Research article, Type: Subscription ***Volume: 12***

BIM-based facility management for complex structures

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Research article Page: 01-21

BIM-based facility management for complex structures utilizes digital twins created during design to centralize asset data, maintenance schedules, and operational metrics, enabling proactive decision-making throughout a building's lifecycle. For intricate facilities like high-rises or hospitals, BIM integrates HVAC, electrical, and structural systems into a single interactive model, allowing facility managers to visualize spatial relationships and track real-time performance via linked IoT sensors. This approach supports predictive maintenance by analyzing usage patterns, reducing downtime by 20-30% and optimizing energy consumption through automated simulations. Space utilization analytics from BIM models aid occupancy planning, while lifecycle documentation ensures compliance and seamless handovers from construction teams. Such integration enhances resilience for aging urban infrastructure, complementing your interests in SHM and multi-hazard design.

Wireless sensor networks for structural health monitoring

Ali Mohameed Alabdan, Fahad Saud Almotairi, Soliman Ibrahim Al-Abdan, Aishah Shafi Alanazi, Molawwah Nasser Alqahtani & Shoaa G.

Research article Page: 22-38

Wireless sensor networks (WSNs) enable continuous structural health monitoring (SHM) of civil infrastructure like bridges and buildings by deploying low-cost, battery-powered sensors that measure strain, vibration, and temperature without extensive wiring. These networks use protocols like ZigBee or Wi-Fi for real-time data transmission to a central base station, supporting damage detection through acoustic emission and Lamb wave techniques. Key advantages include scalability for hundreds of nodes, reduced installation costs compared to wired systems, and condition-based maintenance that predicts failures early. Challenges involve power management, data synchronization, and harsh environmental resilience, addressed via energy harvesting and embedded algorithms for anomaly detection. Applications in urban settings enhance safety for aging structures, aligning with your interests in vibration control and seismic resilience.

Smart grid optimization for urban energy distribution

Moneef Ibrahim, Almoneef Thamer, Khalifah Alkhalifah, Abdulrahman Sharaf Faisal Alwuthaynani, Razan Hameed, Alsulami Wessal & Hassan Toweirqie

Research article Page: 39-51

Smart grid optimization for urban energy distribution uses advanced sensors and AI to monitor and balance electricity supply with real-time demand in densely populated cities. This approach integrates renewable sources like solar and wind, reducing transmission losses by up to 20% through dynamic load management and predictive analytics. Automated demand response systems shift peak usage to off-peak times, minimizing blackouts and cutting energy costs for consumers. Technologies such as IoT-enabled smart meters and microgrids enhance grid resilience against outages while supporting electric vehicle charging infrastructure. Overall, these optimizations promote sustainable urban growth by lowering CO_2 emissions and enabling efficient energy trading. ……… [For more click here]

Drones in construction site monitoring

Mohameed Alabdan, Fahad Almotairi, Soliman Ibrahim Abdan, Aishahi Alanazi & Molawwah Nasser Alqahtani

Research article Page: 52-68

Modifies the tensile response of steel fibre reinforced concrete (SFRC) by altering both the cementitious matrix and the fibre–matrix interface. Over years of service, microstructural densification of the matrix can increase the limit of proportionality and initial tensile strength, while creep and shrinkage still promote crack development. Aging often enhances fibre–matrix bond, which may increase post-cracking residual tensile capacity, but corrosion of exposed steel fibres in aggressive environments can gradually reduce their bridging efficiency. Overall, the long-term tensile performance of SFRC depends on exposure conditions and temperature, with moderate environmental actions showing good retention of residual tensile capacity, whereas severe corrosion or high-temperature histories can cause notable degradation……… [For more click here]

Augmented reality in structural inspection

Carolina Seade, María Acosta & Rakesh Ray

Research article Page: 69-84

Flow-3D or FSUM to simulate horseshoe vortices, downflow, and bed shear stresses, capturing velocity gradients and sediment transport under live-bed conditions. These models predict maximum scour depths (y_s/D) at pier front edges, with rectangular piers (L/D=5-9) showing 10-25% deeper scour than circular due to enhanced downflow and turbulence intensity. Non-uniformity amplifies scour via shear stress peaks and asymmetric vortex shedding, validated against flume tests with RMSE <0.2 for equilibrium depths. Empirical corrections to HEC-18 equations improve predictions for skewed or compound piers in unsteady flows……… [For more click here].

Big data analytics in urban flood prediction

Musdalifah Djamaluddin, Haedar Akib, Anshari, Andi Kasmawati & Wahira, Hamsu

Research article Page: 85-94

High-rise implementations, such as twin tower studies, demonstrate comparable carbon footprints and seismic performance Sustainable design of recycled aggregate concrete (RAC) in high-rise structures promotes environmental benefits by reducing landfill waste and virgin resource extraction through the reuse of construction and demolition debris. Performance evaluations reveal that RAC maintains adequate compressive strength and durability for structural applications when replacement levels shows slightly lower modulus of elasticity compared to natural aggregate concrete. High-rise implementations, such as twin tower studies, demonstrate comparable carbon footprints and seismic performance with optimized mixes incorporating supplementary cementitious materials. ……. [For more click here]