"SMART LED CAMERA"

A

Project Report

submitted

in partial fulfillment

for the award of the Degree of

Bachelor of Technology

in Department of Information Technology

Project Mentor:

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Swami Keshvanand Institute of Technology, Management & Gramothan, Jaipur

Department of Information Technology

CERTIFICATE

This is to certify that **Mr Samyak Pagariya(19ESKIT084)**, a student of B.Tech(Information Technology) VIII semester has submitted his Project Report entitled **Smart LED Camera** under my guidance.

Mentor

Ms. Richa Rawal

Associate Prof., IT

Signature.....

Coordinator

Ms. Sanju Choudharay

Associate Prof., IT

Signature.....

Swami Keshvanand Institute of Technology, Management & Gramothan, Jaipur

Department of Information Technology

CERTIFICATE

This is to certify that **Mr Shreyansh Jain(19ESKIT088)**, a student of B.Tech (Information Technology) VIII semester has submitted his Project Report entitled **Smart LED Camera** under my guidance.

Mentor	**Coordinator**
Ms. Richa Rawal	Ms. Sanju Choudharay
Associate Prof., IT	Associate Prof., IT
Signature.....	Signature.....

DECLARATION

We hereby declare that the report of the project entitled **Smart LED Camera** is a record of an original work done by us at **Swami Keshvanand Institute of Technology, Management and Gramothan, Jaipur** under the mentorship of Ms. Richa Rawal(Dept. of Information Technology) and coordination of Ms. Sanju Choudhary (Dept.of Information Technology). This project report has been submitted as the proof of original work for the partial fulfillment of the requirement for the award of the degree of Bachelor of Technology (B.Tech) in the Department of Information Technology.It has not been submitted anywhere else, under any other program to the best of our knowledge and belief.

Team Members **Signature**

Samyak Pagariya, 19ESKIT084

Shreyansh Jain, 19ESKIT088

Acknowledgement

A project of such a vast coverage cannot be realized without help from numerous sources and people in the organization.We take this opportunity to express our gratitude to all those who have been helping us in making this project successful.

We are highly indebted to our faculty mentor Ms. Richa Rawal. She has been a guide, motivator source of inspiration for us to carry out the necessary proceedings for the project to be completed successfully. We also thank our project coordinator Ms. Sanju Choudhary for his co-operation, encouragement, valuable suggestions and critical remarks that galvanized our efforts in the right direction.

We would also like to convey our sincere thanks to Prof. Dr. Anil Choudhary, HOD, Department of Information Technology, for facilitating, motivating and supporting us during each phase of development of the project.Also, we pay our sincere gratitude to all the Faculty Members of Swami Keshvanand Institute of Technology, Management and Gramothan, Jaipur and all our Colleagues for their co-operation and support.

Last but not least we would like to thank all those who have directly or indirectly helped and cooperated in accomplishing this project.

Team Members:

Samyak Pagariya, 19ESKIT084

Shreyansh Jain, 19ESKIT088

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Chapter 1
Introduction

1.1 Problem Statement and Objective

Design and develop a smart LED bulb with an integrated camera that addresses the need for enhanced security and convenience in residential or commercial spaces while maintaining user privacy and network security. This problem statement highlights the key objectives of the project, which include:

1. Designing a smart LED bulb: The project involves creating a hardware solution that combines LED lighting technology with a compact and efficient camera system.

2. Enhancing security and convenience: The goal is to provide users with a reliable and accessible security solution by integrating a camera into the bulb. This includes features such as remote monitoring, motion detection, and notifications.

3. Ensuring user privacy: Privacy is a critical concern when using cameras in private spaces. The project should address privacy concerns by implementing robust security measures, secure data transmission, and user control over the camera's operation.

4. Network security: The project should focus on implementing strong network security measures to protect against potential cyber threats, ensuring that the smart LED bulb does not become a vulnerability in the connected ecosystem.

By addressing these objectives, the project aims to create a smart LED bulb with a camera that offers an effective and user-friendly solution for enhancing security and convenience while prioritizing privacy and network security.

1.2 Literature Survey /Market Survey/Investigation and Analysis

These are market survey of this product:

1. Market size: The global market for smart LED bulbs with cameras is expected to reach $14.5 billion by 2027, growing at a CAGR of 18.5% from 2022 to 2027.
2. Market drivers: The growth of the market is being driven by the increasing demand for smart home devices, the growing popularity of security cameras, and the rising awareness of the benefits of smart LED bulbs.
3. Market challenges: The market is facing some challenges, such as the high cost of smart LED bulbs with cameras, the lack of awareness about the benefits of these products, and the security concerns associated with using cameras in homes.

