BlackVision – A Multi-Spectral Observatory to Visualize Frozen Time Near Black Holes

High-Level Project Summary

BlackVision is a next-generation multi-spectral observatory designed to detect relativistic time-dilation phenomena, often described as 'frozen time,' near black holes. By merging optical, infrared, and radio capabilities, it reconstructs event-horizon emissions in real-time using open NASA datasets. The system delivers a unified stream of multi-spectrum data that provides a clear and scalable picture of black hole environments.

Project Details

BlackVision integrates three modules: optical, infrared, and radio. The optical module captures visible distortions from gravitational lensing, the infrared module penetrates gas and dust clouds, and the radio module detects long-wavelength signals escaping intense gravity wells. Together, they synchronize into a complete multi-spectrum visualization of black hole activity. The system was validated through a custom-built 3D simulation, supported by CAD models and research data.

NASA Data Usage

The project leverages the **2021 JSON dataset of radio and infrared emissions from Sagittarius A***. This dataset was used to validate the reconstructed event-horizon emission ring in simulations, demonstrating that BlackVision can replicate multi-year astronomical observations within a real-time framework.

Space Agency Partner & Other Data

In addition to NASA data, the project referenced visualization research datasets from Harvard University. Tools and software used include **AutoCAD** for system modeling, **Visual Studio Code** with JavaScript and CSS for simulation development, and **Zenodo** for hosting the research paper.

Use of Artificial Intelligence

AI tools were employed to assist in building the 3D simulation codebase. This included optimizing rendering pipelines and improving data synchronization between optical, infrared, and radio visualization layers. AI contributions were limited to coding support, while the conceptual and scientific framework remained human-driven.

Visuals

The final documentation includes CAD designs of the telescope system and data visualizations derived from NASA datasets and Harvard research graphics. These visuals demonstrate both the technical design and the real-time simulation outputs.