AI-driven predictive maintenance for infrastructure

Mohammad Alabbad & Mahdi Mubark

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AI-driven predictive maintenance for infrastructure analyzes real-time data from IoT sensors on bridges, roads, and buildings to forecast failures using machine learning models like random forests and neural networks. These systems detect anomalies in vibration, strain, and corrosion patterns, scheduling repairs proactively to cut downtime by 30-50% and maintenance costs by 18-25%. In transportation, AI monitors rail tracks and bridges for wear, while energy grids predict transformer overloads from load and weather data. Benefits include 40% longer asset life and 75% fewer safety incidents, with continuous learning improving accuracy over time. This complements SHM applications, enhancing resilience for aging urban structures.……… [For more click here].

Smart grid optimization for urban energy distribution

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

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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

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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

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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: 65-84

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]