1.3 Introduction to Project

This project is a smart bulb with a camera that can be used to monitor your home or office. It is a small, discreet device that can be easily hidden, making it ideal for homes and offices where you want to keep an eye on things without being too obvious.

This project can be controlled from your smartphone or tablet, so you can check in on your home or office even when you're not there. You can also use the camera to provide light in areas that are dark or difficult to reach.

This project is a great way to improve the security of your home or office. It is small, discreet, and easy to use, making it a great option for anyone who wants to keep an eye on their belongings. Here are some of the features of this project:

1.4 Proposed Logic / Algorithm / Business Plan / Solution / Device

In this project we will be using an ESP32 camera module for the camera and a LED bulb for the LED and power supply. In this project we will also be using an ardunio for the coding of the ESP32 camera module. Their will a web app for the streaming of the camera live. In this project we also integrated with the AWS for the remote use of the device.

1.5 Scope of the Project

Here are some of the things you could do to expand the scope of your project:

1. Add motion detection to the camera. This would allow you to only stream images when there is movement, which would save bandwidth and storage space
2. Add facial recognition to the camera. This would allow you to identify people who are in the camera's view.
3. Integrate the camera with a home automation system. This would allow you to control the camera using voice commands or automation rules.

Chapter 2
Software Requirement Specification

2.1 Overall Description

This project aims at developing a LED bulb which has a camera in it. From this LED bulb we can also stream the live video of the feed from the camera on to a web browser. This is build in such a way that it is not easy to identified by anyone unknown so it help people in catching thief and can work as security.

2.1.1 Product Perspective

2.1.1.1 System Interfaces

- **Client on Internet** - Web Browser, Operating System (any)
- **Client on Intranet** - Web Browser, Operating System (any)
- **Web Server** - WASCE, Firebase, Operating System (any)

2.1.1.2 User Interfaces

- In this their will be a web page for interacting with the user.
- Start stream to start the stream (live feed).
- Both user and bulb can be on same WiFi.

2.1.1.3 Hardware Interfaces

Minimum Requirements

Client Side			
	Processor	RAM	Disk Space
Google Chrome 52	All Intel or AMD x86_64	4 GB	1.5GB

Server Side			
	Processor	RAM	Disk Space
RSM	Intel Core i3 or Amd ryzen	4 GB	4.5 GB
MongoDb	Intel Core i5 or AMD ryzen	4 GB	4.5 GB

Figure 2.1: Hardware Requirements

Recommended Requirements

Client Side			
	Processor	RAM	Disk Space
Google Chrome-52	Intel Core i5 or Amd ryzen	8GB	1TB

Server Side			
	Processor	RAM	Disk Space
RSM	Intel Core i5 or Amd ryzen	8 GB	1 TB
MongoDb	Intel Core i5 or Amd ryzen	8 GB	5 GB

Figure 2.2: Recommended Requirements

2.1.1.4 Software Interfaces

- MS-Windows Operating System
- Arduino IDE
- IDE: Microsoft Visual Studio

2.1.1.5 Communications Interfaces

- Client (customer) on Internet will be using HTTP/HTTPS protocol.
- Client (system user) on Internet will be using HTTP/HTTPS protocol.

2.1.1.6 Constraints

- GUI is only in English.
- Limited to HTTP/HTTPS.
- This system is working for single server.

Chapter 3
System Design Specification

3.1 System Architecture

A two-tier architecture is a software architecture in which the presentation layer or interface runs on the client, and the data layer or data structure gets stored on the server. Separating these two components into different locations represents a two-tier architecture, as opposed to a single-tier architecture. Other kinds of multi-tier architectures add additional layers in distributed software design.

In a two-tier architecture, the client and server are connected through a network. The client sends requests to the server, and the server sends responses back to the client. The client is responsible for displaying the data to the user, and the server is responsible for storing and retrieving the data.

Two-tier architectures are often used for small applications that do not require a lot of complexity. They are also often used for applications that need to be deployed quickly and easily. When it comes to 2-Tier architecture, there are two layers:

- **Presentation layer : Client-side Component (Front-end)**
  The client-side component of a web application architecture enables users to interact with the server and the backend service via a browser. The code resides in the browser, receives requests and presents the user with the required information. This is where UI/UX design, dashboards, notifications, configurational settings, layout and interactive elements come into the picture. Here are some of the commonly used front-end technologies:

  1. **HTML** - HTML or Hypertext Markup Language is a popular standard markup language that enables developers to structure web page contents using a series of page elements. Developed by Tim Berners-lee and released in 1993, HTML quickly evolved and became the standard markup

language across the globe.

