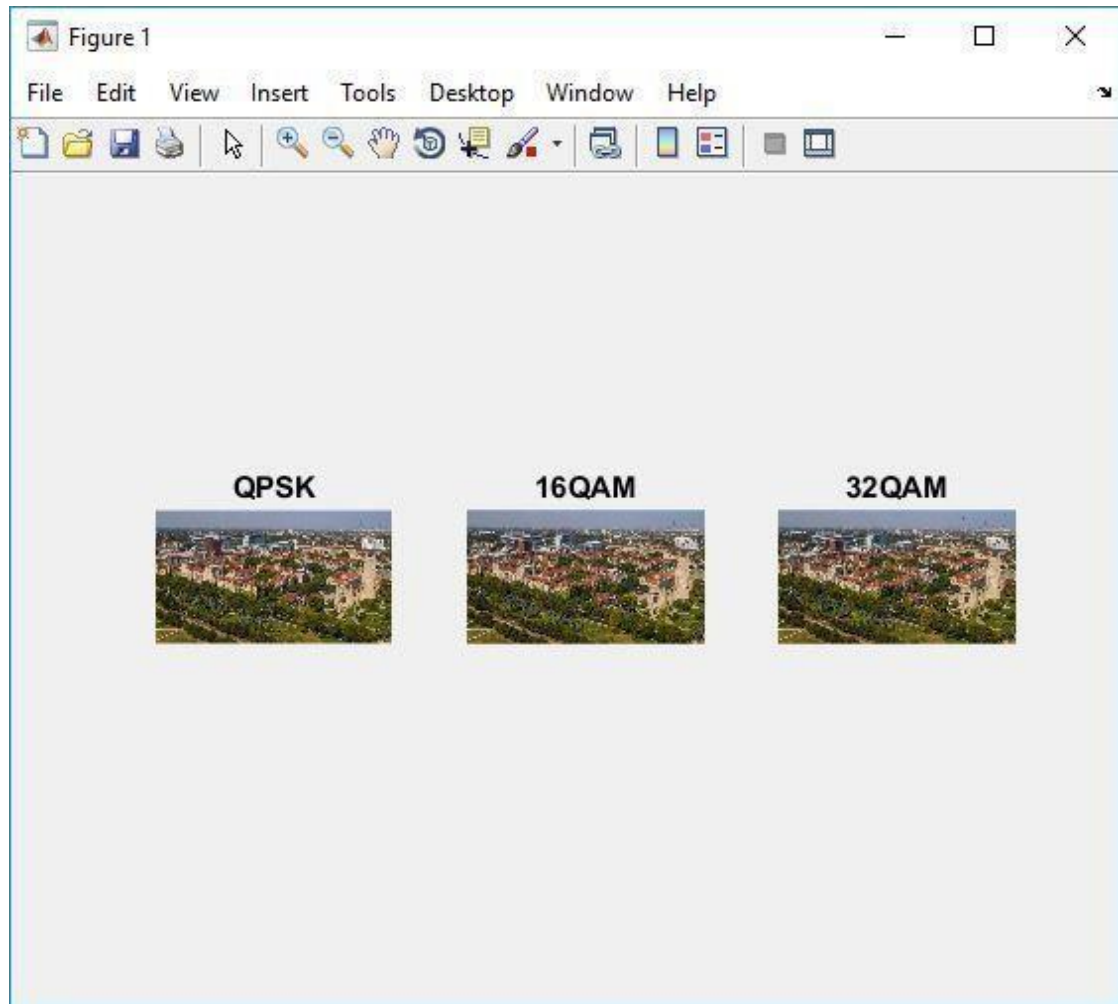Fig 2: Implementation Module OFDM Simulate combine QPSK with 4QAM, 32QAM

