A

Synopsis Report

On

“Collision Alert System At Blind Spot.”

Submitted to

Department of Electronics & Telecommunication Engineering

Submitted By

Mr. Mayur Jadhav

(Roll No- 2105067)

Under the Guidance of

Dr. A.B. Kakade

K.E.Society’s

Rajarambapu Institute of Technology, Rajaramnagar

(An Autonomous Institute)

Affiliated to Shivaji University Kolhapur

2024-2025

K. E. Society's

Rajarambapu Institute of Technology, Rajaramnagar

An Autonomous institute

SYNOPSIS

1. Name of Program : Electronics and Telecommunication

2. Name of Student : Jadhav Mayur Anil

3. Enrollment No. **:** 2105067

4. Date of Registration :

5. Name of Guide : Dr. A.B.Kakade

6. Sponsor's Detail (if any) : nil

7. Proposed Title : Collision Alert System At Blind Spot.

8. Synopsis of Dissertation Work

8.1 Relevance:

Collisions in blind corners of buildings, passages, and hallways are common, especially in high-traffic areas like offices, hospitals, schools, and shopping malls. These incidents can cause injuries, disruptions, and inefficiencies in movement. Existing solutions, such as mirrors and signs, require user awareness and may not always be effective.

This technology solves the problem by actively detecting potential collisions and providing an immediate alert through a buzzer, reducing the chances of accidents.

Discussion of Related Art

The opening of doors continues to cause injuries to persons and damage to objects when doors are opened by a person on one side of the door while a person or moving object is on the opposite side of the door. When a person is about to operate a door from one side, they normally cannot determine whether or not a person or movable object carried or pushed by another person is on the other side of the door. As a consequence, the potential exists that the door may strike a person or movable object on the opposite side of the door. Similarly, people moving along or past a visual barrier, such as a wall or screen, may collide with other people or movable objects moving toward them from the other side of the visual barrier. It is therefore desirable to prevent injury and damage when people and/or movable objects approach each other from adjacent areas that are mutually not visible to one another.

One solution to the problem as it relates to adjacent areas on opposite sides of a door is to place a window in the door so that a person about to open the door may observe activity on the opposite side before opening the door. This solution is not practical if the door is intended to provide privacy and/or security. Furthermore, where doors are opened quickly or people are moving quickly, it may be that a visual assessment through a window does not provide sufficient warning of a potential collision. One reason for this is that, the person opening the door must actively look through the window and assess what is observed. This may difficult when the area on the other side of the door is poorly lit or s when the person opening the door or the person/object on the other side of the door is moving quickly.

One solution related to adjacent areas around blind corners in hallways and adjacent areas on different sides of other visual obstructions is to place a convex mirror such that people moving from opposite sides of the obstruction can see one another. This solution has the advantages of being simple and inexpensive but suffers form the draw-backs including not functioning well if one or both sides of the obstruction are poorly lit and that it requires each person to actively look at objects in the mirror to determine if anything or anyone is moving or obstructing the opposite side of the visual barrier.

8.2. Literature Review:

Designing a collision warning system for two people at a door is an innovative approach to enhancing safety in environments where individuals may inadvertently collide due to limited visibility or high foot traffic. While extensive research has been conducted on collision avoidance systems in automotive and industrial contexts, literature specifically addressing human-to-human collision warning systems in architectural settings is limited. However, insights from related fields can inform the development of such a system.

Collision Avoidance Systems in Automotive Applications

Automotive collision avoidance systems (CAS) have been extensively studied and developed to prevent vehicle-to-vehicle collisions. These systems utilize sensors such as radar, lidar, and cameras to detect potential obstacles and provide warnings or automatic braking to avoid accidents. A comprehensive review by John Dahl et al. (2018) categorizes threat-assessment algorithms used in CAS, including single-behavior threat metrics, optimization methods, formal methods, probabilistic frameworks, and data-driven approaches like machine learning. These methodologies could be adapted for human-to-human collision detection by employing appropriate sensors and algorithms.[1]