2. **CSS** - CSS or Cascading Style Sheets is a popular style sheet language that enables developers to separate website content and layout for sites developed using markup languages. Using CSS, you can define a style for elements and reuse them multiple times. Similarly, you can apply one style across multiple sites. It is simple and easy to learn. You can apply a style for a single element, an entire webpage or the entire website. It is device-friendly too.
3. **JavaScript** - avaScript or JS is the most popular client-side programming language which is used by more than 90 percent of websites in recent times. It was designed by Brendan Eich of Netscape in 1995. JavaScript uses a simple, easy-to-learn syntax. The language is so popular that every browser comes with a JS engine to run JavaScript code on devices. It is easy to insert JS code on any web page which makes it highly interoperable. It allows you to create rich interfaces to deliver a better UI/UX experience. Being on the client-side, JS reduces the server load as well. However, developers should be careful about the security as the code is executed on the client-side which can be exploited by hackers at times.

- **Data layer: Database**

  A database is a key component of a web application that stores and manages information for a web app. Using a function, you can search, filter and sort information based on user request and present the required info to the end user. They allow role-based access to maintain data integrity. While choosing a database for your architecture of web app, the size, speed, scalability and structure are the four aspects that require your consideration. For structured data, SQL-based databases are a good choice. it suits financial apps wherein data integrity is a key requirement.

  Google Cloud Platform (GCP) is a suite of cloud computing services provided by Google. It is a public cloud computing platform consisting of a variety of services like compute, storage, networking, application development, Big

Data, and more, which run on the same cloud infrastructure that Google uses internally for its end-user products, such as Google Search, Photos, Gmail and YouTube, etc.

The services of GCP can be accessed by software developers, cloud administrators and IT professionals over the Internet or through a dedicated network connection. Google Cloud Platform is known as one of the leading cloud providers in the IT field. The services and features can be easily accessed and used by the software developers and users with little technical knowledge. Google has been on top amongst its competitors, offering the highly scalable and most reliable platform for building, testing and deploying the applications in the real-time environment.

Apart from this, GCP was announced as the leading cloud platform in the Gartner's IaaS Magic Quadrant in 2018. Gartner is one of the leading research and advisory company. Gartner organized a campaign where Google Cloud Platform was compared with other cloud providers, and GCP was selected as one of the top three providers in the market.

Most companies use data centers because of the availability of cost forecasting, hardware certainty, and advanced control. However, they lack the necessary features to run and maintain resources in the data center.

