Technical Answers to Real World Problems

(EEE3999)

Project Report

Innovative Geeks

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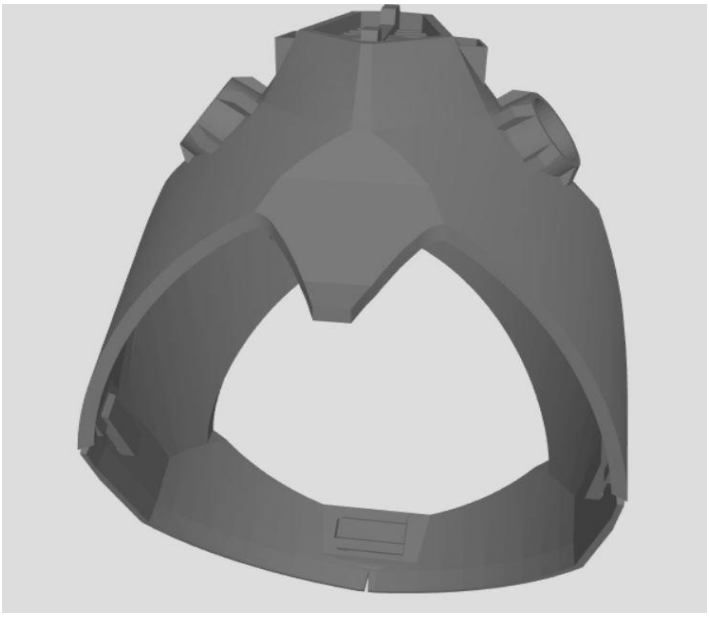
Smart Smoke Detection Mask



Declaration:

I the undersigned solemnly declare that the project report **"SMART SMOKE DETECTION MASK"** is based on my own work carried out during the course of our study under the supervision of **Prof. DHANAMJAYULU C**.

I assert the statements made and conclusions drawn are an outcome of my research work. I further certify that

- **I.** The work contained in the report is original and has been done by me and my teammate under the general supervision of my supervisor.
- **II.** The work has not been submitted to any other Institution for any other degree/diploma/certificate in this university or any other University of India or abroad.
- **III.** We have followed the guidelines provided by the university in writing the report.
- **IV.** Whenever we have used materials (data, theoretical analysis, and text) from other sources, we have given due credit to them in the text of the report and giving their details in the references.

Certification:

This is to certify that **Lakshya Porwal,** student of B. Tech 6th SEMESTER Electronics and Instrumentation Engineering, has successfully completed his3 credit course (Technical Answers to Real World Problems), Vellore for 1 semester. He has completed the whole project as guided by his supervisor.

Under the Guidance of:-

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Assistant Professor (Senior)

TT, VIT University, Vellore

DATE: 20-05-2020

Acknowledgement:

I would sincerely like to express my gratitude towards VIT University, for providing me the opportunity of pursuing my 3 credit course in this renowned University and endowing me with this unparalleled experience and deep understanding of a wide array of processes and manufacturing method taking place in different workshops of the industry.

I would also like to thank my training guide **Prof. DHANAMJAYULU C** whose guidance and motivation went a long way in my understanding of different section of my project. Furthermore, I would like to thank my institute for giving me this opportunity and increasing my practical knowledge base.

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Abstract

One of the most serious problems in disaster management is the intake of harmful gases present in the smoke in case of an outbreak of fire. Several smoke detection methods have been proposed but only some of them are able to maintain an effective detection performance. A proper smoke detection system could help us avoid the disasters and the intake harmful gases which can be present in the smoke. The proposed model is of a Smart Smoke Detection Mask, is an initiative to detect the smoke nearby and overcome the problem of intake of harmful gases in case of a disaster or fire. The paper describes a model of a smart mask with embedded sensors, microcontroller and a filter. If somehow a house or place is on fire, the smoke mask senses the smoke and filters it out, and helps the person to evacuate with minimum damage by making him take the path with least smoke. This helps in preventing as well as solving the problem relating to fires and disasters.

Keywords: *Smoke detection, Filter, smart mask*

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Introduction:

Today, there is a significant demand for automatic smoke detection systems that work fast while requiring low maintenance costs. These observation frameworks are used for smoke discovery itself or for early detection of fires. In the last case, flames may not show up before the camera during the main minutes after start, however consuming materials discharge mainstays of smoke that involve bigger volumes. In such cases, a mishap can be distinguished regardless of whether the wellspring of the fire is taken cover behind another article, for example, a fence. Cameras are by all account not the only methods for smoke recognition [7]. Sensor hubs, utilized inside wired, or remote systems, can recognize temperature changes and noxious gas fixations without requiring light sources. At the point, when sensor hubs are furnished with batteries and remote correspondence modules, they can be set very a long way from one another and can cover immense zones. In any case, this sort of arrangement requires ordinary support, and can't be utilized to study entire regions in light of the discrete idea of the sensor hubs' spatial dispersion [2][4]. Cameras require less upkeep and can review the entire locale in their field of view; in any case, broadly useful observation cameras neglect to give significant information around evening time because of poor commotion execution and absence of shading data. To adapt to this issue,[1] Torabnezhad et al. have proposed another approach to recognize smoke by using infrared (IR) pictures, which permit recognizing of smoke from other smoke like locales with higher exactness; in any case, this strategy depends on shading data, and in this way doesn't take care of the issue of smoke recognition around evening time. The significant expense of IR cameras additionally influences the capacity to assemble financially savvy frameworks dependent on such strategies [5].

