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The Daily BooII -Spooky Edition!

IT'S ONLY 7 DAYS UNTIL Halloween

A Novel Machine Learning Method for Generalized Spirit Detection

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The accurate detection of spirits has long been a matter of existential significance within the pseudo-scientific community. Yet, despite the importance of the problem, past methods have fallen short of being able to detect ghosts reliably and accurately without sensitivity to noise.

Introduction

Ghosts, ghouls, phantoms and specters, collectively referred to as "spirits" are commonly believed to be present in the world all around us. However, accurately and reliably detecting these spirits has long proved to be a difficult task within the scientific community. Some methods trace their roots to the middle ages, such as table turning, Ouija spelling, and seances, though their efficacy is questionable at best, and even those with empirical foundations are limited to detecting ghastly presences with notably high SNR, while lacking spatial precision [1]. More recent technologies, such as EMF detectors and laser thermometers, suffer from environmental noise and local variations in temperature caused by the uncontrolled environment in which they are deployed. Recent work has proposed the use of Mass Spectrometry to detect ghosts with more precision, aided by a comically large vacuum tubes [2-3]. However, their proposed MS-SPOOKY method is highly susceptible to noise from graduate students in the local vicinity.

In light of the recent explosion of broad-scale availability of machine learning equipment and methods, we propose a robust, noise-resistant, and precise statistical method for detecting spirits using a combined visual-auditory perception system and machine learning frameworks. Our method utilizes a Basic Optical Optimizer (BOO)-based model for the visual input to segment ectoplasmic reticulum from the background, and uses Auditory Haunting Heuristics (AHH) for extracting relevant spooky noises from the recorded audio, with both outputs fused in a decoder-architecture to produce a 3D spatial map of predicted ghost activity within the target area.

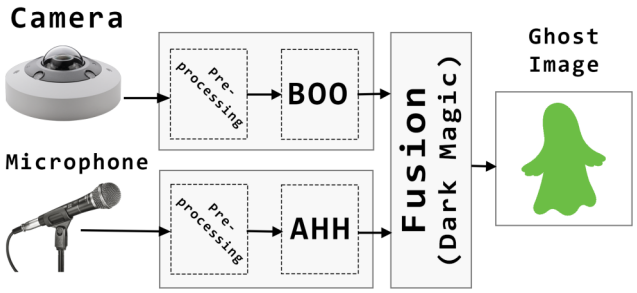

Figure 1: Proposed Spirit Detection Architecture

Method

Our proposed system architecture is shown in Figure 1. We utilize a four layer BOO Convolutional Neural Network, with 8 ResNet block layers at the input for feature extraction, with the resulting features output fed into a Flatten layer, followed by two fully connected layers with 3 and 5 neurons, respectively. Thus, our network structure has been termed BOO8135. This network was trained by forcing it to watch every *Scary Movie* movie [4], with an Adam's optimizer using L_2 loss.

The Auditory Haunting Heuristics (AHH) system utilizes a variety of audio-processing techniques in both the frequency and time domains, such as anti-aliasing, noise cloaking, source-separation via log-power-spectra mapping, and scream identification. This system was tested audio from *Paranormal Activity* [5], and was found to be able to correctly distinguish the audio contribution of spirits from other sources with an accuracy of 86.57%. We evaluate our system here via a simulated environment.

Results and Discussion

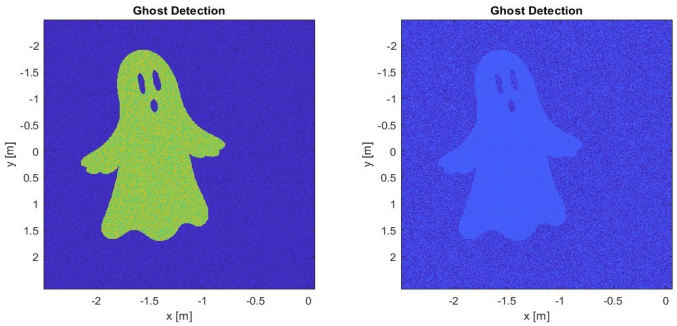

Figure 2: 2D-slices of Example System Outputs. Left: SNR ≈10. Right: SNR ≈ 1.1

In simulation, our system was able to clearly and fully detect a full ghost figure, with an example result shown in Figure 2. Our method was able to confidently resolve a spirit figure down to a simulated SNR of 1.1 before the BOO8135 model began confusing the noise for ghostly phenomenon. Our system also proved to be particularly sensitive to simulated ectoplasmic ejections, which are commonly seen from fleeing ghosts. This is likely due to a lack of training data available for this phenomenon, owing to its short duration.

Conclusion

We have proposed a machine learning based method for ghost detection in a general setting. Our system relies on visual and auditory systems, and fuses the two to create noise-resistant localizations of ghost activities. Having demonstrated the efficacy of this method in simulation, we aim to apply it to a physical experiment in the near future.

References

[1] D. Chakravarti, H. Green, *et. al.*, "Spooky Month: Psychics with Dylan Marron," *SciShow Tangents,* 15 October, 2024. Complexly [Online] Available: https://scishow-tangents.simplecast.com/episodes/spooky-month-psychics-with-dylan-marron

[2] E. Warren, "Proposed Detection of Ghosts by Mass Spectrometry-Spectral Presence Origin-Omics Kinetic Yield (MS-SPOOKY)", *Journal of Immaterial Science Miscommunication,* Jun. 2021. DOIOU: 760.706.7425

[3] J. Nintendo, *Luigi's Mansion*, 2001.

[4] *Scary Movie*, 2000

[5] *Paranormal Activity*, 2007

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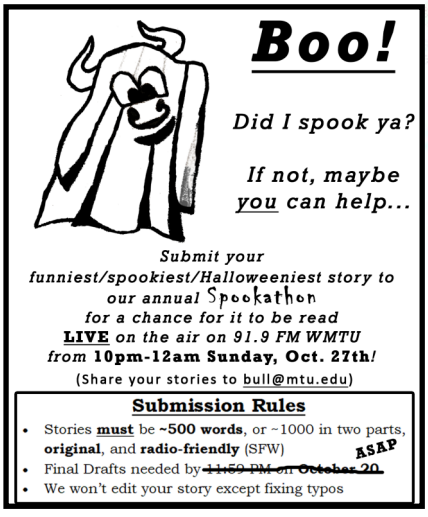

Boo!

Did I spook ya?

If not, maybe you can help...

Submit your funniest/spookiest/Halloweeniest story to our annual Spookathon for a chance for it to be read ***LIVE*** *on the air on 91.9 FM WMTU from* **10pm-12am Sunday, Oct. 27th!**

(Share your stories to bull@mtu.edu)

Submission Rules

- Stories **must** be **~500 words**, or ~1000 in two parts, **original**, and **radio-friendly** (SFW) ASAP
- Final Drafts needed by ~~11:59 PM on October 20~~
- We won't edit your story except fixing typos

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