

VISVESVARAYA TECHNOLOGICAL UNIVERSITY



BELAGAVI – 590018, Karnataka

INTERNSHIP REPORT

ON

Submitted in partial fulfilment for the award of degree(18EEI75)

BLIND ASSISTANCE SYSTEM USING MACHINE LEARNING

**BACHELOR OF ENGINEERING IN
Electrical and Electronics Engineering**

Submitted By:

RAKESH B R (1MV20EE057)



Conducted at
Compssoft Technologies Pvt Ltd



Department of Electrical & Electronics Engineering

Sir M VISVESVARAYA INSTITUTE OF TECHNOLOGY

(Approved by AICTE New Delhi, Affiliated to VTU, Belagavi, ISO 9001:2008 Certified)

Off International Airport Road, Krishnadevaraya Nagar, Bengaluru – 562157

2023 – 2024

CERTIFICATE

This is to certify that the Internship titled “**BLIND ASSISTANCE SYSTEM USING MACHINE LEARNING**” carried out by **Mr. RAKESH B R**, a bonafide student of Sir M. Visvesvaraya Institute of Technology, in partial fulfillment for the award of **Bachelor of Engineering**, in **Electrical and Electronics Engineering** under Visvesvaraya Technological University, Belagavi, during the year 2022-2023. It is certified that all corrections/suggestions indicated have been incorporated in the report.

The project report has been approved as it satisfies the academic requirements in respect of Internship prescribed for the course Internship (18EEI85)

Signature of Guide

Mr. Kumarswamy

Signature of HOD

Dr. Suresh H.L

Signature of Principal

Prof.Rakesh S G

External Viva:

Name of the Examiner

Signature with Date

1) _____

2) _____

DECLARATION

I, **Rakesh B R** final year student of Branch, College Name - 560 082, declare that the Internship has been successfully completed, in Compsoft Technologies Pvt Ltd. This report is submitted in partial fulfillment of the requirements for award of Bachelor Degree in Electrical and Electronics Engineering, during the academic year 2023-2024.

Date : 20/09/2023

:

Place : Bengaluru

USN : 1MV20EE057

NAME : Rakesh B R

OFFER LETTER



Date: 14th August, 2023

Name: **Rakesh B R**
USN: **1MV20EE057**
Placement ID: **1408ML023**

Dear Student,

We would like to congratulate you on being selected for the **Machine Learning with Python (Research Based)** Internship position with **Compsoft Technologies**, effective Start Date **14th August, 2023**. All of us are excited about this opportunity provided to you!

This internship is viewed as being an educational opportunity for you, rather than a part-time job. As such, your internship will include training/orientation and focus primarily on learning and developing new skills and gaining a deeper understanding of concepts of **Machine Learning with Python (Research Based)** through hands-on application of the knowledge you learn while you train with the senior developers. You will be bound to follow the rules and regulations of the company during your internship duration.

Again, congratulations and we look forward to working with you!.

Sincerely,

Nithin K. S
Project Manager
COMPSOFT TECHNOLOGIES
*No. 363, 19th main road,
1st Block Rajajinagar
Bangalore - 560010*

ACKNOWLEDGEMENT

This Internship is a result of accumulated guidance, direction and support of several important persons. We take this opportunity to express our gratitude to all who have helped us to complete the Internship.

We express our sincere thanks to our Principal, for providing usadequate facilities to undertake this Internship.

We would like to thank our Head of Dept – branch code, for providing us an opportunity to carry out Internship and for his valuable guidance and support.

We would like to thank our (Lab assistant name) Software Services for guiding us during the period of internship.

We express our deep and profound gratitude to our guide, Guide name, Assistant/Associate Prof, for her keen interest and encouragement at every step in completing the Internship.

We would like to thank all the faculty members of our department for the support extended during the course of Internship.

We would like to thank the non-teaching members of our dept, for helping us during the Internship.

Last but not the least, we would like to thank our parents and friends without whose constant help, the completion of Internship would have not been possible.

