Criteria	Criteria 2- Teaching- Learning and Evaluation
Key Indicator	2.3 Teaching- Learning Process
Metric	2.3.1 Student centric methods, such as Laboratory methodologies used for experiential learning

LABORATORY

As a part of curriculum students gain hands on experience by doing practicals. SMVITM provides well equipped laboratory to conduct laboratory classes. In these laboratory classes faculties monitor the students as mentor and recorded teaching learning experiences in record book. Idea lab, Innovation lab helps to students gain hands on knowledge.

This document reveals the process conducted by the institute to enhancing Teaching learning through laboratory.

SHRI MADHWA VADIRAJA INSTITUTE OF TECHNOLOGY & MANAGEMENT

Vishwothama Nagar, Bantakal, Udupi District – 574 115

(A Unit of Shri Sode Vadiraja Matt Education Trust)

SMVITM

LABORATORY MANUAL

for

COMPUETR GRAPHICS LAB WITH MINI PROJECT

[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018 -2019)

Semester: VI SEMESTER CSE
Subject code: 18CSL67

Edited on: 22-04-2021

LIST OF PROGRAMS IN PART A

1. Implement Bresenham's line drawing algorithm for all types of slope.
2. Create and rotate a triangle about the origin and a fixed point.
3. Draw a color cube and spin it using OpenGL transformation matrices.
4. Draw a color cube and allow the user to move the camera suitably to experiment with perspective viewing.
5. Clip a line using Cohen-Sutherland algorithm.
6. To draw a simple shaded scene consisting of a tea pot on a table. Define suitably the position and properties of the light source along with the properties of the surfaces of the solid object used in the scene.
7. Design, develop and implement recursively subdivide a tetrahedron to form 3D Sierpinski gasket. The number of recursive steps is to be specified by the user.
8. Develop a menu driven program to animate a flag using Bezier Curve algorithm.
9. Develop a menu driven program to fill the polygon using scan line algorithm.

PART – B (MINI PROJECT)

Student should develop mini project on the topics mentioned below or similar applications using Open GL API. Consider all types of attributes like color, thickness, styles, font, background, speed etc., while doing mini project.

(During the practical exam: the students should demonstrate and answer Viva-Voce)

Sample Topics: Simulation of concepts of OS, Data structures, algorithms etc.

Conduction of Practical Examination:
Experiment distribution
- Experiment distribution
  - For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.
  - For laboratories having PART A and PART B: Students are allowed to pick one experiment from PART A and one experiment from PART B, with equal opportunity.
- Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only.
- Marks Distribution *(Coursed to change in accordance with university regulations)*
  - For laboratories having only one part – Procedure + Execution + Viva-Voce: 15+70+15 =
    100 Marks
  - For laboratories having PART A and PART B
    i. Part A – Procedure + Execution + Viva = 6 + 28 + 6 = 40 Marks
    ii. Part B – Procedure + Execution + Viva = 9 + 42 + 9 = 60 Marks

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COMPILING OPENGL PROGRAMS AT HOME USING VISUAL STUDIO

1. Download GLUT

2. Unzip the file.

3. Put the following files in the following locations:

glut.h	`C:\Program Files\Microsoft Visual Studio 12\VC\include\GL\`
glut32.lib	`C:\Program Files\Microsoft Visual Studio 12\VC\lib\`
glut32.dll	`C:\Windows\System32\`, if your operating system is 64 bits, place it to 'C:\Windows\SysWOW64\' (to your system directory)

4. Create a Visual Studio Project

1. Create a new project (File ---> New ---> --->Project)

2. In the Project Types: **select** Visual C++, Win32. **Then select** Win 32 Console

Application **in the** Templates: **Name your project, select the location for the**

project and click OK.

3. Click the Application Settings **tab on the left, and check the** Empty Project **box.**

Then click Finish button.

5. Add Source Code

1. Select Project, Add New Item.

2. In the Categories **pane, select** Visual C++, Code. **Then select** C++ File

(.cpp) **in the** Templates: **Name your file and then click** Add.

3. Write the code, save it.

6. Modify the project properties

1. Menu: "Project -> (your-project-name) Properties"

2. Tab: "Configuration Properties -> Linker -> Input"

3. Under "Additional Dependencies", add "opengl32.lib glu32.lib glut32.lib"

7. Compile and Run the project

1. Compile

From the Visual Studio's menu Build option (Build ---> Build Solution)

2. Execute the program

From the Visual Studio's menu Debug **option** (Debug ---> Start without

Debugging)

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COURSE FILE (2022-23)

Department: Computer Science and Engineering   **Class:** VI SEM

Course Title: Computer Graphics Laboratory with Mini Project   **Course code:** 18CSL67

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BANTAKAL - 574115

1. Course details

1.1 Primary information

1	Course Code	18CSL67
2	L-T-P	0-2-2
3	Course Credit	2
4	Marks (Min/Max) VTU Exam Internal Assessment	44/100 24/60 20/40
5	Pre-requisite	Basic knowledge of C/C++ programming
6	Teaching Department	Computer Science and Engineering
7	Course Duration	36 Hours
8	Faculty Handling the course	Mr. Raghavendra Hegde / Ms. Soundharya
9	Course Coordinator	Mr. Raghavendra Hegde

1.2 Textbooks

1.   Edward Angel: Interactive Computer Graphics A Top-Down Approach with OpenGL, 5th Edition, Pearson Education, 2008.
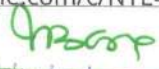
1.3 Reference Books

1.   Donald Hearn and Pauline Baker: Computer Graphics- OpenGL Version, 3rd Edition, Pearson Education, 2004.
2.   F.S. Hill Jr.: Computer Graphics Using OpenGL, 3rd Edition, PHI, 2009.
3.   James D Foley, Andries Van Dam, Steven K Feiner, John F Hughes, Computer Graphics, Pearson Education 1997.