Pedestrian Detection and Collision Mitigation

Pedestrian detection systems in vehicles aim to identify and prevent collisions with individuals on foot. These systems often employ computer vision techniques and artificial intelligence to recognize pedestrians in the vehicle's path and initiate warnings or automatic braking. The principles of pedestrian detection, such as real-time image processing and pattern recognition, can be applied to detect individuals approaching a doorway from opposite sides. Implementing similar sensor technologies and algorithms could enhance the accuracy and reliability of a doorway collision warning system. [2]

Human Factors and System Design

Understanding human behavior and response to warning systems is crucial in designing effective collision avoidance technologies. Research by Kyongsu Yi (2000) examines the effects of driver, vehicle, and environment characteristics on collision warning system design, emphasizing the importance of user acceptance and appropriate warning strategies. These insights highlight the need for intuitive and non-intrusive alert mechanisms in human-to-human collision warning systems to ensure users respond effectively without experiencing alarm fatigue. [3]

Sensor Technologies and Implementation

The selection of appropriate sensors is vital for accurate detection in collision warning systems. Ultrasonic sensors, infrared sensors, and cameras have been utilized in various applications to detect obstacles and measure distances. For instance, an Arduino-based forward collision detection system employs ultrasonic sensors to detect vehicles ahead and alert drivers to potential collisions. Adapting such sensor technologies for doorway applications involves configuring them to detect human presence and movement accurately, considering factors like sensor range, field of view, and environmental conditions.[4]

Collision Avoidance in Door Systems

Research into door collision avoidance has primarily focused on preventing accidents between doors and obstacles, including humans. For instance, a patent by Rhode et al. (2018) discusses systems and methods for vehicle door collision avoidance, utilizing sensors to detect obstacles and prevent door operation to avoid collisions. Although centered on vehicle applications, the principles of obstacle detection and preventive measures can be adapted for human-to-human collision scenarios in doorway settings. [5]

Sensor Technologies for Collision Prevention

Advancements in sensor technologies have significantly contributed to collision prevention systems. Pepperl+Fuchs offers dual-technology sensors combining motion detection and presence sensing to enhance safety in automatic door applications. These sensors utilize active infrared technology to create protective fields, preventing collisions by detecting the presence of individuals near doorways. Such technologies can be adapted to monitor both sides of a door, providing warnings when two people approach simultaneously. [6]

Similarly, OndoSense provides radar sensors designed for collision avoidance, capable of reliable obstacle detection even in challenging environmental conditions. These sensors can be employed in various applications, including monitoring pedestrian traffic in doorways to prevent collisions. [7]

Human-Robot Interaction and Collision Avoidance

Studies in human-robot interaction offer insights into collision avoidance strategies that can be translated into human-to-human contexts. For example, a hybrid collision avoidance system for indoor mobile robots engages both humans and robots in generating new collision-free paths, emphasizing the importance of interactive solutions in dynamic environments. Applying similar interactive approaches in doorway systems could involve adaptive warnings or dynamic adjustments based on real-time human movement patterns. [8]

8.3. Proposed Work:

8.3.1 Objectives:

1.To sense the movement of the person or object.
2.To alert the people by turning on buzzer using microcontroller.
3.To avoid the collision between persons and objects.

8.3.2 Need It Fulfills:

1.Prevents Accidental Collisions in high-traffic indoor spaces like hospitals, offices, malls, and schools.
2. Enhances Safety for visually impaired individuals, children, and the elderly.
3. Reduces Workplace Accidents, especially in industrial settings where unexpected movement can lead to injuries.
4. Increases Awareness by providing real-time, automatic alerts instead of relying on passive warning signs or mirrors.

8.3.3 Productivity & Impact:

1. Efficiency in Movement – Ensures smoother pedestrian traffic by preventing sudden stops or accidents.
2. Reduces Medical & Legal Costs – Minimizes injuries that could result in medical expenses or liability issues.
3. Energy & Cost-Efficient – Uses simple, low-power sensors and microcontrollers, making it affordable and easy to maintain.
4. Scalable & Adaptable – Can be installed in various environments, from commercial buildings to public infrastructure.
5. This system provides a practical, low-cost, and effective solution to a common safety issue, improving movement efficiency and reducing risks in everyday spaces. Would you like me to include potential future enhancements.