NAME: RAKESH B R

USN: 1MV20EE057

ABSTRACT

Blind spots pose a significant challenge to the safety and reliability of autonomous vehicles. These areas outside the field of view of traditional sensors can lead to critical accidents and hinder the widespread adoption of self-driving technology. This paper introduces a novel approach to address blind spots in autonomous vehicles through the utilization of Machine Learning (ML) techniques. Our research leverages advanced ML algorithms to enhance the perception capabilities of autonomous vehicles, allowing them to detect and respond to objects and obstacles in their blind spots. By fusing data from various sensors, such as cameras, LiDAR, and radar, our ML model creates a comprehensive representation of the vehicle's surroundings.

Furthermore, we develop a real-time object tracking system that predicts the movement of objects within the blind spots, enabling proactive decision-making and collision avoidance. The ML-based blind spot detection system has been extensively tested in various scenarios, demonstrating remarkable improvements in the vehicle's ability to identify and respond to previously hidden dangers.

This research not only enhances the safety of autonomous vehicles but also contributes to the broader goal of enabling their widespread adoption. By leveraging Machine Learning to mitigate blind spots, we take a significant step towards achieving a future with more reliable and secure autonomous transportation systems.

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CHAPTER 1

COMPANY PROFILE

1. COMPANY PROFILE

A Brief History of Company

Company, was incorporated with a goal "To provide high quality and optimal Technological Solutions to business requirements of our clients". Every business is a different and has a unique business model and so are the technological requirements. They understand this and hence the solutions provided to these requirements are different as well. They focus on clients requirements and provide them with tailor made technological solutions. They also understand that Reach of their Product to its targeted market or the automation of the existing process into e-client and simple process are the key features that our clients desire from Technological Solution they are looking for and these are the features that we focus on while designing the solutions for their clients.

Company is a Technology Organization providing solutions for all web design and development, MYSQL, PYTHON Programming, HTML, CSS, ASP.NET and LINQ. Meeting the ever increasing automation requirements, Sarvamoola Software Services. specialize in ERP, Connectivity, SEO Services, Conference Management, effective web promotion and tailor-made software products, designing solutions best suiting clients requirements.

we strive to be the front runner in creativity and innovation in software development through their well-researched expertise and establish it as an out of the box software development company in Bangalore, India. As a software development company, they translate this software development expertise into value for their customers through their professional solutions.

They understand that the best desired output can be achieved only by understanding the clients demand better. At our Company we work with them clients and help them to define their exact solution requirement. Sometimes even they wonder that they have completely redefined their solution or new application requirement during the brainstorming session, and here they position themselves as an IT solutions consulting group comprising of high caliber consultants.

They believe that Technology when used properly can help any business to scale and achieve new heights of success. It helps Improve its efficiency, profitability, reliability; to put it in one sentence "Technology helps you to Delight your Customers" and that is what we want to achieve.

CHAPTER 2

ABOUT THE COMPANY

2. ABOUT THE COMPANY

We are a Technology Organization providing solutions for all web design and development, Researching and Publishing Papers to ensure the quality of most used ML Models, MYSQL, PYTHON Programming, HTML, CSS, ASP.NET and LINQ. Meeting the ever increasing automation requirements, Compssoft Technologies specialize in ERP, Connectivity, SEO Services, Conference Management, effective web promotion and tailor-made software products, designing solutions best suiting clients requirements. The organization where they have a right mix of professionals as stakeholders to help us serve our clients with best of our capability and with at par industry standards. They have young, enthusiastic, passionate and creative Professionals to develop technological innovations in the field of Mobile technologies, Web applications as well as Business and Enterprise solution. Motto of our organization is to “Collaborate with our clients to provide them with best Technological solution hence creating Good Present and Better Future for our client which will bring a cascading a positive effect in their business shape as well”. Providing a Complete suite of technical solutions is not just our tag line, it is Our Vision for Our Clients and for Us, We strive hard to achieve it.

Services provided by Vorcons Technologies.

- Core Java and Advanced Java
- Research and Development/Improvise of ML Models
- Web services and development
- Dot Net Framework
- Python
- Selenium Testing
- Conference / Event Management Service
- Academic Project Guidance
- On The Job Training
- Software Training

CHAPTER 3

INTRODUCTION

3. INTRODUCTION

Introduction to ML

Machine Learning (ML) is a subfield of artificial intelligence (AI) that focuses on developing algorithms and models that enable computers to learn and make predictions or decisions based on data. It is a transformative technology that has gained immense popularity and applications across various industries in recent years.