3.2 High Level Design Diagrams

3.2.1 Use Case Diagram

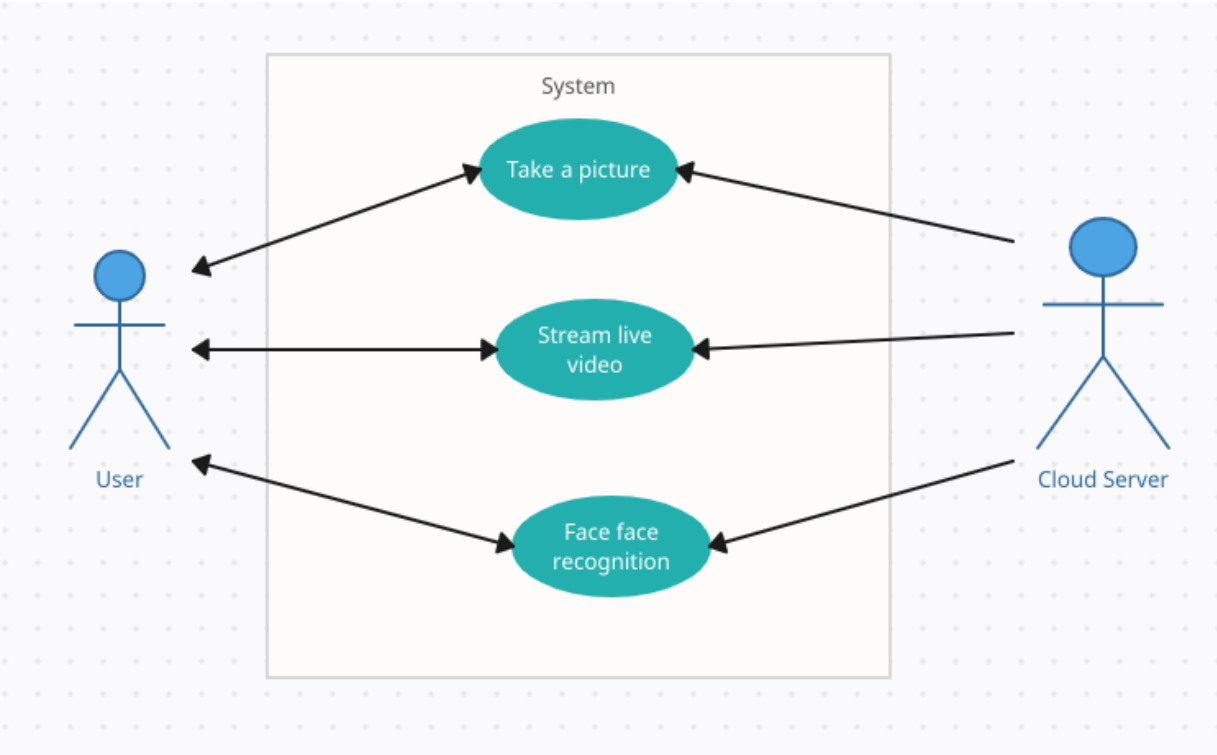

Figure 3.1: Use Case diagram

3.2.2 Flow Chart

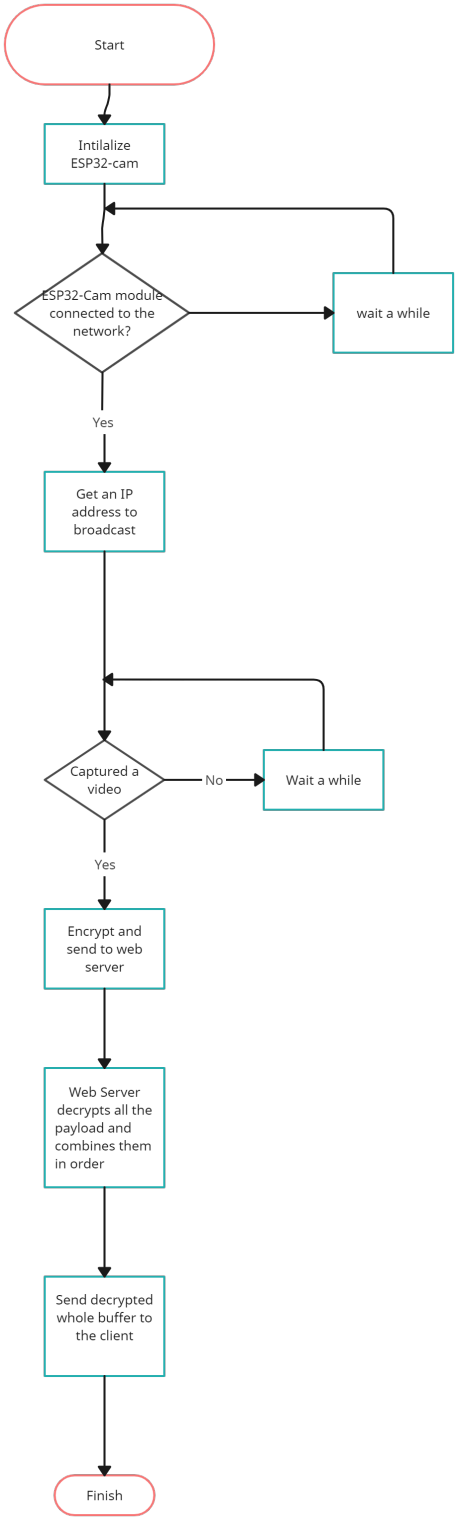

Figure 3.2: Flow-Chart

Chapter 4

Methodology and Team

4.1 Introduction to Spiral Methodology

Spiral model is one of the most important Software Development Life Cycle models, which provides support for Risk Handling. In its diagrammatic representation, it looks like a spiral with many loops. The exact number of loops of the spiral is unknown and can vary from project to project. Each loop of the spiral is called a Phase of the software development process. The exact number of phases needed to develop the product can be varied by the project manager depending upon the project risks. As the project manager dynamically determines the number of phases, so the project manager has an important role to develop a product using the spiral model.

