WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Human Activity Identification Using Image Processing

Koushika M[1], Dr. A Mythili[2]

[1]UG-Student, Dept of Computer Science with Cognitive Systems, Dr. N. G. P Arts and Science College, Coimbatore, Tamilnadu, India
Email: koushikakoushika872@gmail.com
[2]Assistant Professor, Dept of Computer Science with Cognitive Systems, Dr. N.G. P Arts and science college, Coimbatore, Tamilnadu, India
Email: amaidhi.16@gmail.com

ABSTRACT

The "fire detection and SMS Alert Notification Nearby Station Using YOLO" is an advanced system designed to detect fires in residential settings using the You Only Look Once (YOLO) object detection algorithm. This system leverages real-time video feeds from surveillance cameras to identify fire outbreaks accurately and promptly. Upon detection, the system immediately triggers alerts through various channels, including mobile notifications, alarms, and integration with local emergency services. The primary objective is to minimize response time and mitigate fire-related damage by leveraging state-of-the-art computer vision techniques. The system's modular design ensures scalability and adaptability, making it suitable for diverse applications in smart homes and other residential spaces.

Upon identifying signs of fire or smoke, the system immediately triggers alerts, including local alarms, push notifications to connected devices, and automatic notifications to emergency services. The integration of YOLO ensures robust performance, with capabilities to detect fire even in challenging conditions, such as low lighting or partial obstructions. Its modular and scalable design allows seamless integration into smart home ecosystems and provides a proactive solution for reducing fire-related risks and enhancing residential safety. By bridging modern AI technology with practical safety measures, this system aims to significantly minimize fire response times and mitigate property and life losses.

Keywords - You only look once (YOLO), Deep Learning, Real-Time prediction, .

I. INTRODUCTION

This paper focuses on developing fire detection and sms alert notification nearby system using Yolo The effectiveness of a fire detection and alerting system lies not only in its ability to detect fire hazards but also in its capacity to deliver timely alerts to relevant stakeholders. Whether deployed in single-family homes, apartment complexes, or large residential buildings, these systems play a crucial role in enhancing situational awareness, enabling prompt responses, and ultimately reducing the impact of house fires.

In this context, this report presents the development and implementation of a fire detection and Alert System, focusing on the utilization of the YOLOv5 platform. Through the integration of computer vision techniques, machine learning algorithms, and real-time data processing capabilities, the system aims to provide an efficient and reliable solution for detecting fire incidents and issuing alerts to mitigate the consequences of house fires. The following sections will delve into the methodology, implementation details, results, and potential applications of the system, highlighting its significance in residential safety, emergency response, and disaster management initiatives.

II. LITERATURE REVIEW

Our project focuses on leveraging the YOLO (You Only Look Once) algorithm for real-time fire detection. Renowned for its exceptional speed and accuracy in object detection, YOLO is an ideal choice for identifying fire and smoke in diverse environments, enabling timely alerts and responses.

The primary objective of this project is to develop a highly accurate model capable of detecting fire or smoke in images and videos with precision and efficiency. To achieve this, the YOLO model will be trained on datasets containing images of fire and smoke under varying conditions, including differences in fire intensity, smoke density, and environmental backgrounds. By employing transfer learning techniques, we will fine-tune pre-trained YOLO models specifically for house fire detection tasks, thereby enhancing the model's performance and adaptability.

This system is designed to significantly contribute to residential safety, industrial fire monitoring, and public infrastructure protection. By providing an automated, reliable, and efficient fire detection solution, our project demonstrates the potential of state-of-the-art machine learning technology in addressing critical safety concerns and mitigating fire-related risks.

III. PROBLEM IDENTIFICATION

Fire outbreaks pose a serious threat to life, property, and the environment, especially in situations where early detection and response are lacking. Traditional fire detection systems are often limited to sounding alarms locally, which may go unnoticed if no one is present to hear them. This delay in awareness and response can lead to significant damage and loss. In remote or densely populated areas, the lack of timely communication to nearby residents and emergency services further escalates the risk. Therefore, there is a pressing need for a smart fire detection system that can not only detect fires in real-time but also immediately send SMS alerts to people nearby and to emergency responders. Such a system can enhance safety by ensuring faster response times, early evacuation, and effective coordination during fire emergencies

IV. METHODOLOGY

4.1 Input Module

Components: Cameras or video capture devices.

Function: Captures real-time video feeds from installed cameras in residential areas.

Key Features:

High-resolution input to enhance detection accuracy.

Support for multiple camera feeds.

2. Pre-processing Module

Components: Image enhancement and normalization algorithms.

Function: Prepares raw input data by resizing, filtering, and converting video frames into a format suitable for YOLO processing.

Key Features:

Frame extraction for real-time analysis.

Noise reduction to improve detection performance.

3. Detection Module

Components: YOLO (You Only Look Once) model.

Function: Detects fire and smoke in the video frames using pre-trained YOLO weights optimized for house fire detection.

Key Features:

Real-time fire and smoke recognition.

High accuracy and low latency due to YOLO's efficient architecture.

4. Alert Module

Components: Notification systems (email, web apps), local alarm systems.

Function: Notifies residents, neighbors, and emergency services upon detecting fire.

5. Emergency Response Module

Components: Automated emergency contact systems.