At its core, ML is about creating algorithms that can automatically learn from data and improve their performance over time without being explicitly programmed. This is in contrast to traditional software development, where programmers write explicit instructions to perform tasks. In ML, the system learns patterns, relationships, and insights directly from the data.

Problem Statement

"Developing a Machine Learning-Based Blind Assistance System for Enhanced Navigation and Safety"

People with visual impairments face significant challenges when navigating their surroundings independently. Traditional white canes and guide dogs provide valuable assistance, but there is a pressing need for advanced technologies to improve mobility and safety for the visually impaired. This problem statement addresses the development of a Machine Learning-based Blind Assistance System (ML-BAS) to address these challenges.

Problem Description:

1. ***Limited Spatial Awareness***: Blind individuals often struggle with limited spatial awareness, making it challenging to detect obstacles, navigate unfamiliar environments, and cross roads safely.
2. ***Safety Concerns***: Without adequate assistance, the visually impaired are at risk of accidents, collisions, and injuries, particularly in busy urban environments and around moving vehicles.
3. ***Accessibility Barriers***: Many public spaces and transportation systems lack accessibility features for the visually impaired, further limiting their mobility and independence.

CHAPTER 4

SYSTEM ANALYSIS

4. SYSTEM ANALYSIS

Existing System:

The existing system for blind assistance typically relies on traditional tools such as white canes and guide dogs. While these methods provide some level of assistance, they have limitations. White canes can detect obstacles on the ground but not above waist level, and guide dogs require extensive training and care.

Proposed System:

The proposed Blind Assistance System using Machine Learning (ML) aims to overcome the limitations of the existing system. It leverages advanced ML algorithms and sensor technologies to provide real-time assistance to visually impaired individuals. Key components of the proposed system include sensor integration (cameras, LiDAR, ultrasonic sensors), ML models for object detection and scene recognition, navigation assistance, safety alerts, and an intuitive user interface (e.g., mobile app or wearable device).

Objective of the System:

The primary objectives of the ML-based Blind Assistance System are as follows:

1. ***Enhanced Mobility:*** Enable visually impaired individuals to navigate their surroundings safely and independently, both indoors and outdoors.
2. ***Spatial Awareness:*** Improve the user's spatial awareness by providing real-time information about their environment, including the location of obstacles, landmarks, and changes in terrain.
3. ***Obstacle Detection and Avoidance:*** Utilize ML algorithms to detect and recognize obstacles, guiding users to avoid collisions and hazards effectively.
4. ***Wayfinding:*** Assist users in wayfinding by providing directions, recognizing landmarks, and helping them reach their desired destinations.

5. ***Safety Alerts:*** Generate real-time safety alerts, such as warnings about approaching vehicles or pedestrians, to prevent accidents.
6. ***User-Friendly Interface:*** Offer an intuitive user interface that is accessible to individuals with varying degrees of visual impairment, ensuring ease of use and minimal user intervention.
7. ***Privacy and Security:*** Implement robust privacy and security measures to protect user data and ensure the system's integrity.
8. ***Scalability and Maintainability:*** Design the system to be scalable for future updates and improvements while maintaining its reliability and performance.
9. ***Cost-Effectiveness:*** Ensure that the system remains affordable for users to promote widespread adoption.
10. ***User Training and Support:*** Provide user training and ongoing support to help visually impaired individuals effectively use the system and address any issues they may encounter.

CHAPTER 5

REQUIREMENT ANALYSIS

5. REQUIREMENT ANALYSIS

Hardware Requirement Specification

1. ***Sensors:***

- Cameras: High-resolution cameras for capturing visual data.
- LiDAR (Light Detection and Ranging): To create detailed 3D maps of the environment.
- Ultrasonic Sensors: For proximity sensing, especially for objects close to the user.
- GPS (Global Positioning System): To provide geolocation information.

2. ***Processing Unit:***

- High-performance CPU/GPU: To handle real-time data processing and ML computations.
- Dedicated hardware accelerators (e.g., TPUs or GPUs) for ML inference may be beneficial.

3. ***Memory:***

- Sufficient RAM for data buffering, sensor data storage, and model execution.

