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Skywave:
An Exploration of the Enchanting Impacts of Cosmic Cybernetics

Keywords

Cosmic Interaction, Cybernetics, Radio Skywave Effect, Technopaganism.

Abstract

Skywave explores the invisible impacts of cosmic interaction upon both machines and humans. Culminating as a ritual between human and non-human participants, radio transmission and machine learning are utilized to explore systems of communication between humans, machines, and the natural world. In joining witchcraft and modern technological frameworks, we explore new paradigms where natural and animistic concepts intertwine with information technology, informing new modes of communication.

Research Questions

I. How can enchantment be created or amplified by inferring natural (analog) modes of communication?
II. How can both mechanical and human processes be informed by communicating across common channels?
III. What can be inferred from cosmic phenomena by exploring their impact upon human and mechanical systems?

Methodology

Radio

When the perspective of radio is slightly skewed, the communication technology can soon appear as if a magic spell humanity learned to wield. Radio signaling uses the skywave effect to bounce back and forth from the Earth to the ionosphere, an electrically charged layer of the atmosphere (Poole 1999). This layer is impacted by the sun's UV light rays, becoming thinner in their absence, and thus further propagating radio waves. These waves sometimes escape the Earth, have cosmic origins, and/or interact with celestial objects, as in moon bouncing, or earth-moon-earth (EME) radio reflection.

Amateur radio (or ham radio) is a range of radio frequencies reserved for hobbyists, researchers, and any wanting to use radio signaling without any related monetary compensation. North America happens to be one of the most popular areas for ham radio, with Quebec being the most widely serviced province in Canada. There are over 600 repeaters (frequencies that

‘bounce’ signals further) in the province, including 12 in Montreal (and one in Concordia University). This means that relatively weak (and cheap) signals can go a long way.

The community on air and online is not only large, it is also generous. Most (if not all) ham radio digital signal processing (DSP) software interfaces are open source. Most frameworks have not been updated in years (the technology has not required it), and to our knowledge, only FLDigi, our chosen software, works on the newer Mac Silicon architecture. Similarly, hobbyists often freely upload data from their experiments with ham radio, including that from moon bouncing, eclipse ionosphere interactions, and cosmic noise.

Machine Learning Model

The input for our machine learning model consists of information received via radio. This information may arrive in different forms depending on our chosen transmission protocol; audio, a digital or analog signal, text, or image. We plan to train and test initially with open-source data found online, before generating data of our own during the ritual performance. We expect to process this data externally via Wekinator’s mapping software, outputting it to TouchDesigner via OSC.

In mapping, we aim to discover underlying patterns or information in the transmission, whose origin is likely to be cosmic background noise. The output of this regression task should be handled as an input within TouchDesigner, affecting the audio-visual output for the human systems of Skywave to interact with. Inspired by PSK31’s (a radio digital mode) waterfall signal display, the output of Skywave will be a materialization of the processed data. TouchDesigner’s input will inform a 2D visual output (e.g., trails of frequencies over time), which will in turn inform a depth map. This data will translate into a 3D render where the camera (and the viewer) will navigate through the signals and its environment, making the invisible visible.

Timeline

Mar. 28

- Proposal Submission, Presentation
- Feedback & Adjustments
- Reach out to Concordia radio club
- Interview primary references

April 4

- Begin project documentation, continue research
- Begin experimenting with the equipment
- Prototype our ML model and inter-machine communication

April 11

- Refine model and output
- Plan ritual, meet with participants
- Gather training data
- Draft documentation

April 18

Conduct ritual

Post-ritual data processing

TouchDesigner post-processing

Video creation and editing

Apr. 25

Presentation Day

Documentation complete

Apr. 26

Final Report Submission

Inspiration

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