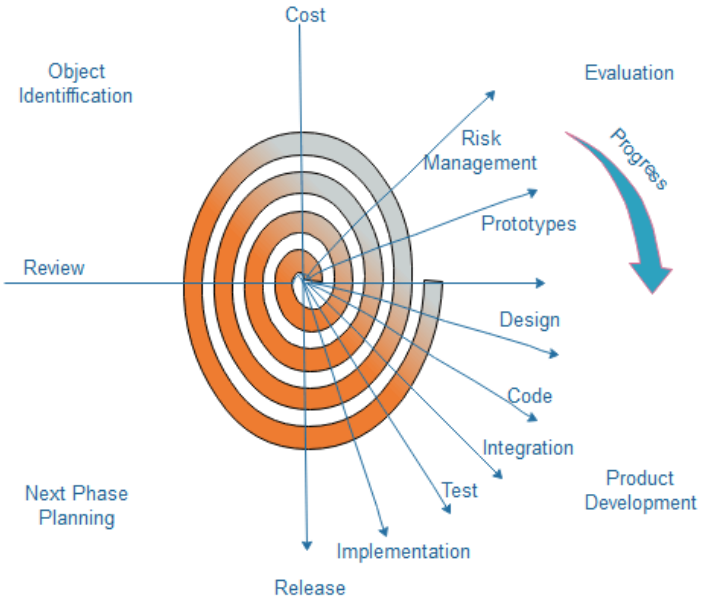

Figure 4.1: Spiral model

The Spiral Model is a risk-driven model, meaning that the focus is on managing risk through multiple iterations of the software development process. It consists of the following phases:

1. **Objective setting:** TEach cycle in the spiral starts with the identification of

purpose for that cycle, the various alternatives that are possible for achieving the targets, and the constraints that exists.

2. **Risk Assessment and reduction:** The next phase in the cycle is to calculate these various alternatives based on the goals and constraints. The focus of evaluation in this stage is located on the risk perception for the project.

3. **Development and validation:** The next phase is to develop strategies that resolve uncertainties and risks. This process may include activities such as benchmarking, simulation, and prototyping.

4. **Planning:** Finally, the next step is planned. The project is reviewed, and a choice made whether to continue with a further period of the spiral. If it is determined to keep, plans are drawn up for the next step of the project.

The development phase depends on the remaining risks. For example, if performance or user-interface risks are treated more essential than the program development risks, the next phase may be an evolutionary development that includes developing a more detailed prototype for solving the risks.

The risk-driven feature of the spiral model allows it to accommodate any mixture of a specification-oriented, prototype-oriented, simulation-oriented, or another type of approach. An essential element of the model is that each period of the spiral is completed by a review that includes all the products developed during that cycle, including plans for the next cycle. The spiral model works for development as well as enhancement projects.

When to use Spiral Model?

1. When deliverance is required to be frequent.
2. When requirements are unclear and complex
3. When changes may require at any time
4. Large and high budget projects

Spiral Model Pros & Cons

Advantage

- It is well-suited for large, complex projects. The spiral model's iterative nature allows for the project to be broken down into smaller, more manageable pieces. This can be helpful for projects with a large number of requirements or a complex design
- It can help to mitigate risk. The spiral model's risk analysis phase allows the team to identify and address potential risks early in the project. This can help to reduce the likelihood of costly delays or failures.
- It allows for customer feedback. The spiral model's iterative nature allows the customer to provide feedback on the project at each stage. This can help to ensure that the final product meets the customer's needs.
- It is flexible. The spiral model can be adapted to meet the specific needs of each project. This flexibility can be helpful for projects with changing requirements or a limited budget.

Disadvantage

- It can be time-consuming and expensive. The spiral model's iterative nature can add to the overall time and cost of the project.
- It can be difficult to manage. The spiral model can be complex to manage, especially for large projects.
- It may not be suitable for all projects. The spiral model is not suitable for all projects. It is best suited for large, complex projects with a high degree of risk.
- It can be difficult to manage: The spiral model can be complex to manage, especially for large projects. This is because there are many moving parts and it can be difficult to keep track of all of the tasks and deadlines.
- It may not be suitable for all projects: The spiral model is not suitable for all projects. It is best suited for large, complex projects with a high degree of risk.

This is because the iterative nature of the spiral model can be time-consuming and expensive, and it may not be necessary for smaller, less complex projects.

4.2 Team Members, Roles & Responsibilities

Samyak Pagriya(19ESKIT084)- Responsible for the cloud working and choosing the right platform for the project to work. Also responsible for bringing new ideas to the team for the project.
Shreyansh Jain(19ESKIT088) - Responsible for the hardware and the coding of the ESP32 and arduino. Also responsible for making new ideas come to life and work for the project .

