

Design and Development of Automatic Broken Glass System with Bus Fire Accidents

Prof. Sachin Z Jadhav¹, Mr. Saurabh S Ekhande², Mr. Jaysing R. Pawar³ Mr. Akshay Keshav Bhujbal³

¹DEPARTMENT OF MECH ENGINEERING & SHARADCHANDRA PAWAR COLLEGE OF ENGINEERING, OTUR, PUNE

²DEPARTMENT OF MECH ENGINEERING & SHARADCHANDRA PAWAR COLLEGE OF ENGINEERING, OTUR, PUNE

³DEPARTMENT OF MECH ENGINEERING & SHARADCHANDRA PAWAR COLLEGE OF ENGINEERING, OTUR, PUNE

⁴DEPARTMENT OF MECH ENGINEERING & SHARADCHANDRA PAWAR COLLEGE OF ENGINEERING, OTUR, PUNE

Abstract -

The proposed system enhances emergency response mechanisms by incorporating an automatic glass-breaking functionality. It uses advanced sensor technology, including acoustic and vibration analysis, to detect emergencies such as fire, gas leaks, or physical impacts. The system ensures swift evacuation and increased safety, minimizing false alarms through improved signal processing algorithms. Key features include robust detection algorithms, an integrated control unit, and compatibility with modern safety standards. Keywords: glass breaking, emergency evacuation, sensor technology, automated systems.

Key Words: Glass breaking, Emergency evacuation, Sensor technology, Automated systems, Safety standards, Signal processing

1. INTRODUCTION

Emergencies such as fire outbreaks or structural impacts often require immediate evacuation. Current manual systems, such as hammers for breaking glass, are slow and inefficient, particularly under stress. This paper introduces an automatic glass-breaking system, employing vibration, acoustic, and gas sensors, to detect emergencies and shatter glass windows automatically. The system is designed to enhance response time and improve safety for occupants.

2. System Design

Sensor Integration

The system uses piezoelectric sensors to detect vibrations, microphones for acoustic signals, and gas detectors for hazardous environments. A central Electronic Control Unit (ECU) processes data and triggers the glass-breaking mechanism when thresholds are breached.

Detection Algorithm

Building on existing research, the system incorporates a two-stage detection algorithm:

1. **Thud Detection:** Identifies initial impact sounds to minimize false positives.
2. **Break Confirmation:** Analyzes high-frequency signals characteristic of glass shattering.

Actuation Mechanism

A servo-controlled hammer or magnetic release is employed to shatter glass upon validation from the ECU.

3. CONCLUSIONS

The automatic glass-breaking system offers a significant improvement in emergency response. It reduces evacuation times and enhances safety. Future work will focus on integrating the system with building management systems and exploring alternative energy-efficient actuation mechanisms.

ACKNOWLEDGEMENT

The heading should be treated as a 3rd level heading and should not be assigned a number.

REFERENCES

1. Ramachandran, Dinesh, and Karthik Ravishankar. "Automatic Opening of Emergency Window by Magnetic Release Mechanism." Thiagarajar College of Engineering, India.
2. Minakshi Bhosale, Snehal Marwade, Vinod Arke, and Amol Shirsath. "A Review of Glass Break Detector System." International Journal for Research & Development in Technology, Vol. 7, Issue 3 (March 2017).
3. Edward P. Furlani. "Permanent Magnet and Electromechanical Devices."
4. Priyanga, R., et al. "Sensor-Based Accident Detection and Prevention Technology." IJATES, Vol. 2, Issue 11 (November 2011).
5. Datasheet of MSP430 from Texas Instruments, "www.ti.com".
6. L. Chuan-zhi, H. Ru-fu, and Y. E. Hong-wu. "Method of Freeway Incident Detection Using Wireless Positioning," in Proceedings of the IEEE International Conference on Automation and Logistics (2008), pp. 2801-2804.
7. C. Thompson, J. White, B. Dougherty, A. Albright, and D. C. Schmidt. "Using Smartphones to Detect Car Accidents and Provide Situational Awareness to Emergency Responders," in 3rd International ICST Conference (2010).