1.4 Other Resources (Online, Text, Multimedia, etc.)

- https://www.opengl.org/
- https://learnopengl.com/

1.5 Link of class web page (Google classroom/CANVAS etc.,)

- **Section A:** https://classroom.google.com/c/NTE4MDg5MzUwNTMx
  Class code: lnb5dq7
- **Section B:** https://classroom.google.com/c/NTE4Mjc5MDY3MTg5?cjc=2izps2z
  Class code: 2izps2z

Course Plan

2.1 Course Outcomes

Sl. No.	At the end of the course, Students will be able to	Bloom's Level	Target Attainment
CO1	Implement computer graphics algorithms using OpenGL.	L3	2.9
CO2	Apply the concepts of computer graphics to design and create computer graphics applications using OpenGL.	L4	2.9

Cognitive levels as per Bloom's Taxonomy: L1-Remembering, L2-Understanding, L3-Applying, L4-Analyzing, L5-Evaluating and L6-Creating

2.2 Mapping of COs with POs (Course articulation matrix)

	Engineering Knowledge	Problem Analysis	Design & Development of Solutions	Conduct Investigations of Complex Problems	Usage of Modern Tools	Engineer & Society	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Management & Finance	Life-long Learning		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1			1										1
CO2				1	1				1				1	

POs Mapping Level: 1-Slightly   2-Moderately   3-Highly

2.3 Justification for CO-PO mapping

		Justification	Performance Indicator
CO1	PO1	Apply theory and principles of computer science and engineering to solve an engineering problem	1.4.1
	PO4	Design and develop appropriate procedures/methodologies based on the study objectives	4.2.1
	PSO2	Able to successfully adapt to the changes in the field of computer science.	
CO2	PO4	Synthesize information and knowledge about the problem from the raw data to reach appropriate conclusions	4.3.4
	PO5	Identify modern engineering tools, techniques and resources for engineering activities	5.1.1
	PO9	Implement the norms of practice (e.g., rules, roles, charters, agendas, etc.) of effective team work, to accomplish a goal.	9.1.2
	PSO1	Able to design, implement and test the algorithms to solve real world problems.	

3

2.5 Course Delivery Schedule

Expt. No.	Name of the Experiment	Relevant CO	Date		Faculty Sign (Every class)	HOD Sign
1	Software Demonstration	CO1	A1	20/03/2023	R.&f	
			A2	31/03/2023	R&f	
			B1	04/04/2023	P	
			B2	06/04/2023	P	
2	Implement Bresenham's line drawing algorithm for all types of slopes.	CO1	A1	20/03/2023	R&f	S
			A2	31/03/2023	R&f	
			B1	0f/04/2023	P	
			B2	06/04/2023	P	
3	Create and rotate a triangle about the origin and a fixed point.	CO1	A1	03/04/2023	R&f	
			A2	08/04/2023	R&f	
			B1	11/04/2023	P	
			B2	13/04/2023	P	
4	Program to draw a color cube and allow the user to move the camera suitably to experiment with perspective viewing. Use OpenGL functions.	CO1	A1	19/04/2023	R&f	
			A2	17/04/2023	R&f	
			B1	11/04/2023	P	
			B2	20/04/2023	P	
5	Program to draw a color cube and spin it using OpenGL transformation matrices.	CO1	A1	19/04/2023	R&f	S
			A2	17/04/2023	R&f	
			B1	18/04/2023	P	
			B2	27/04/2023	P	
6	Program to implement the Cohen-Sutherland line- clipping algorithm. Make provision to specify the input line, window for clipping and view port for displaying the clipped image.	CO1	A1	24/04/2023	R.&f	
			A2	21/04/2023	R&f	
			B1	25/04/2023	P	
			B2	04/05/2023	P	
	Program to draw a simple shaded scene consisting of a tea pot on a table. Define	CO1	A1	08/05/2023	R&f	
			A2	28/04/2023	R&f	

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4

No.	Description	CO	Batch	Date	Date	Sign	
7	suitably the position and properties of the light source along with the properties of the surfaces of the solid object used in the scene.		B1	02/05/2023		℗	
			B2	18/05/2023		℗	
8	Program to recursively subdivide a tetrahedron to from 3D Sierpinski gasket. The number of recursive steps is to be specified by the user.	CO1	A1	15/05/2023		R&J	
			A2	05/05/2023		R&J	
			B1	16/05/2023		℗	
			B2	01/05/2023		℗	
9	Program to develop a menu driven program to animate a flag using Bezier Curve Algorithm.	CO1	A1	12/6/2023		R&J	
			A2	09/6/2023		R&J.	
			B1	07/06/2023		℗c	
			B2	23/06/2023		℗	
10	Program to develop a menu driven program to fill the polygon using scan line algorithm.	CO1	A1	22/05/2023		R&J	Sɣ
			A2	19/05/2023		R&J	
			B1	30/05/2023		℗	
			B2	15/06/2023		℗	
11	Project Demonstration	CO2	A1	12/6/23	10/7/23	R&J	
			A2	9/6/23	7/7/23	R&J	
			B1	10/06/23	24/06/2023	℗	
			B2	15/06/23	30/06/2023	℗	
12	IA Test (1 & 2)	CO1	A1	29/5/23	19/6/23	R&J	
			A2	26/5/23	23/6/23	R&J	
			B1	23/05/23	06/07/23	℗	
			B2	25/05/23	07/07/23	℗	