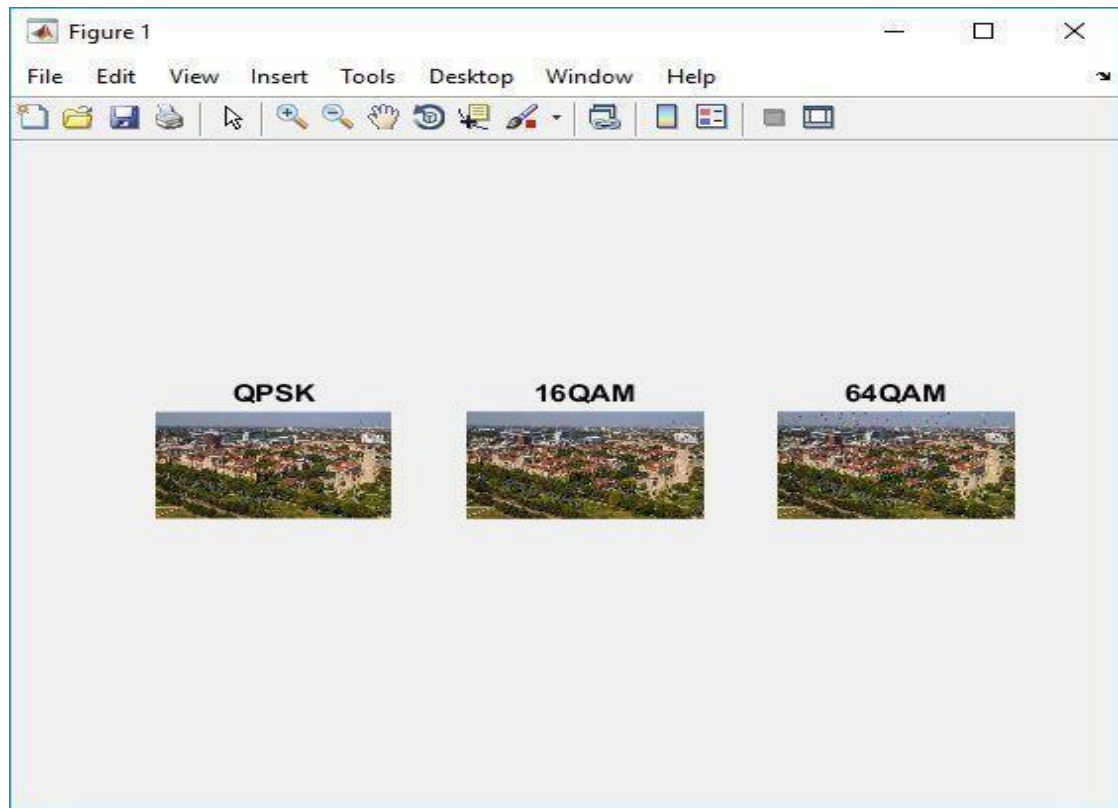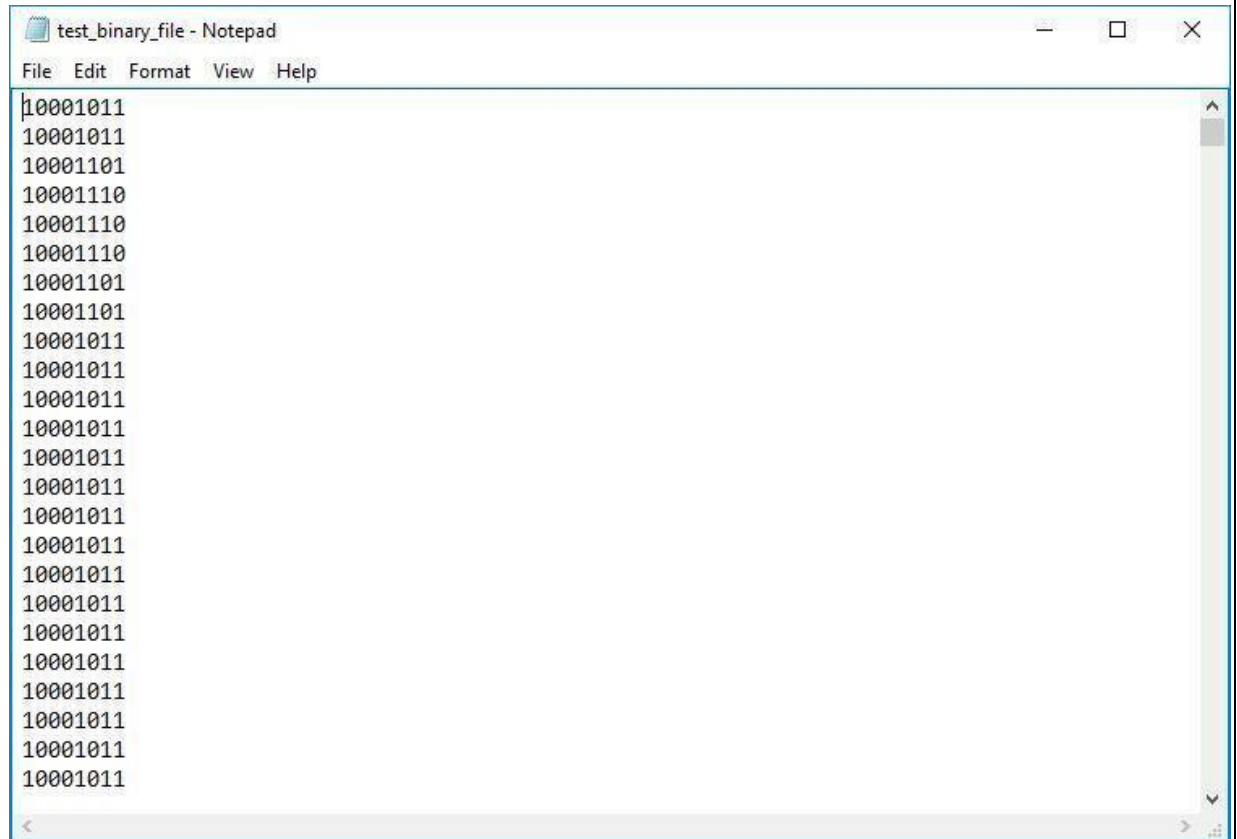Fig 3: Implementation Module OFDM Simulate combine QPSK with 16QAM, 32QAM