Chapter 5
Centering System Testing

The designed system has been testing through following test parameters.

5.1 Functionality Testing

In testing the functionality of the web sites the following features were tested:

1. Links

   (a) Internal Links: All internal links of the website were checked by clicking each link individually and providing the appropriate input to reach the other links within.

   (b) External Links: Till now no external links are provided on our website but for future enhancement we will provide the links to the candidate's actual profile available online and link up with the elections updates online etc.

   (c) Broken Links : Broken links are those links which so not divert the page to specific page or any page at all. By testing the links on our website, there was no link found on clicking which we did not find any page.

2. Forms

   (a) Error message for wrong input : Error messages have been displayed as and when we enter the wrong details (eg. Dates), and when we do not enter any details in the mandatory fields. For example: when we enter wrong password we get error message for acknowledging us that we have entered it wrong and when we do not enter the username and/or password we get the messages displaying the respective errors.

   (b) Optional and Mandatory fields : All the mandatory fields have been marked with a red asterisk (*) and apart from that there is a display of error messages when we do not enter the mandatory fields. For example: As the first

name is a compulsory field in all our forms so when we do not enter that in our form and submit the form we get an error message asking for us to enter details in that particular field.

3. Database Testing is done on the database connectivity.

5.2 Performance Testing

Performance Testing is a software testing process used for testing the speed, response time, stability, reliability, scalability, and resource usage of a software application under a particular workload. The main purpose of performance testing is to identify and eliminate the performance bottlenecks in the software application. It is a subset of performance engineering and is also known as "Perf Testing".
The focus of Performance Testing is checking a software program's

- Speed – Determines whether the application responds quickly.
- Scalability – Determines the maximum user load the software application can handle.
- Stability - Determines if the application is stable under varying loads.

5.3 Usability Testing

Usability testing refers to evaluating a product or service by testing it with representative users. Typically, during a test, participants will try to complete typical tasks while observers watch, listen and takes notes. The goal is to identify any usability problems, collect qualitative and quantitative data and determine the participant's satisfaction with the product.
Benefits :

1. Learn if participants are able to complete specified tasks successfully.
2. Identify how long it takes to complete specified tasks.
3. Find out how satisfied participants are with your Web site or other product.