Signature of **Faculty Handling**   **Course Coordinator**

HOD

Date: 03/4/2023   Date: 04/04/2023   Date: 4/4/23

2.6 Details of the experiments conducted beyond the syllabus or open ended experiments or mini project

S. No.	Aim of the experiment/objectives and outcomes of mini-project	Relevant PO	Date	
1	Points, Lines and Polygons drawing Using openGL functions	PO4	A1	20-03-2023
			A2	31-03-2023
			B1	04-04-2023
			B2	06-04-2023

3. Assessment of COs

3.1 Assessment method

Regularity (5)	Execution (10)	Record (5)	Project (13)	Project Report (7)
Continuous Evaluation - 3	Procedure Writing - 7	Neatness -3	Demo -5 Viva - 3	Abstract - 2
Attendance - 2	Result - 3	On Time Submission - 2	PPT - 5	Neatness and Completeness - 5

3.2 Measuring CO Attainment

3.2.1 Direct attainment by CIE

CO	TLOs mapped	Assesment Tool Used	Attained Level of Bloom's Taxonomy	Marks allotted	Total Marks	Weightage	Attainment Level	Contribution to CO Attainment	CO - Direct attainment
CO1	1	Record	L2	5	20	0.25	3	0.75	3.00
	1	Attendance	L2	2		0.10	3	0.30	
	1	Practice Program	L3	3		0.15	3	0.45	
	1	Writeup	L2	3		0.15	3	0.45	
	1	Result	L3	7		0.35	3	1.05	
CO2	2	Synopsis	L3	2	20	0.10	3	0.3	3.00
	2	Report	L3	5		0.25	3	0.75	
	2	PPT	L3	5		0.25	3	0.75	
	2	Demo	L3	5		0.25	3	0.75	
	2	Viva	L3	3		0.15	3	0.45	

3.2.2 Direct attainment by lab Internal Assessment

% of students scoring more than 60% of the maximum marks in lab IA	
CO attainment Level (Level 3- More than 70% of students scoring more than 60% of maximum marks Level 2: 60 to 70% of students scoring more than 60% of maximum marks Level 1: More than 45% of students scoring more than 60% of maximum marks)	3

3.2.3 Final Direct attainment by CIE and Lab IA

CO	CO attainment by CIE	CO attainment by Lab IA	Final Direct attainment (CIE + IA) / 2
CO1	3	3	3
CO2	3	3	3

3.2.4 Indirect attainment (Course end survey)
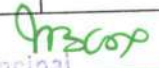
S. No.	CO questions	No of students responded			Indirect Attainment Level $(3*A+2*B+C)/N$
		Strongly agree (A)	Somewhat Agree (B)	Neutral(C)	
1	Implement computer graphics algorithms using OpenGL.	84	24	5	2.70
2	Apply the concepts of computer graphics to design and create computer graphics applications using OpenGL.	79	30	4	2.66

3.2.5 Final CO attainment

Sl. No.	Course Outcomes	Direct attainment	Indirect attainment	Final CO = 80% DA + 20% IA
1	Implement computer graphics algorithms using OpenGL.	3.00	2.70	2.94
2	Apply the concepts of computer graphics to design and create computer graphics applications using OpenGL.	3.00	2.66	2.93

3.3 Observations of Course coordinator on CO attainment

Sl. No.	Course Outcomes	Target	Attainment	Gap	Action Proposed to bridge the Gap	Revision of target wherever achieved
1	Implement computer graphics algorithms using OpenGL.	2.90	2.94	-	-	2.95

2	Apply the concepts of computer graphics to design and create computer graphics applications using OpenGL.	2.90	. 93	-	-		2.95

3.4 Other Information about the course

	Section - A	Section - B
Total number of Lab classes held	12	12
Number of content beyond syllabus experiments	1	1
Portion coverage	100%	100%
No. of students having attendance shortage	NIL	NIL
University result		
Use of various teaching methods	PPT, BB, Demo, Hands-on	PPT, BB, Demo, Hands-on
Details of the e-content developed	-	-

3.5 Outcomes on Actions for CAYm1 Observations/Suggestions

S. No.	Action Taken	Change Observed
	NIL	

3.6 Comments/Suggestions by the Course Coordinator for the next academic year

S. No.	Comment/Observations	Suggested Actions
1	Practical knowledge on topics like light material interaction, shadow properties, reflection and various light properties shall be improved	Practical Assignment on such topics shall be given

Signature of

Faculty Handling
Date: 07·08·2023

Course Coordinator
Date: 07·08·2023

HOD
Date: 7/8/23

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Udupi District, Karnataka, INDIA

SMVITM

SMVITM VALUED BANTAKAL

DEPARTMENT OF ......COMPUTER SCIENCE.......

Certificate

This is to certify that Mr. / Ms. ......SUPRIYA JK...........

bearing USN......4MW20CS109...............has satisfactorily completed the laboratory

course ......Computer graphics....................................

prescribed by the Visvesvaraya Technological University, Belagavi for the VI

semester of Bachelor of Engineering in....Computer science and.

Engineering during the year ....2022-23.......