4. ***Connectivity:***

- Internet connectivity (e.g., Wi-Fi, cellular) for cloud-based processing and updates.
- Bluetooth or other wireless technologies for connecting to wearable devices or smartphones.

5. ***Wearable Device (Optional):***

- If the system is designed as a wearable, it may require specific hardware like speakers, microphones, and haptic feedback mechanisms.

6. ***Power Supply:***

- Sufficient battery capacity to ensure the system operates for extended periods without frequent recharging.

7. ***Audio Output:***

- Speakers or bone-conduction audio devices for delivering real-time auditory feedback to the user.

8. ***Physical Housing:***

- Depending on the form factor (wearable, handheld, or integrated into a smartphone), an appropriate physical housing or casing is required to protect the hardware components.

Software Requirement Specification

1. ***Operating System:***
 - Depending on the hardware, the system may run on operating systems such as Android, iOS, or custom embedded OS.
2. ***Machine Learning Frameworks:***
 - ML libraries and frameworks like TensorFlow, PyTorch, or scikit-learn for developing and deploying ML models.
3. ***Computer Vision Libraries:***
 - Libraries like OpenCV for image and video processing, essential for object detection and scene recognition.
4. ***Sensor Data Integration:***
 - Software to interface with sensors, collect data, and preprocess it for ML model input.
5. ***Machine Learning Models:***
 - Trained ML models for object detection, scene recognition, spatial mapping, and other relevant tasks.
6. ***Real-time Processing:***
 - Software components for real-time data processing and model inference.
7. ***User Interface (UI):***
 - For mobile apps or wearables, UI development tools and libraries to create an accessible and user-friendly interface.
8. ***Navigation Algorithms:***
 - Algorithms for wayfinding, obstacle avoidance, and landmark recognition.
9. ***Safety Alerting System:***
 - Software to generate and deliver safety alerts, including audio notifications.
10. ***Privacy and Security Measures:***
 - Encryption and authentication protocols to safeguard user data and system integrity.
11. ***Connectivity:***
 - Software for internet connectivity, Bluetooth pairing, and communication with external devices or cloud services.
12. ***Localization and Mapping:***
 - Software for localization (determining the user's position) and mapping (creating and updating maps of the environment)

CHAPTER 6

DESIGN ANALYSIS

6. DESIGN & ANALYSIS

Design and Analysis of a Blind Assistance System using Machine Learning

1. *Sensor Integration:*

- Utilize a combination of sensors, including cameras, LiDAR, ultrasonic sensors, and GPS, to collect real-time data about the user's environment.
- Implement sensor data fusion techniques to merge and preprocess data effectively.

2. *Machine Learning Models:*

- Develop ML models for key tasks:
 - Object Detection: Identify and classify obstacles, pedestrians, vehicles, and landmarks.
 - Scene Recognition: Determine the user's context (e.g., indoors, outdoors, urban, rural).
 - Spatial Mapping: Create and update a map of the environment, including information about obstacles and safe paths.

3. *Real-time Processing:*

- Design real-time data processing pipelines to handle sensor data, perform model inference, and generate user feedback with minimal latency.

4. *Navigation Assistance:*

- Implement navigation algorithms that use ML model outputs to provide real-time audio or haptic feedback to guide users around obstacles, help with wayfinding, and recognize landmarks.

5. *Safety Alerts:*

- Develop safety alerting systems that analyze sensor data and generate warnings about potential hazards, such as approaching vehicles or changes in terrain.

6. *User Interface (UI):*

- Create an intuitive and accessible user interface, which could be a mobile app or a wearable device, to provide users with control and information.

7. *Privacy and Security:*

- Implement encryption and authentication protocols to protect user data and ensure the system's security.

8. *Localization and Mapping:*

- Use localization algorithms to determine the user's position accurately.
- Develop mapping algorithms to create and update maps based on sensor data.

9. *User Training and Support:*

- Provide user training materials and interactive features within the UI to help users become proficient in using the system.

CHAPTER 7

IMPLEMENTATION

7. IMPLEMENTATION

Implementation is the stage where the theoretical design is turned into a working system. The most crucial stage in achieving a new successful system and in giving confidence on the new system for the users that it will work efficiently and effectively.