Fig 4: Implementation Module OFDM Simulate combines QPSK with 16QAM, 64QAM

9. RESULT AND DISCUSSION

The image is given as the input to the OFDM Modulation technique form communication Model where the Radio Frequency based OFDM system and optical communication based OFDM system combined in a hybrid Model. Before transmitting the image the type of network is to be choosing by the user .The model asks the Bellow said configuration details based upon the network to be transmitted. Then it generates the results for the image that is given as input based on the selected modulation technique and transmit to output of demodulate the image as combine QPSK and 4QAM,32QAM,64QAM modulation technique such as IFFT and FFT.

All the experiments are carried out using MATLAB R2017a.The optical communication there improve network performance by using OFDM Modulation technique in Light fidelity network.

Parameter for QPSK and QAM

A. Bit Error rate

The number of bit errors per unit time is denoted as Bit Error Rate. The error that occurs in transmission system is referred to as Bit Error rate. The number of errors that occur in a string of a specified number of bits. Bit Error Rate is also called as Probability of Error (POE). The bit error rate can be determined as

$$BER = \frac{Error}{Length\ of\ bit}$$

Bit Error Rate can be reduced by Lower order modulation and reduced bandwidth.

- Lower order modulation schemes will be employed, but it leads to fewer data throughput.
- Bandwidth ends up in the lower level of noise and thus signal to noise ratio (SNR) will progress.
- The BER is the amount of bit error per unit time. In noise ratio channels BER is frequently as a purpose of the controlled carrier-to-noise ratio measure denoted Eb/N0.

There are Symbol Error Rate (SER) is the probabilities of receiving a symbol and bit in error, respectively.

$$\text{SER} = \frac{\text{No of symbols in Error}}{\text{Total no Transmitted Symbol}}$$

B. Additive White Gaussian Noise channel

The AWGN is noise which can be added to the channel. Additive as a result of the arriving signal is equal to the transmitted signal, White as a result of rent less power spectral density, Probability distribution function is Gaussian, and Noise distorts the received signal. Deep space communication links and satellites communications are applicable to the AWGN model.

Test Configuration

Parameter and performance Calculation

Image Size	250*250
IFFT Size	16
Number Of Size	4
Modulation technique	QPSK,QAM
Peak Power Cliping	10dB
SNR	20dB

10 CONCLUSION AND FUTURE WORK

In this work we have implemented a simple OFDM based communication model with help of modulation technique (QPSK, QAM (4, 16, 32, 64)) with both radio frequencies based OFDM system and light fidelity network using the MATLAB R2017a.The output obtained were analyzed by giving various inputs and concluded that the Light Fidelity based OFDM system is more efficient than the Radio Frequency (RF) based OFDM system in data transmission with minimum amount of data loss comparatively. Since the Bandwidth of the channel model is high, the data transfer is considerably good. The Additive White Gaussian Noise (AWGN) channel for a network is the next challenge in this area. The channel is the next area to be concentrated and how the both Li-Fi and Wi-Fi Networks can be combined and new protocol for handover of these two networks can be designed. In this implemented work we have only concentrated on the images with help of OFDM modulation technique (QPSK, 4QAM, 16QAM, 32QAM, and 64QAM).

In future, the system can be adopted all kind of inputs such as, text, audio and video.

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Appendix A

Acronyms

Wi-Fi   Wireless Fidelity

Li-Fi   Light fidelity

OWC   Optical Wireless Communication

OFDM   Orthogonal Frequency division multiplexing

PSK   Phase shift keying

QPSK   Quadrature Phase Shift Keying

QAM   Quadrature Amplitude Modulation

IFFT   Inverse Fast Fourier Transform

SNR   Signal-to-Noise Ratio

FFT   Fast Fourier Transform

AWGN   Additive White Gaussian Noise channel

BER   Bit Error Rate

Appendix B

Paper Published on Current Work

Paper published in IJRERD (International Journal of Recent Engineering Research and Development), Volume: 04, Issue: 10, Oct-2019 by Ms. Akshata Sunil Jadhav, Prof. Ms.Nimisha Deval, Prof. P. A. Satarkar on **"A Review Paper on Light Fidelity Network".**

Paper published in JETIR (Journal of Emerging Technologies and Innovative Research) Volume: 07, Issue: 03, March-2020 by Ms. Akshata Sunil Jadhav, Prof. Ms.Nimisha Deval, Prof. P. A. Satarkar on **"Performance Improvement Using Light Fidelity Network".**