Faculty In-charge

Principal
SHRI MADHWA VADIRAJA
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33
––
40

Marks awarded

Head of the Department
Dept. of Comp. Science & Engg.
SMVITM, BANTAKAL-574 115

"To Establish an Excellent, Value-based Higher Educational Hub to Meet the Challenges of Global Competitiveness"

INSTITUTE MISSION

"To impart holistic education with state of the art infrastructural facilities and conducive academic ambience, at affordable costs, leading to the creation of Centers of Excellence with best brains collectively interacting for total personality development and intellectual growth."

DEPARTMENT VISION

1. Impart knowledge by providing a healthy learning enviroment

2. Encourage the real to be update in technolodgy front and abitale by ethical and moral values

3. Enage in result orented research and inovation to cater the societal needs

DEPARTMENT MISSION

To be rignized as a center of excellence in the field of computer science & Engineering imparting houstic education catering the needs of society

PROGRAM EDUCATIONAL OBJECTIVES

PEO1: The fundamental Knowledge in computer science & Engineering to work in diversive fields of computer science and Engineering

PEO2: Ability to express & demonstrate the technology Skills sets the attaino at solution to real world problems

PEO3: Be effective contributors in team for multi desciplinary projects with effective interaction amongst peer.

PEO4: The real of being uppalto in technology front through continow learning

EVALUATION SCHEME

Sl. No.	Description	Marks	
		Maximum	Alloted
1.	CIE	5	04
2.	IA	10	06
3.	RECORD	5	04
4	MINI PROJECT	20	18
	TOTAL	40	33

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....
Student Signature

....
Faculty Signature

COURSE OUTCOMES

CO1: Implement computer graphics algorithm using openGL

CO2: Apply the concepts of computer graphics to design and create computer graphics application using openGL.

PROGRAM OUTCOMES

PO 1 **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2 **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3 **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4 **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5 **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6 **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7 **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9 **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10 **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11 **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12 **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

PSO1: Be able to design implement test evaluate computer system components too algorithm to solve problem using appropriate data structure
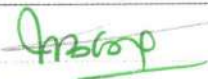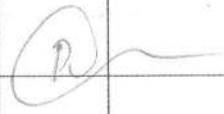
PSO2: Be able to successfully adopt to changes in the field of computer science & engineering for both personal professional growth.

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Vishwothama Nagar, BANTAKAL - 574 115
Udupi District, Karnataka, INDIA

SMVITM

DEPARTMENT OF *Computer Science and Engineering*

Certificate

This is to certify that Mr. / Ms. *Chandana*

bearing USN *4MW20CS018* has satisfactorily completed the laboratory

course *Computer Graphics Laboratory*

prescribed by the Visvesvaraya Technological University, Belagavi for the *6th*

semester of Bachelor of Engineering in *2022-23 CSE*

Engineering during the year *2022-23*
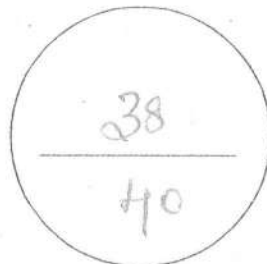
_____
Faculty In-charge

_____
Head of the Department

$\dfrac{38}{40}$

Marks awarded

Dept. of Comp. Science & Engg
SMVITM, BANTAKAL-574 115
Principal
SHRI MADHWA VADIRAJA
INSTITUTE OF TECHNOLOGY & MANAGEMENT
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INSTITUTE VISION

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INSTITUTE MISSION

"To impart holistic education with state of the art infrastructural facilities and conducive academic ambience, at affordable costs, leading to the creation of Centers of Excellence with best brains collectively interacting for total personality development and intellectual growth."

DEPARTMENT VISION

To be recognized as a center of excellence in the field of computer science and engineering education and research catering the needs of Industries and Society.

DEPARTMENT MISSION

To educate the computer Science and engineering aspirants with basic and advanced technological who can make a difference in compitative environments, continuously improve their technology skills, communicate effectively and be faith full to ethical values.

PROGRAM EDUCATIONAL OBJECTIVES

1. The fundamental knowledge in computer Science and engineering to work in diverse fields of computer Science & engineering industry.

2. Ability to express & demonstrate the technological skills to arrive at a solution to the realworld problems.

3. Be efficient contributes in a team for multidisciplinary projects with efficient interaction amongst peers.

4. The zeal of being updated in technology front through continous learning

Principal

EVALUATION SCHEME

Sl. No.	Description	Marks	
		Maximum	Alloted
1.	CIE	5	5
2.	IA	10	8.5
3.	Record	5	5
4.	Mini project	20	19
	TOTAL	40	37.5

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BANTAKAL - 574 115

....
Student Signature

....
Faculty Signature

CO1: Implement computer graphics algorithm using openGL

CO2: Apply concepts of Computer graphics to design and create computer graphics applications using openGL.

PROGRAM OUTCOMES

PO 1 Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2 Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3 Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4 Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5 Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6 The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7 Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9 Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10 Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11 Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12 Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

PSO1: Able to successfully adopt the changes in the field of computer Science

PSO2: Able to design, implement and test the algorithm to Solve the real world problem

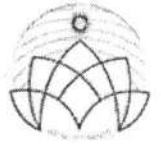# SHRI MADHWA VADIRAJA INSTITUTE OF TECHNOLOGY AND MANAGEMENT

A Unit of Shri Sode Vadiraja Mutt Education Trust (R), Udupi

Affiliated to the Visvesvaraya Technological University, Belagavi

Approved by AICTE, New Delhi & Recognized by Government of Karnataka, NAAC Accredited with "A" Grade

Vishwothamanagar, Bantakal – 574 115, Udupi, Karnataka, India

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SMVITM

Class: VI SEM   Course Title: **Computer Graphics Laboratory**   Course code: 18CSL67