Architecture of System:

8.3.4 Process Diagram:

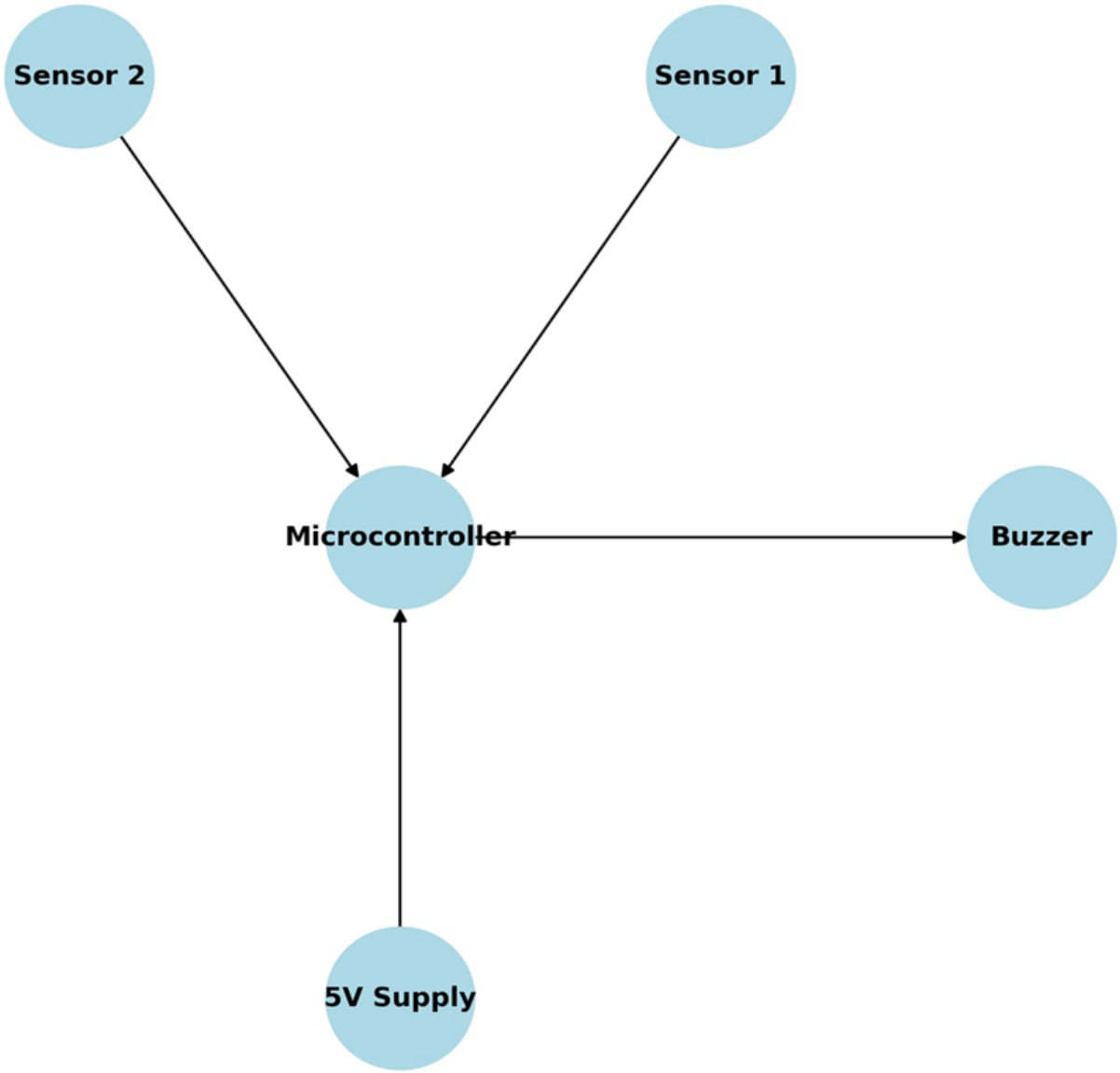

Fig1 . Diagram of System

This system is designed to detect and prevent collisions at blind corners in buildings by using multiple sensors and a microcontroller. The sensors detect individuals approaching from different directions, and if they are within a predefined collision range, the system triggers a buzzer alert to notify them.

