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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 to edge detection was shown to be highly accurate for simulating the

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 career path?

Q. So you attended the ITC in Jacksonville; what

ELECTRIC



By David P. Cusatis
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 in Emmitsburg, MD He is a licensed Journeyman Electrician offered by ATF and the National Fire Academy.

Basic Circuits

Fire investigators are faced with numerous electrical circuits. Many investigators have a solid understanding of electrical circuits but admittedly struggle when it comes to this topic.

Typically, the struggle begins when the investigator determines if the electrical circuit was the cause of the fire or was a victim of the fire and an opinion can be easily rendered as to what role electricity may or may not have played. Often, the investigator must dig deeper into the electrical circuit to respect to what role electricity may or may not have played.

Once the investigator determines electricity was the cause of the fire, energized electrical circuit within their area of concern. The National Fire Protection Association (NFPA) 921, or NFPA 70 (National Electrical Code) understanding of an electrical circuit can be found in NFPA 70. Holt describes an electrical circuit as a continuous, closed, conductive pathway for the electrical energy.

Authors: Steven J. Avato, M.S., B.A., B.S.
Joshua W. Hottle, B.S.

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, it is a reminder that an investigator can

ELECTRICAL SHORTS



by P. Cusatis, IAAI-CFI

...cohol, Tobacco, Firearms and Explosives (ATF) as a Program Manager/Lay
...TF National Response Team, stationed at the National Fire Academy (NFA)
...rician and developed the Electrical Aspects of Fire Investigation course

...ectrical challenges during a fire scene examination. Some
...lectricity and its potential to be a competent ignition source. Many
...ic and how it relates to the cause of the fire.

...tigator must determine whether the electrical devices, appliance
...victim of the fire. At times, the physical evidence is overwhelming,
...the involvement of electricity; however, this is not always the cas
...the electrical system to support or refute their hypothesis with
...ot have had in the cause of the fire.

...was present, the next step is to determine if there was an
...of concern. The definition of an electrical circuit is not specifically
...Electrical Code, NEC). The most simplistic and common-sense
...found in Mike Holt's Illustrated Guide to Basic Electrical Theory
...it as having three components: 1) an electrical energy source,
...y to travel to and from the source, and 3) a load. Without these



executive director's view



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

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 success...