Assessment method

Continuous Evaluation (10)	Internal Assessment Test (10)	Mini Project (20)
Record Write- up (5)	Procedure Writing (3)	Synopsis(2)
Practice Program (3)	Execution with Output (7)	Report(5)
Attendance (2)		PPT(5)
		Demo(5)
		Viva(3)

Rubrics for Continuous Assessment in the Laboratory

Parameters	Allocated Marks	High	Medium	Low
Practice Program	03	Able to execute the program by using proper algorithm (with 100% accuracy)	Able to execute the program by using proper algorithm with (with 60% accuracy)	Not able to design programs.
		3 Mark	**2-1 Marks**	**1 Mark**
Attendance	02	Student were regular for the laboratory	Students with 80-90% attendance	Students with less than 75% attendance
		2 Marks	**1 Mark**	**0-1 Mark**
Record Write Up	05	Completed record was submitted	Record was submitted but incomplete	Record was not submitted in the lab session
		4-5Marks	**1-4 Mark**	**0-1 Mark**

Rubrics used for Evaluation of Internal Lab Examination

Parameters	Allocated Marks	High	Medium	Low

Phone   : 0820-2589182/183 (Extn: 213), Fax: 0820-2589184, E-mail: cs@sode-edu.in

Principal
SHRI MADHWA VADIRAJA
INSTITUTE OF TECHNOLOGY & MANAGEMENT
VISHWOTHAMA NAGAR, Udupi Dist
BANTAKAL-574 115

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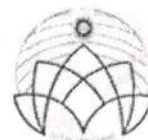
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Procedure Writing	03	Students were able to write the program by using proper algorithms with 90-100% accuracy.	Student was able to write the program by using proper algorithm with 50% accuracy	Student was not able to write the program.
		3 Marks	**2-1 Marks**	**0 Mark**
Execution With Output	07	Student was able to conduct the given experiment with expected output	Student was partially able to conduct the given experiment.	Student was not able conduct the giv experiment.
		6-7 Marks	**2 – 5 Marks**	**0 -1Mark**

Rubrics used for Mini Project Evaluation

Parameters	Allocated Marks	High	Medium	Low
Synopsis	0𝟑	Students were able to design abstract by referring references with 90-100% accuracy.	z	Student was not able to submit an abstract.
		2-3 Marks	**1 Mark**	**0 Mark**
Report	05	Student was able to prepare document on the topic with expected result	Student was partially able to prepare document on the topic with expected result	Student was not able prepare the document
		4-5 Marks	**2 – 3 Marks**	**0 -1Mark**
PPT	05	Student was able to prepare presentation on the topic with expected result	Student was partially able to prepare presentation on the topic with expected result	Student was not able prepare tl presentation.
		4-5 Marks	**2 – 3 Marks**	**0 -1Mark**

Principal
SHRI MADHWA VADIRAJA
INSTITUTE OF TECHNOLOGY & MANAGEMENT
Udupi Dist
BANTAKAL - 574115

Phone : 0820-2589182/183 (Extn: 213), Fax: 0820-2589184, E-mail: cs@sode-edu.in

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

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Demo	05	Students were able to demonstrate the result with 90-100% accuracy.	Students were able to demonstrate the result with 50% accuracy.	Student was not able demonstrate the resul
		4-5 Marks	**2 – 3 Marks**	**0 -1Mark**
Viva	03	Student answered all the viva voce questions	Student Answered only a few viva voce questions	Student did not answer any viva voce question
		4 Marks	**1-3 Mark**	**0-1 Mark**

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SHRI MADHWA VADIRAJA
INSTITUTE OF TECHNOLOGY & MANAGEMENT
Vishwothama Nagar, Udupi Dist.
BANTAKAL - 574 115

Faculty Handling
Coordinator

Sony J S H
Head of the Department

Head
Dept, of Comp.Science & Engg.
SMVITM. BANTAKAL-574115

CG LAB MINI PROJECT 18CSL67 : 6th B – SMVITM UDUPI

Sl. No	Title	Team members	USN
1	Olympic Ring	Swaroop Kumar	4MW20CS099
		Ashlesh Kini	4MW20CS105
2	Vertical lift bridge simularion	Bhagyashri	4MW21CS401
		J. Bhavani	4MW21CS402
3	3D House	Puneeth D	4MW20CS059
		Shane	4MW20CS071
4	LRU and STACK simulation	Rahul U B	4MW20CS060
		Royston	4MW20CS064
5	Tic Tac Toe	Raksha	4MW20CS061
		Shreya Nayak	4MW20CS079
6	Satellite Communication	Rathan Nayak	4MW20CS062
		S. Pradhwin	4MW20CS074
7	Car Racing	Adarsh Patil	4MW20CS108
		Rohan Shetty	4MW20CS063
8	Flying Ball	Ruha	4MW20CS065
		Shravya Mendon	4MW20CS077
9	Space fighter	Sampath	4MW20CS066
		Shetty Sainath	4MW20CS075
10	Path Finder	Jayavardhan	4MW20CS068
		Vijayavardhan	4MW20CS069
11	Galactic tour	Sheema	4MW20CS107
		Aaqib	4MW20CS072
12	Virtu Cycle	Shaikh Shuhood	4MW20CS073
		Shreyas	4MW20CS080
13	Air Traffic control	Shadhwal Rao	4MW20CS070
		Shravya	4MW20CS076
14	Tower of Hanoi	Shreelakshmi	4MW20CS078
		Shwetha	4MW20CS084
15	Rubik's cube	Shreyas	4MW20CS081
		Shreedhar	4MW20CS082
16	Steam engine simulation	Sumith Naik	4MW20CS096
		Siddesh K	4MW19CS123
17	3D Solar System	Sneha	4MW20CS086
		Soujanya	4MW20CS088
18	Simple Village Life	Sanjana K V	4MW20CS067
		Sindhura	4MW20CS085
19	Car parking	Shriharsha	4MW20CS090
		Suhas Bhat	4MW20CS093
20	Lift Over Bridge with traffic indication	Sudheendra	4MW20CS092
		Vaishnavi	4MW20CS101
21	Interactive Robot Arm	Suhas Nayak	4MW20CS094
		Sourav Achar	4MW20CS089
22	Atoms	Supriya J K	4MW20CS083
		Shriraksha	4MW20CS109
23	Algorithm Sorting Visualizer	Sujith Shetty	4MW20CS095
		Sushanth	4MW20CS097