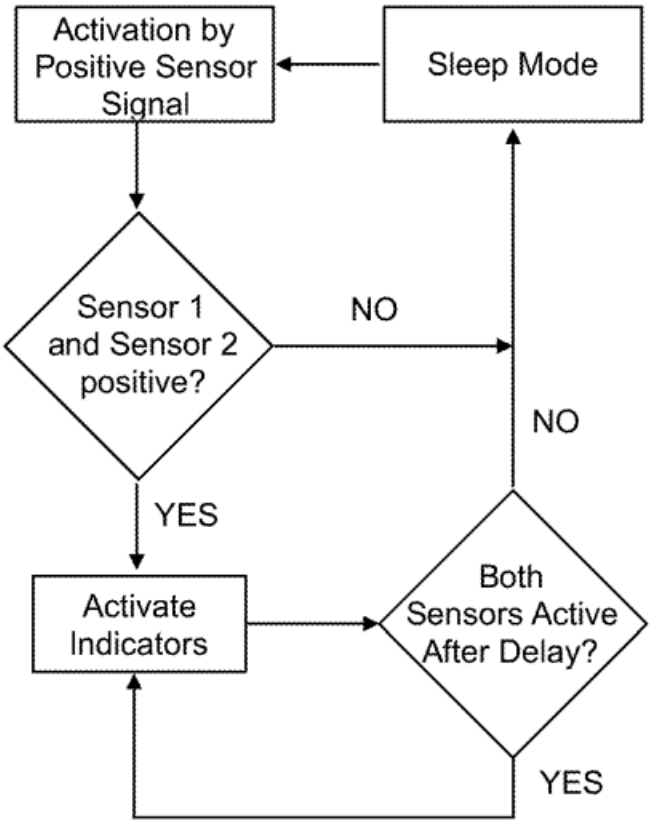

Fig 2 . Working flow of System

Sensor 1 and Sensor 2 continuously monitor movement.

If both sensors detect objects (people) within a defined range, the microcontroller activates the buzzer.

The buzzer alerts the individuals, preventing a collision.

9. Facilities Available

The following facilities to carry out dissertation work are available at Rajarambapu Institute of Technology, Rajaramnagar.

1. Internet Facility
2. Advance digital library(IEEE and other journals)

10. Expected Date for Completion of Work: May 2025

11. Approximate Expenditure: 4000/-

Date: Mayur Anil Jadhav

Place: Rajaramnagar Student

Dr.A.B.Kakade	Dr.M.S.Kumbhar	Dr.M.S.Patil
Guide	Head of Program	Head of Department

References :

1. Jorge D. Cardenas, Omar Contreras-Ponce, Carlos A. Gutierrez, Ruth Aguilar-Ponce, Francisco R. Castillo-Soria, Cesar A. Azurdia-Meza

Experimental Assessment of a Forward-Collision Warning System Fusing Deep Learning and Decentralized Radio Sensing

Published: 2023

Source: arXiv

2. Jianqiang Wang, Ding Wen, Huijing Zhao, Ming Liu

A Forward Collision Warning System Using Driving Intention Recognition of the Front Vehicle and V2V Communication

Published: 2019

Source: IEEE Xplore

3. N.Sreeraman

Performance Study On IR Sensor For Automobile Braking System

Published: 2018

Source: IRJET

4. Chirantana Kuchimanchi, S. S. P. Rao, K. S. R. Anjaneyulu

Collision Warning With Automatic Braking System For Electric Cars

Published: 2016

Source: ResearchGate

5. Rhode, D. S., Schmidt, D. J., & Tellis, L. (2018). Systems and methods for door collision avoidance. U.S. Patent Application No. 15/436,364.

6. Pepperl+Fuchs. (2024). Dual-Technology Sensor for Preventing Collisions. Technical Documentation.

7. OndoSense. (2017). Collision avoidance with radar sensors. OndoSense Applications.

8. Al-Hudhud, G., & Al-Shaikhli, I. F. T. (2016). A hybrid collision avoidance system for indoor mobile robots based on human-robot interaction. IEEE International Conference on Industrial Technology.