The problem mentioned in this paper is that the detection of smoke that s of a smoke sensor. Smoke may be the first precursor of fireplace, and its speedy detection could decrease the hurt that a hearth can cause. As cheap police investigation systems tend to use low-resolution cameras, the rule ought to work quick and will be ready to sight smoke from low-resolution video knowledge [3]. However, low cost high-definition (HD) cameras area unit presently rising whose knowledge cannot be processed quickly by means that of existing algorithms for police investigation tasks. This paper describes a model of a Smart smoke detection mask, which not only detects smoke but also helps filter

the smoke-filled air to avoid difficulty in breathing, or breathing in of harmful gases. This model also helps in navigating through the path with least smoke with the help of an application in mobile. This model helps to minimize the damage in case of an outbreak of a fire due to failure of the detection system.

LITERATURE REVIEW:

S. N	Paper Title	Author	Year	Abstract	Outcome
1.	Visible and IR image fusion algorithm for short range smoke detection	Mehdi Torabnezhad, Ali Aghagolzadeh, HadiSeyedarabi	2013	In this paper, we combined the data of visible and infrared images for the detection of smoke in short distances. For this purpose, the absence of the smoke in IR images can be used to distinguish between smoke and smoke-like moving objects.	The technique propose in this paper is able to detect smoke in different conditions successfully, and also to reduce the rate of false detection. In addition to the correct and punctual detection of fire, it is also required to have more data about fire fronts to fight fire efficiently.
2.	Smoke detection using spatial and temporal analyses	C.-Y. Lee, C.-T. Lin, C.-T. Hong, and M.-T. Su	2012	In this study, the process of extracting smoke features from Candidate regions was accomplished by analysing the spatial and temporal characteristics of video sequences	No existing algorithms are sufficiently robust and flexible enough to overcome all the problems faced by the automatic video fire and smoke detection systems, such as lighting

				for three important features: edge blurring, gradual energy changes, and gradual chromatic configuration changes. The proposed spatial-temporal analysis technique improves the feature extraction of gradual energy changes.	conditions, scene complexity, and shadows. This study developed a novel smoke-detection approach using spatial and temporal analyses, which was based on a block-processing technique.
3.	CONTOUR BASED SMOKE DETECTION IN VIDEO USING WAVELETS	B. Ugur Toreyin, Yigithan Dedeoglu, and A. Enis Cetin	2006	This paper proposes a novel method to detect smoke in video. It is assumed the camera monitoring the scene is stationary. The smoke is semi-transparent at the early stages of a fire. Therefore edges present in image frames start loosing their sharpness and this leads to a decrease in the high frequency content of the image.	A novel method for detecting smoke in video is developed. The algorithm is mainly based on determining the edge regions whose wavelet subband energies decrease with time and wavelet based contour analysis of possible smoke regions. These regions are then analyzed along with their corresponding background regions with respect to their ROB and chrominance

					values.
4.	A fast-accumulative motion orientation model based on integral image for video smoke detection	F. Yuan	2008	In order to improve the performance of video smoke detection, the proposal of an accumulative motion model based on the integral image by fast estimating the motion orientation of smoke. To reduce this influence, the accumulation of the orientation over time is performed to compensate results for the inaccuracy of orientation. The model is able to mostly eliminate the disturbance of artificial lights and non-smoke moving objects by using the accumulation of motion.	In this paper, an accumulative motion model is proposed. The estimation is greatly accelerated by using the integral image technique. The model can mostly eliminate the disturbance of artificial lights and non-smoke moving objects by using the accumulation of motion. In order to further reduce the false alarm, the accumulation of alarms is also used. Experiments show that our model can detect the presence of smoke correctly in most cases.
5.	Smoke detection for static cameras	Alexander Filonenko, Danilo C´aceres Hern´andez, and Kang-	2015	This paper describes the smoke detection for static cameras. The background	In this paper the smoke detection algorithm for static cameras was explained. While using expensive sensors

		Hyun Jo		subtraction was used to determine moving objects. Color characteristics were utilized to distinguish smoke regions and other scene members. Separate pixels were united into blobs by morphology operations and connected components labeling methods. The image is then refined by boundary roughness and edge density to decrease amount of false detections. Results of the current frame are compared to the previous one in order to check the behavior of objects in time domain.	shows good detection performance, it also was achieved by a single low-resolution camera. Processing time approached to real-time. In future work some of steps will be reconsidered to be used in CUDA kernels. Currently, all the parameters are chosen manually, but for fully autonomous systems they should be adjusted according to lightning conditions. This kind of automatic adjustment will be introduced in future work.