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			Acharya	
24	Car Animation		Sushmitha	4MW20CS098
			Anusha	4MW21CS400
25	Exploring Molecular Dynamics		Sonu	4MW20CS087
			Unnathi	4MW20CS100
26	Traffic control simulation		Vijay Kumar	4MW20CS104
			Venkatesh	4MW20CS102
27	3D Scenary		Keerthan	4MW20CS106

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

Jnana Sangama, Belagavi – 590 014

A Computer Graphics Mini Project Report On

"STEAM ENGINE"

Submitted in Partial fulfillment of the Requirements for the VI Semester of the Degree of

Bachelor of Engineering

In

Computer Science & Engineering

By

CHANDANA (4MW20CS018)
DHRISHYA (4MW20CS026)

Under the Guidance of

Ms. R SOUNDHARYA
Asst. Prof, Dept. of CSE
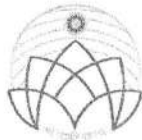
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
Shri Madhwa Vadiraja Institute of Technology & Management
Vishwothama Nagar, Bantakal-574115 July,
2023

Principal
SHRI MADHWA VADIRAJA
INSTITUTE OF TECHNOLOGY & MANAGEMENT
Vishwothama Nagar, Udupi Dist.
BANTAKAL - 574 115

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

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CERTIFICATE

Certified that the Computer Graphics and Visualization Mini Project work entitled "STEAM ENGINE" has been carried out by **CHANDANA (4MW20CS018)** and **DHRISHYA SHETTY (4MW20CS026)** who are the bonafide students of Shri Madhwa Vadiraja Institute of Technology and Management, in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year **2021-2022**. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the Report deposited in the departmental library. The Graphics Project Report has been approved as it satisfies the academic requirements in respect of project work prescribed for the said Degree.

Principal
SHRI MADHWA VADIRAJA
INSTITUTE OF TECHNOLOGY & MANAGEMENT
Vishwothama Nagar, Udupi Dist.
BANTAKAL - 574 115

MS. R SOUNDHARYA

Project Guide

Dept. of CSE

DR.SOWMYA J BHAT

Professor and Head

Dept. of Comp. Science & Engg.
Dept. of CSE
SMVITM, BANTAKAL-574 115

External Viva

Name of the examiners

Signature with date

1. Raghavendra 1. Hegde   14.07.2023

2. Aravind Nair   14/7/23

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ABSTRACT

A steam engine is a heat engine that performs mechanical work using steam as its working fluid. Heat is obtained from the fuel burnt in a closed firebox and is transferred to the water in a pressurized boiler, ultimately boiling the water and transforming it into saturated steam. The steam is transferred to the motor unit which uses it to push on pistons to power machinery. The used, cooler, lower pressure steam is exhausted to the atmosphere.

The engine is initially at rest. On right-clicking, the user is provided with a menu which provides five options-shaded, animate, increase, and decrease speed and transparency. The animate option starts the steam engine from rest or stops the engine if it is running. The speed of the engine can then be increased by the increase speed option or decreased by the decrease speed option. The shaded option can change the texture of the engine. There are two textures. One being the normal solid fill and the other being the wireframe. The transparent option makes the front portion of the cylinder transparent and shows the up and down motion of the piston.

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ACKNOWLEDGEMENT

It is our duty to acknowledge the help rendered to us by various persons in completing this Computer Graphics and Visualization Mini Project titled "STEAM ENGINE"

We would like to express our heartfelt thanks to **Dr. Thirumaleshwara Bhat, Principal, SMVITM, Bantakal,** for extending his support.

We would also like to express our deepest gratitude to **Dr. Sownya J Bhat, HOD, Computer Science and Engineering** whose guidance and support was truly invaluable in completing this project on time.

It is our privilege to express our sincerest regards to our project coordinator, **Ms. R Soundharya,** for her valuable inputs, guidance, encouragement, and whole-hearted cooperation throughout the duration of our project.

We take this opportunity to thank all our teaching and non-teaching staff of Department of CSE who has directly or indirectly helped the completion of our project.

We pay our respects and love to our parents and all other family members and friends for their love and encouragement throughout our student life.

Principal
SHRI MADHWA VADIRAJA
INSTITUTE OF TECHNOLOGY & MANAGEMENT
Vishwothama Nagar, Udupi Dist,
BANTAKAL - 574 115

Thanking you all,

CHANDANA

DHRISHYA SHETTY

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) Develop a menu driven program to fill the polygon using scan line algorithm

Partical.

