



FIRE & ARSON INVESTIGATOR

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The Identification of Lines of Demarcation for Use in Analyzing Fire Damage through DIGITAL Image Processing and Artificial Intelligence

Abstract

Visual interpretation of varying levels of damage and lines of demarcation is subjective in fire investigations. Processing images with edge detection algorithms using mathematical identification of gradients between areas of different intensities has been demonstrated here to be an objective means to identify varying lines of demarcation of fire damage. In this study, five standard algorithms were used including: Canny, Laplacian of Gaussian (LoG), Prewitt, Roberts, and Sobel. The edge detection algorithms struggled to properly distinguish between edges that were considered lines of demarcation and noise. Finally, an artificial intelligence edge detection model was used as well. The artificial intelligence model built for this study showed that edge detection was shown to be highly accurate for simple damage patterns.

Student and Mentoring Committee



The newly created Student and Mentoring Committee has some exciting things in the works to help move our industry forward and answer the charge of President Watson of raising up the next generation of fire investigators within our industry. We will be spotlighting a past or present student in every article to help showcase how our industry is moving forward and give readers a glimpse into who is moving the industry along. Our first in this ongoing series will be recent Eastern Kentucky Graduate and 2022 ITC participant Arianna Trotter.

NEW!



Student Spotlight: Arianna Trotter

College: Eastern Kentucky University (EKU)
Degree: B.S in Fire Safety Engineering Technology
With an emphasis on Fire, Arson & Explosion Investigation
Current Employer: University of Kentucky
Job title: Code Specialist
Responsibilities: Plan Review, Safety Inspections, Systems Inspections Fire & Safety investigations
IAAI ATC: 2022 Jacksonville, FL

Committee members recently sat down with Arianna and discussed her thoughts on her degree program and the IAAI's student mentorship program.

Q. What made you decided to go into the fire service career path?

C. So you attended the ITC in Jacksonville; what

ELECTRIC



By David

David P. Cusatis, IAAI-CFI is employed by Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) as an Enforcement Training Specialist and a member of the ATF Fire Protection Division in Emmitsburg, MD He is a licensed Journeyman Electrician and holds a Fire Protection Certification offered by ATF and the National Fire Academy.

Basic Circuits

Fire investigators are faced with numerous electrical circuitry issues. While most fire investigators have a solid understanding of electrical systems, many admittedly struggle when it comes to this topic.

Typically, the struggle begins when the investigator must determine if a shorted or energized electrical circuit within their area of investigation was the cause of the fire or was a contributing factor. An opinion can be easily rendered as to whether or not a shorted or energized circuit was the cause of the fire. Often, the investigator must dig deeper into the electrical system to determine the respect to what role electricity may or may not have played in the fire.

Once the investigator determines electricity was involved in the fire, they must determine if the energized electrical circuit within their area of investigation was the cause of the fire or was a contributing factor. The understanding of an electrical circuit can be found in the NFPA 70 (National Electrical Code) and the NFPA 921 (Guide for Fire and Explosion Investigations). Holt describes an electrical circuit as "any conductive pathway for the electrical energy to flow".

ABSTRACT: Throughout the history of fire investigation, mentoring has been a method for training new fire investigators. While this process has garnered some criticisms for perpetuating “myths and legends”, the passing of knowledge is still a valid and trusted method for training neophytes in almost every field of endeavor, including the sciences, provided that the information passed is validated and received properly. This article aims to advance the field by providing the new fire investigator some general, philosophical heuristics on how to prepare their minds for the cognitive challenges they will face and to provide their mentors with a framework for presenting and sharing knowledge.

Advice for New Fire Investigators

Being in fire investigation for a long time provides one the opportunity to learn, unlearn and re-learn a lot of information about fire science and fire investigation.

may be followed (or ignored) at any time during the reader's career.

Think! While this piece of advice may seem obvious, *think about what an investigator can*

CAL SHORTS



J. P. Cusatis, IAAI-CFI

Alcohol, Tobacco, Firearms and Explosives (ATF) as a Program Manager/Lawyer for the ATF National Response Team, stationed at the National Fire Academy (NFA) in Emmitsburg, Maryland and developed the Electrical Aspects of Fire Investigation course

electrical challenges during a fire scene examination. Some electrical components have the potential to be a competent ignition source. Many times, the investigator must determine whether the electrical devices, appliance or fixture was the cause of the fire.

The investigator must determine whether the electrical devices, appliance or fixture was the cause of the fire. At times, the physical evidence is overwhelming, such as the involvement of electricity; however, this is not always the case. The investigator must determine whether the electrical system supported or refuted their hypothesis with respect to the cause of the fire.

If an electrical component was present, the next step is to determine if there was an electrical fault or short circuit. The definition of an electrical circuit is not specifically found in the National Electrical Code (NEC). The most simplistic and common-sense definition of an electrical circuit is that it consists of three components: 1) an electrical energy source, such as having three components: 1) an electrical energy source, such as a power source, 2) a conductor, such as a wire, and 3) a load. Without these components, there is no electrical circuit.



executive director's view



ATF and the IAAI Did you know?

Special agents interested in becoming a CFI must have a minimum of three years of service with ATF, reach at least the GS-12 level, and have a current performance appraisal of fully successful or higher. Candidates must also submit a curriculum vitae/resume that lists previous training and experience investigating arson, explosives, and other complex cases.

Candidates must successfully pass a written exam and a physical fitness test.

I would like to welcome and congratulate ATF's Director Steven Dettelbach

President Biden appointed and swore in Steven M. Dettelbach as the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) Director on July 13, 2022. Mr. Dettelbach is responsible for leading an agency of men and women charged with protecting the public by enforcing laws and regulations related to firearms, explosives, arson, and alcohol and tobacco trafficking.*



Scott Stephen

