عنوان مقاله:

Using artificial intelligence for advanced health monitoring of marine vessels

محل انتشار:

دومین کنفرانس بین المللی دستاوردهای خلاقانه معماری، شهرسازی، عمران و محیط زیست در توسعه پایدار خاورمیانه (سال: 1402)

تعداد صفحات اصل مقاله: 12

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خلاصه مقاله:

The maritime industry, serving as the backbone of global trade and transportation, is undergoing a profound transformation with the integration of artificial intelligence (AI) into the health monitoring of marine vessels. This article explores the revolutionary impact of AI algorithms on predictive maintenance, anomaly detection, and data fusion, revolutionizing the traditional approach to vessel management.Predictive maintenance algorithms, notably Long Short-Term Memory (LSTM) networks, analyze historical engine data to forecast potential failures, allowing for proactive interventions and minimizing downtime. Simultaneously, anomaly detection models, such as Isolation Forests and Gaussian Mixture Models, continuously scrutinize real-time sensor data for irregular patterns, acting as a vigilant early-warning system against potential issues. The synergy of data fusion techniques aggregates information from diverse sources, including sensor data, external conditions, and historical logs. Utilizing ensemble learning and clustering algorithms, this comprehensive approach provides operators with a holistic view of vessel health, enabling data-driven decision-making. The emergence of digital twins introduces a new dimension to vessel health monitoring, allowing for sophisticated simulations and predictive analysis. Reinforcement learning algorithms fine-tune these simulations, offering insights into adaptive maintenance strategies and enhancing overall operational resilience. In the realm of cybersecurity, AI-driven intrusion detection systems fortify vessel systems against cyber threats, ensuring the integrity of critical onboard infrastructure and protecting against potential cyber-attacks.Beyond safety and security, AI significantly contributes to operational efficiency and environmental sustainability. Algorithms optimizing fuel consumption, planning efficient navigation routes, and reducing emissions showcase the industry's commitment to intelligent and environmentally conscious practices. In conclusion, the integration of AI into marine vessel health monitoring signifies a transformative shift toward safer, more efficient, and environmentally responsible maritime operations. The amalgamation of predictive maintenance, anomaly detection, and data fusion not only ensures the safety and resilience of individual vessels but also contributes to a sustainable future for the global maritime industry. Embracing these innovations is paramount for navigating the seas of the future with resilience and environmental responsibility.

کلمات کلیدی:

Artificial Intelligence, Marine Vessels, Health Monitoring, Predictive Maintenance, Anomaly Detection.

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