$\frac{17}{20}$

$3 + 14 = 17$

R & f

edgedetect
draw point
polygon (....
polygon
display (void)
init → fill menu
int main !

```c
//Program.
    #include <windows.h>
    #include <Stdio.h>
    #include <Stdlib.h>
    #include <Gtl/glut.h>

GL float x1, y1, x2, y2, x3, y3, x4, y4;

int n;
int flag = 0;

void edgedetect (float x1, float y1, float x2, float y2, float *le,
                 float *re).

{   float mx, x, temp;
    if ((y2 - y1) < 0)
    {   temp = y1;
        y1 = y2;
        y2 = temp;

        temp = x1;
        x1 = x2;
        x2 = temp;
    }
    if ((y2 - y1) != 0)
    { mx = (x2 - x1) / (y2 - y1);
      x = mx; }

    else
        mx = x2 - x1;
        x = x1;

    for (int i = y1; i <= y2; i++)
    { if (x < (float) le[i])
```

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(x_1, y_1)

le :

```c
void drawpixel( int x, int y)
{
    glClear glColorClear ( 0.0, 0.0, 0.0, 0.0);     (1.0, 1.0, 1.0);
            Begin (GL_POINTS);
    glColor ( 0.10, 0.0, 0.0);
        glVertex2i (0,4);
    gluRoot Redisplay ();
        glEnd();
}

void Scanlinefill ( float x1, float y1, float x2, float y2, float x3,
float y3, float xh, float yh)
            int le[500], re[500]; int i,y;   for(i=0; i<500; i++) { le[i]=500;
{   glClear (GL_RGB+ GL_RGB); glBegin (GL_LINES);   re[i]=0; }
        glLineLoop();
        glVertex2f (x1,y1);
        glVertex2f (x2,y2);

        glVertex2f (x3,y3);
        glVertex2f (xh,yh);
        glColor (0.0, 1.0, 0.0);
            edgedetect (x1, y1 x1, y1 x2,y2, );le, re);
            edgedetect (x2,y2, x3,y3, le, re);
            edgedetect (x3,y3, xh,yh, le,re);
            edgedetect (xh,yh, x1, y1, le, re);

        for (int y1 y=0; y<=500; y++);    for (y=0; y<500; y++)
        {   if                          { for (i= (int )le[y]; i< (int)re[y];
                                                i++)
                                            draw_pixel (i,y);
}

void display ()
{   glClear ();
    glLoadIdentity ();
    if (flag = 1)
```

```
void display()
{ x1 = 200;
  y1 = 200;
  x2 = 100;
  y2 = 300;
  x3 = 200;
  y3 = 400;
  xh = 300;
  yh = 300;
  glClear ( GL_COLOR_BUFFER_BIT); glBegin (GL_LINE_LOOP);
  glLoadIdentity (); glColor3f (0.0, 0.0, 1.0); glVertex2f (x1,y1); glVertex2f (x2,y2);
  glVertex2f (x3,y3); (glVertex2f (xh,yh);  glEnd();
  if (flag == 1)
     { Scanline ( x1, y1, x2, y2, x3, y3, xh, yh); }
  glEnd (); glFlush ();

}

void fill menu ( int    option )
{ if (option == 1)
     flag = 1;
   if (option == 2)
     flag = 2;
     glPost Redisplay ();  glut Post Redisplay ();
}

void myinit ()
{ glClearColor (0.0, 0.0, 0.0, 0.0); glColor3f (1.0, 0.0, 0.0);
  glOrtho2D ( 0.0, 499.0,  0.0, 499.0 );
  glRedisplay () PointSize (1.0);
  glMatrixMode ( GL_PROJECTION);
}

int main (int argc, char ** argv) , glDisplayMode
```
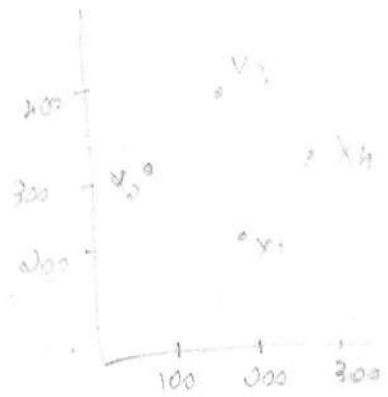
```
glut Add Menu Option ("Fill polygon
glut DisplayFunc (display);
glut
draw_pixel()
glut Add Menu Option
glut Menu Func (fill Menu);
glut Add Menu Entry Option ("Fill polygon", 1);
glut Add Menu Entry Option ("Empty polygon", 2);
    glut MainLoop();
glut FbEnd();

return 0;
}
```

Output :
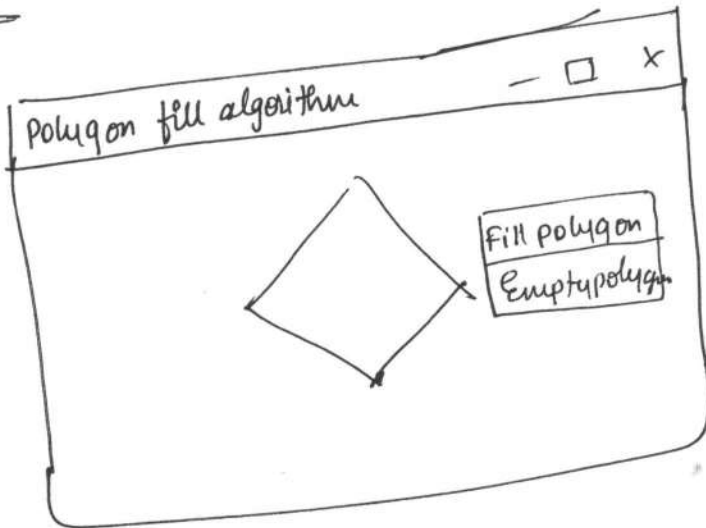
VISVESVARAYA TECHNOLOGICAL UNIVERSITY

