Glass breaks detection system using deep auto-encoders with fuzzy rules induction algorithm

By: Naing, WYN (Naing, Wai Yan Nyein)[1]; Htike, ZZ (Htike, Zaw Zaw)[1]; Shafie, AA (Shafie, Amir Akramin)[1]

INTERNATIONAL JOURNAL OF ADVANCED AND APPLIED SCIENCES
Volume: 6 **Issue:** 2 **Pages:** 33-38
DOI: 10.21833/ijaas.2019.02.006
Published: FEB 2019
Document Type: Article

Abstract

Main uses of glass windows in commercial and residential buildings are prevalent. While a glass-based material has its advantages, it also poses security risks. Therefore, glass break detectors play an important role in security protection for offices and residential buildings. Conventional vibration-based and acoustic-based glass break detectors are designed to detect predetermined temporal and frequency feature thresholds of glass breakage sound signals. This leads to the inability to differentiate glass break from environmental sounds (such as the sound of striking objects, heavy sounds and shouted sounds) that are similar in their amplitude threshold and frequency pattern. Machine learning based acoustic audio classification has been popular in security surveillance applications. Researchers are interested in this research area, and different approaches have been proposed for anomaly event detection (such as gunshots, glass breakage sounds, etc.). This paper proposes a new design of a glass break detection algorithm based on Fuzzy Deep Auto-encoder Neural Network. The algorithm reduces false alarms and improves detection accuracy. Experimental results indicate that proposed fuzzy deep auto-encoder network system attained 95.5% correct detection for the proposed audio dataset. (c) 2019 The Authors. Published by IASE.

Keywords

Author Keywords: Glass break detection; Deep auto-encoder neural network; Fuzzy rule induction algorithm

Author Information

Reprint Address: Naing, WYN (reprint author)

+ IIUM, Mechatron Engn Dept, Gombak, Malaysia.

Addresses:

+ [1] IIUM, Mechatron Engn Dept, Gombak, Malaysia

E-mail Addresses: waiyan.nn18@email.com

Funding

Funding Agency	Grant Number
Ministry of Higher Education Malaysia	PRGS17-002-0042
International Islamic University Malaysia	RIGS16-350-0514

View funding text

Publisher

INST ADVANCED SCIENCE EXTENSION, PO BOX 23-31,, TAIPEI, 00000, TAIWAN

Categories / Classification

Research Areas: Science & Technology - Other Topics
Web of Science Categories: Multidisciplinary Sciences

Document Information

Language: English
Accession Number: WOS:000457887200006
ISSN: 2313-626X

eISSN: 2313-3724

Other Information

IDS Number: HK4IH

Cited References in Web of Science Core Collection: 16

Times Cited in Web of Science Core Collection: 0

See fewer data fields

Cited References: 16

Showing 16 of 16 **View All in Cited References page** *(from Web of Science Core Collection)*

1. **Automatic sound detection and recognition for noisy environment** — **Times Cited: 1**
   By: Dufaux, A; Besacier, L; Ansorge, M; et al.
   10 EUR SIGN PROC C Pages: 1033-1036 Published: 2005
   [Show additional data]

2. **Method and system for detecting a predetermined sound event such as the sound of breaking glass** — **Times Cited: 1**
   Patent Number: 7,680,283
   Inventor/Assignee: Eskildsen, KG.
   U. S. Patent Published: 2005
   Patent and Trademark Office, Washington, D. C., USA

3. **Reducing the dimensionality of data with neural networks** — **Times Cited: 4,238**
   By: Hinton, G. E.; Salakhutdinov, R. R.
   SCIENCE Volume: 313 Issue: 5786 Pages: 504-507 Published: JUL 28 2006

4. **FURIA: an algorithm for unordered fuzzy rule induction** — **Times Cited: 147**
   By: Huehn, Jens; Huellermeier, Eyke
   DATA MINING AND KNOWLEDGE DISCOVERY Volume: 19 Issue: 3 Pages: 293-319 Published: DEC 2009

5. **An Analysis of the FURIA Algorithm for Fuzzy Rule Induction** — **Times Cited: 13**
   By: Huehn, Jens Christian; Huellermeier, Eyke
   ADVANCES IN MACHINE LEARNING I: DEDICATED TO THE MEMORY OF PROFESSOR RYSZARD S. MICHALSKI Book Series: Studies in Computational Intelligence Volume: 262 Pages: 321-344 Published: 2010

6. **Detection, classification and localization of acoustic events in the presence of background noise for acoustic surveillance of hazardous situations** — **Times Cited: 6**
   By: Lopatka, K.; Kotus, J.; Czyzewski, A.
   MULTIMEDIA TOOLS AND APPLICATIONS Volume: 75 Issue: 17 Pages: 10407-10439 Published: SEP 2016

7. **A fast transform for spherical harmonies** — **Times Cited: 98**
   By: Mohlenkamp, MJ
   JOURNAL OF FOURIER ANALYSIS AND APPLICATIONS Volume: 5 Issue: 2-3 Pages: 159-184 Published: 1999

8. **Highly directional glassbreak detector** — **Times Cited: 1**
   Patent Number: 13,105,026
   Inventor/Assignee: Richard, AS.
   U. S. Patent Published: 2011
   Patent and Trademark Office, Washington D. C

9. **The Rise of Crime in Malaysia: An Academic and Statistical Analysis** — **Times Cited: 16**
   By: Sidhu, A. S.
   Journal of the Kuala Lumpur Royal Malaysia police College Volume: 4 Pages: 1-28 Published: 2005

10. **Method of eliminating impact/ shock related false alarms in an acoustical glassbreak detector** — **Times Cited: 1**