Function: Automatically contacts fire departments or designated emergency contacts when fire is detected Fig :04

V. RESULT

Outputs from computer systems are required primarily to communicate the results of processing to users. They are also used to provide a permanent copy of the results for later consultation. The various types of outputs in general are:

External Outputs, whose destination is outside the organization.

Internal Outputs whose destination is within organization

User's main interface with the computer.

Operational outputs whose use is purely within the computer department.

Interface outputs, which involve the user in communicating directly with User Interface.

Output Definition:

The outputs should be defined in terms of the following points:

Type of the output

Content of the output

Format of the output

Location of the output

Frequency of the output

Volume of the output

Sequence of the output

It is not always desirable to print or display data as it is held on a computer. It should be decided as to which form of the output is the most suitable.

For Example

Will decimal points need to be inserted?

Should leading zeros be suppressed.

Output Media:

In the next stage it is to be decided which medium is the most appropriate for the output. The main considerations when deciding about the output media are:

The suitability for the device to the particular application.

The need for a hard copy.

The response time required.

The location of the users

The software and hardware available.

Keeping in view the above description the project is to have outputs mainly coming under the category of internal outputs. The main outputs desired according to the requirement specification are: The outputs needed to be generated as a hot copy and as well as queries to be viewed on the screen. Keeping in view these outputs, the format for the output is taken from the outputs, which are currently being obtained after manual processing. The standard printer is to be used as output media for hard copies

VI. DISCUSSION

Using YOLO, our proposed system provides the following benefits over existing solutions:

Real-time Detection: Leverages YOLO's ability to process video feeds in real-time, enabling immediate response to fire outbreaks.

High Accuracy: Reduces false alarms by distinguishing between actual fire/smoke and unrelated events like steam or cooking flames.

Automated Alerts: Sends immediate notifications to residents, emergency services, or firefighters, ensuring faster action.

Scalable Deployment: Can be integrated into existing CCTV systems or drones for fire monitoring across large areas, such as warehouses or industrial complexes.

Visual Localization: Provides bounding boxes around detected fire, giving exact locations within a scene for targeted firefighting.

By integrating YOLO into the house fire detection framework, this system offers a robust, scalable, and efficient solution to mitigate fire-related risks, ultimately saving lives and minimizing property.

VII.CONCLUSION

In conclusion, the implementation of YOLO (You Only Look Once) in machine learning for fire detection and alert systems represents a ground-breaking advancement in fire safety and prevention. By leveraging the efficiency of real-time object detection, YOLO offers precise identification of fire and smoke in various environments, even under challenging conditions such as low visibility or complex indoor settings. This technology holds immense potential for mitigating fire-related disasters, reducing response times, and enhancing the safety of residential spaces. The integration of YOLO-based systems with smart home technologies and IoT devices further amplifies their utility, allowing for automated alerts and proactive intervention to minimize property damage and save lives. The scalability and adaptability of YOLO make it a valuable tool for homeowners, emergency responders, and policymakers striving to improve fire safety standards. As advancements in deep learning and object detection algorithms continue, YOLO-based house fire detection systems pave the way toward a safer future, ensuring greater protection and peace of mind for individuals and communities alike.

VIII. FUTURE WORK

Future enhancements for fire detection and alert systems using YOLO (You Only Look Once) present promising opportunities for improving fire safety measures and reducing potential hazards. Enhancements could focus on increasing the accuracy and robustness of the system to detect not only visible flames but also early warning signs such as smoke, heat, and gas leaks. This could be achieved by incorporating expanded datasets that include diverse fire scenarios, such as smouldering fires, electrical sparks, or chemical combustions, and fine-tuning YOLO models to recognize subtle visual patterns indicative of fire risks.

Additionally, integrating YOLO with thermal imaging, multispectral sensors, or gas detection technologies could further enhance its detection capabilities in environments where visual cues alone may be insufficient, such as during heavy smoke or in complete darkness. The development of advanced algorithms for distinguishing between false positives (e.g., steam, sunlight reflections, or candles) and actual fire events will improve system reliability and reduce unnecessary alarms.

Collaboration with fire safety experts and IoT developers can enable seamless integration with home automation systems, allowing for real-time alerts through mobile devices, automated activation of sprinkler systems, and direct communication with fire departments. These advancements would not only enhance the effectiveness of house fire detection systems but also foster proactive fire prevention strategies, ultimately reducing the risk of catastrophic losses and ensuring safer living environments.

REFERENCES

1.Redmon, J., Divvala, S., Girshick, R., Farhadi, A.: "You Only Look Once: Unified, Real-Time Object Detection." Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), pp. 779–788 (2016).

2.Lin, T.Y., Goyal, P., Girshick, R., He, K., Dollars, P.: "Focal Loss for Dense Object Detection." IEEE Transactions on Pattern Analysis and Machine Intelligence 42, no. 2 (2020): 318-327.

Wang, C., Bochkovskiy, A., Liao, H.M.: "YOLOv4: Optimal Speed and Accuracy of Object Detection." arXiv preprint arXiv:2004.10934 (2020).

3.Huang, Z., Zhu, C., Zhou, X.: "A hybrid deep learning model for fire and smoke detection in urban buildings." Neurocomputing 439 (2021): 157-170.

4.Wu, Di, and Long Ma. "Real-time house fire detection using lightweight convolutional neural networks." Fire Technology 57, no. 4 (2021): 1835-1852.