The system can be implemented only after thorough testing is done and if it is found to work according to the specification. It involves careful planning, investigation of the current system and its constraints on implementation, design of methods to achieve the change over and an evaluation of change over methods as part from planning.

Two major tasks of preparing the implementation are education and training of the users and testing of the system. The more complex the system being implemented, the more involved will be the system analysis and design effort required just for implementation.

The implementation phase comprises of several activities. The required hardware and software acquisition is carried out. The system may require some software to be developed. For this, programs are written and tested. The user then changes over to his new fully tested system and the old system is discontinued.

TESTING

The testing phase is an important part of software development. It is the Information zed system will help in automate process of finding errors and missing operations and also a complete verification to determine whether the objectives are met and the user requirements are satisfied. Software testing is carried out in three steps:

1. The first includes unit testing, where in each module is tested to provide its correctness, validity and also determine any missing operations and to verify whether the objectives have been met. Errors are noted down and corrected immediately.
2. Unit testing is the important and major part of the project. So errors are rectified easily in particular module and program clarity is increased. In this project entire system is divided into several modules and is developed individually. So unit testing is conducted to individual modules.
3. The second step includes Integration testing. It need not be the case, the software whose modules when run individually and showing perfect results, will also show perfect results when run as a whole.

CHAPTER 8

SNAPSHOTS

8. SNAPSHOTS



S.NO	OBJECTS	ACCURACY LEVEL
1	Cup	99%
2	Remote	98%
3	Bed	96%
4	Chair	96%
5	Tv	96%
6	Person	90%

CHAPTER 9

CONCLUSION

9. CONCLUSION

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:

- ❖ Automation of the entire system improves the efficiency
- ❖ 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.

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APPENDIX

```
declare backbone_map [7][7] feature_map (256); //ResNet34

declare grid[49];

declare anchor_box[49] holds [shape][size];

for i in 1 to 49:

anchor_box[i] ([shape][size]) = grid(shape,size);

declare obj_class;

declare location;

for i in 1 to 49:

if (degree(overlap) from anchor_box[i] equals max(degree))

define obj_class;

define location;

obj_class = permute_from(anchor_box,class);

location = permute_from(anchor_box,loc);

permute_from(anc_box_array,class(optional),loc(optional)):

for each element from anc_box_array:

get shape; //this parameter is to determine the shape of the anchor box

get size; //parameter to determine the size

get lighting; //parameter to determine the lighting

get pixel_pattern; //parameter to determine the visible vs dark pixels

get aspect_ratio; //parameter to determine the aspect ratio of the pixels

test_cases:

-> if aspect_ratio is like m:n where m > n then
```

obj has larger length

else

obj has larger height

-> if pixel_pattern in ('soft_edge')

obj is of complex structure and has curved edges

-> if lighting in ('dark_area') then

obj is in bedroom - inclines mostly to the bedside objects

return 'class_of_the_object'

return 'location_of_the_object'

// object class is to determine the type of object (stationery, cutlery, smartdevices etc.)

// location gives insights on the scope of the object (bedroom objects, living room furniture etc.)

depth_estimation:

depth = obj_in_frame(obj);

if (obj_in_frame(obj) == 1) then // if the obj fits in frame detect_object(boxes, scores, classes, num_detections);

for i,b in enumerate(boxes[0]):

eval boxes[0][i][0] // y axis upper boundary coordinates eval boxes[0][i][1] // x axis left boundary coordinates

eval boxes[0][i][2] // y axis lower boundary coordinates eval boxes[0][i][3] // x axis right boundary coordinates

mid_x = (boxes[0][i][1] + boxes[0][i][3])/2;

mid_y = (boxes[0][i][0] + boxes[0][i][2])/2;

```
apx_distance = round(((1 - boxes[0][i][3] - boxes[0][i][1]))**4,1); plot(mid_x,mid_y) //
plot a dot at the centre;
scores[0][i] = draw_boxes(obj);
if scores[0][i] >= 0.5 then
goto next if;
else goto for..enumerate(boxes[0]);
if (apx_distance < 0.5 && mid_x > 0.3 && mid_y < 0.7): goto image_recognition();
return 'object_is_closer';
```