Jnana Sangama, Belagavi – 590 018

A Computer Graphics Project Report On

"VERTICAL LIFT BRIDGE SIMULATION"

Submitted in Partial fulfillment of the Requirements for the VI Semester of the Degree of

Bachelor of Engineering

In

Computer Science & Engineering

By

BHAGYASHRI(4MW21CS401)
J BHAVANI (4MW21CS402)

Under the guidance of

Mr.RAGHAVENDRA HEGDE
Assistant Professor,Dept of CSE

Department of Computer Science and Engineering

SMVITM
SHRI MADHWA VADIRAJA INSTITUTE OF TECHNOLOGY AND MANAGEMENT
Vishwothama Nagar, BANTAKAL – 574 115, Udupi District
2022-2023

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INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(A Unit of Shri Sode Vadiraja Mutt Education Trust ®, Udupi)

Vishwothama Nagar, BANTAKAL – 574 115, Udupi District, Karnataka, INDIA

Department of Computer Science and Engineering

SMVITM

CERTIFICATE

Certified that the Computer Graphics Project Work entitled **"VERTICAL LIFT BRIDGE SIMULATION"** has been carried out by **BHAGYASHRI (4MW21CS401)** and **J BHAVANI (4MW21CS402),** who are the bonafide students of Shri Madhwa Vadiraja Institute of Technology and Management, in partial fulfillment for the award of **Bachelor of Engineering** in Computer Science and Engineering of Visvesvaraya Technological University, Belagavi during the year 2022-23.It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the report deposited in the department library. The Computer Graphics Mini Project Report has been approved as it satisfies the academic requirements with respect to the project work guidelines prescribed for the said Degree.

Mr.RAGHAVENDRA HEGDE
Project Guide
Dept of CSE

Dr.SOWMYA J BHAT
Professor and Head
Dept, of Comp.Science & Engg
Dept of CSE
SMVITM, BANTAKAL-574 115

Name of the examiners

External Viva

Signature with Date
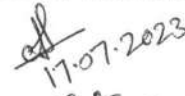
1. Annapurna .M.
2. Rukmini Bhat

17.07.2023

17 07 23

i

ABSTRACT

The project "VERTICAL LIFT BRIDGE SIMULATION" is used to demonstrate the use of OpenGL functions that is defined in OpenGL. Our objective is to develop a simple project to show the simulation of vertical lift bridge.

Here the user must enter the necessary parameters in order to perform the simulation of vertical lift bridge. The OpenGL can be used for interaction with the hardware. Then the result will be displayed on the screen.

This project we are working is under linux platform and are closed using C programming language with underlying tool-OpenGL which gives rich and highly usable 3D graphics.

The same program can be run on different computer and the graphics will be the same on the two machines. We make use of the "GL/glut" to implement the project. "GL/glut" is the library that gives robust framework to create good graphical effects.

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SHRI MADHWA VADIRAJA
INSTITUTE OF TECHNOLOGY & MANAGEMENT
Vishwothama Nagar, Udupi Dist.
BANTAKAL - 574 115

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ACKNOWLEDGEMENT

It is our duty to acknowledge the help rendered to us by various persons in completing this Computer Graphics Project titled "VERTICAL LIFT BRIDGE SIMULATION".
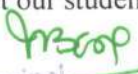
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It is our privilege to express our sincerest regards to our project coordinator, Mr.RAGHAVENDRA HEGDE,for his valuable inputs,guidance,encouragment and whole-hearted cooperation throughout the duration of our project.

We take this opportunity to thank all our teaching and non-teaching staff of the Department of CSE who directly or indirectly helped the completion of our project.We are also grateful to kind strangers on the interweb who acted as helpful references in the journey of the completion of this project.

We pay our respects and love to our parents and friends for their support and encouragement throughout our student life.

Principal
SHRI MADHWA VADIRAJA
INSTITUTE OF TECHNOLOGY & MANAGEMENT
Vishwothama Nagar, Udupi Dist.
BANTAKAL - 574 115

Thanking you all,

BHAGYASHRI(4MW21CS401)

J BHAVANI(4MW21CS402)

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Principal
SHRI MADHWA VADIRAJA
INSTITUTE OF TECHNOLOGY & MANAGEMENT
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BANTAKAL - 574 115

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SHRI MADHWA VADIRAJA
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BANTAKAL - 574 115

CONCLUSION AND FUTURE SCOPE

CONCLUSION

Designing and implementing project in graphics is a great experience. We understood and analyzed about the concepts of OpenGL which is very useful for our future.

"VERTICAL LIFT BRIDGE SIMULATION" is developed to provide a GUI. An attempt has been made to develop an openGL package which meets necessary requirements of the user.

. The development of the mini project has given us a good exposure to openGL by which we have learnt some of the techniques which help in the development of interactive application

FUTURE SCOPE

This application is like open source where anyone can design and add his own codes to modify. Even more features can be included.

- The project can be made to implement multimedia to enable the users to turn music on or off.
- The project can be upgraded to a three-dimensional version itself to increase it's visual appeal.

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INSTITUTE OF TECHNOLOGY & MANAGEMENT
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