4. Identify changes required to improve user performance and satisfaction

5. And analyze the performance to see if it meets your usability objectives

Chapter 6

Project Screen Shots

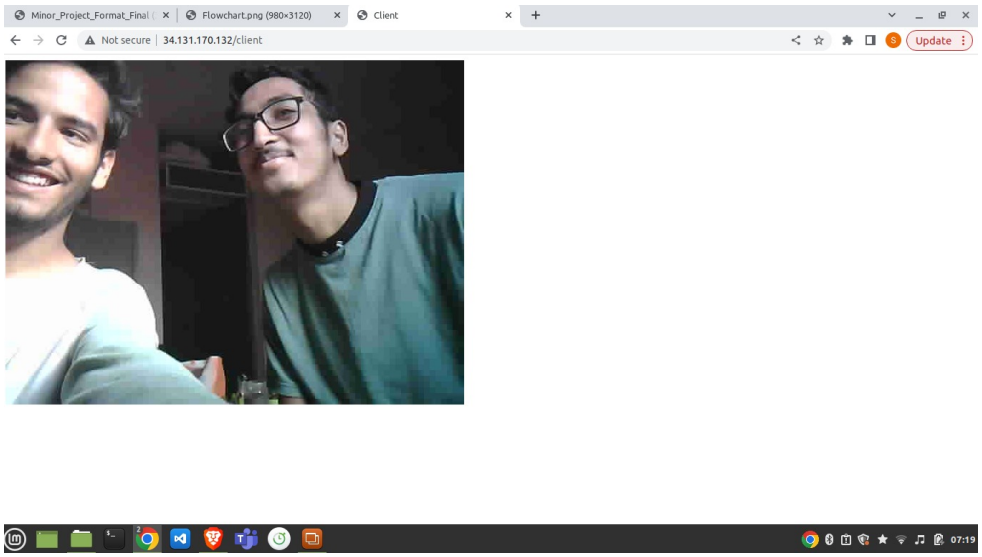

Figure 6.1: Web Browser

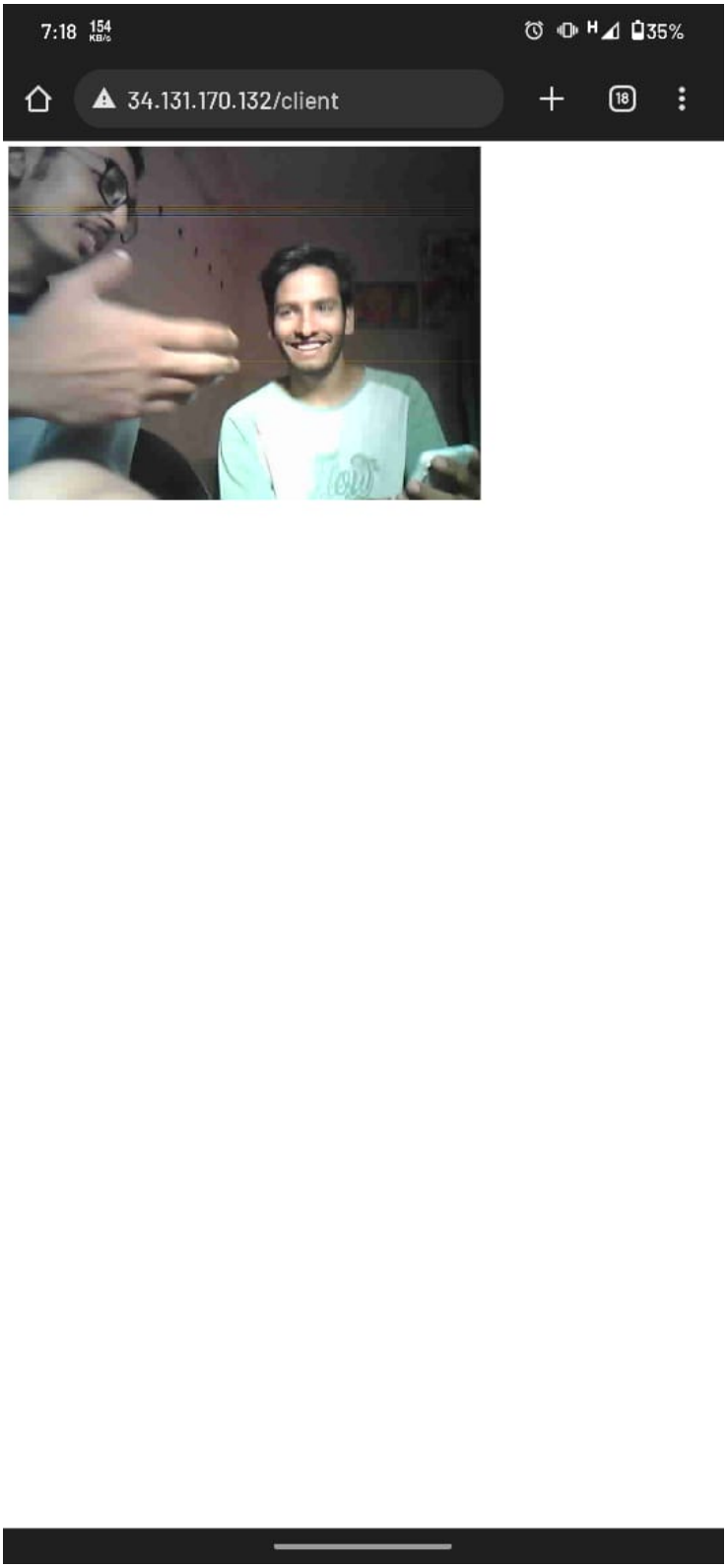

Figure 6.2: Mobile Browser

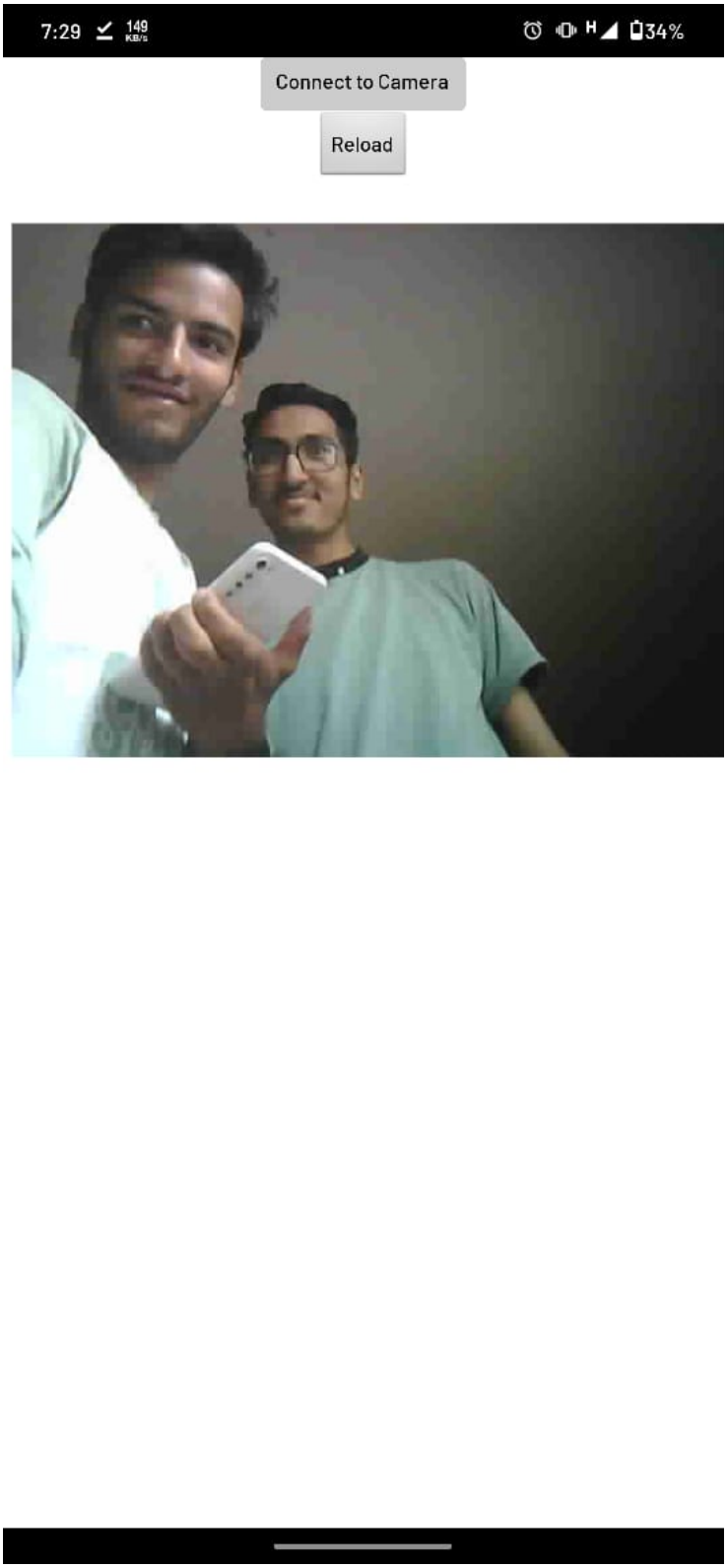

Figure 6.3: MIT App

Figure 6.4: Code snippet

Chapter 7
Project Summary and Conclusions

7.1 Summary

The package was designed in such a way that future modifications can be done easily. The following conclusions can be deduced from the development of the project.

- It provides a friendly graphical user interface which proves to be better when compared to the existing system
- It gives appropriate access to the authorized users depending on their permissions.
- It effectively overcomes the delay in communications.
- Updating of information becomes so easier.
- System security, data security and reliability are the striking features.
- The System has adequate scope for modification in future if it is necessary.

7.2 Conclusions

The conclusion of the project is that the Project It Smart LED Camera is a successful project that has the potential to revolutionize the way we live and work. The camera is a powerful tool that can be used to improve our lives in a variety of ways.

The project was a success because it met its goals and objectives. The camera was designed, developed, and deployed on time and within budget. The camera is high-quality and takes great pictures and videos. The software platform is easy to use and allows users to easily upload their pictures and videos to the cloud. The camera has been well-received by users.

The project also taught us the importance of having a clear project plan and clear communication with stakeholders. The project also taught us the importance of testing the product thoroughly before deployment.

We recommend that the company continue to develop and market the camera. We also recommend that the company consider developing other smart LED products in the future.

The future of the Project It Smart LED Camera project is bright. The camera has the potential to make a significant impact on our lives.

For any code References : https://github.com/samyakpagariya/Smart_LED_Camera

Chapter 8
Future Scope

Here are some specific ideas for the future scope of the project:

- Improve the camera's features and capabilities: The camera could be improved by adding new features, such as a zoom lens, a night vision mode, or a built-in microphone.
- Develop new software applications for the camera: The camera could be used with a variety of software applications, such as a photo editing app or a video editing app.
- Market the camera to a wider audience: The camera could be marketed to a wider audience, such as businesses, schools, and government agencies.

The future of the Project It Smart LED Camera project is bright. The camera has the potential to make a significant impact on our lives.

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