ABSTRACT

Satellite anomalies caused by extreme space weather events such as geomagnetic storms and high energy particle flux can disrupt satellite operations, damage onboard instruments, and threaten mission success. Many existing monitoring systems are still limited in functionality and lack advanced interactive and visual analytics features that are essential for early detection and effective decision support. This study presents the latest version of the Satellite Anomaly Information System, known in Indonesia as Sistem Informasi Anomali Satelit (SIAS), which has been redesigned as a web-based platform using the Laravel framework with a modular and responsive frontend design. The system introduces key features such as an interactive dashboard, orbital heatmaps, and time series charts that visualize anomaly trends and space weather conditions, supported by filters based on satellite type, anomaly source, and time range. Data reporting is made flexible through export options in PNG and PDF formats. The system was developed using an iterative incremental approach, enabling continuous refinement based on user feedback. Usability testing using the System Usability Scale served as the performance metric in this study and produced an average score of 79.16, indicating a high level of user acceptance. The platform bridges the gap between static anomaly records and interactive analytical tools, providing a more informative and accessible approach for satellite anomaly investigation. This research focuses on the design and implementation of a web-based interface and data processing logic, including the development of dynamic visualization modules and the integration of both historical and near real time data to support anomaly trend analysis. Future improvements will be directed toward enhancing the accuracy of intensity representation in heatmap visualizations and improving the overall user experience.

Keywords— *Satellite, Anomaly, Space Weather, Geomagnetic, Frontend, Laravel, Data Visualization, Heatmap*