Intelligent Fault-Tolerant Control of Offshore Wind Turbines via Deep Reinforcement Learning

- Handling actuator & sensor faults by deep reinforcement learning for offshore wind turbines (OWT).
- Combining the merits of both data-driven and model-based control methods.

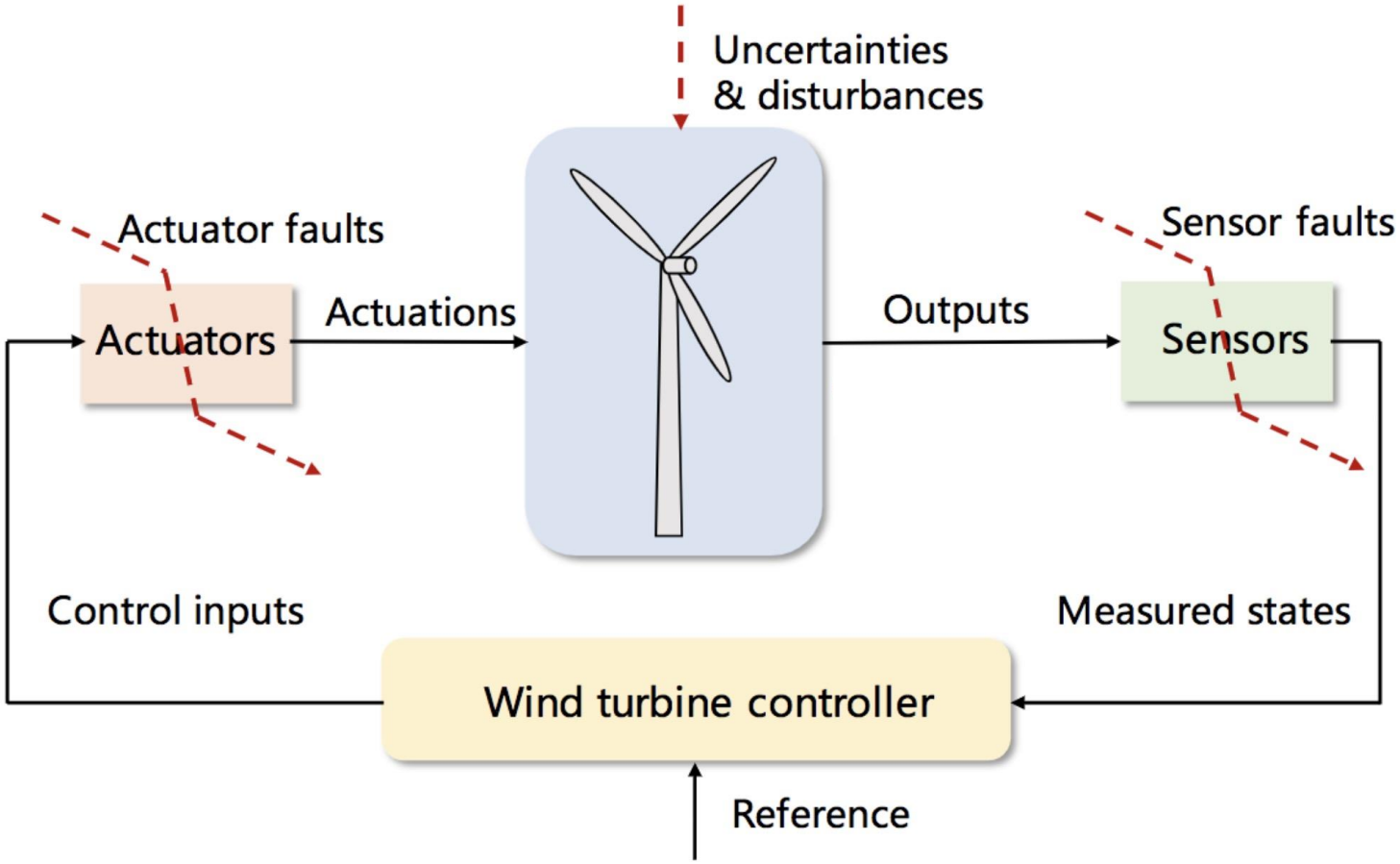

Figure: OWT control system with actuator and sensor faults.

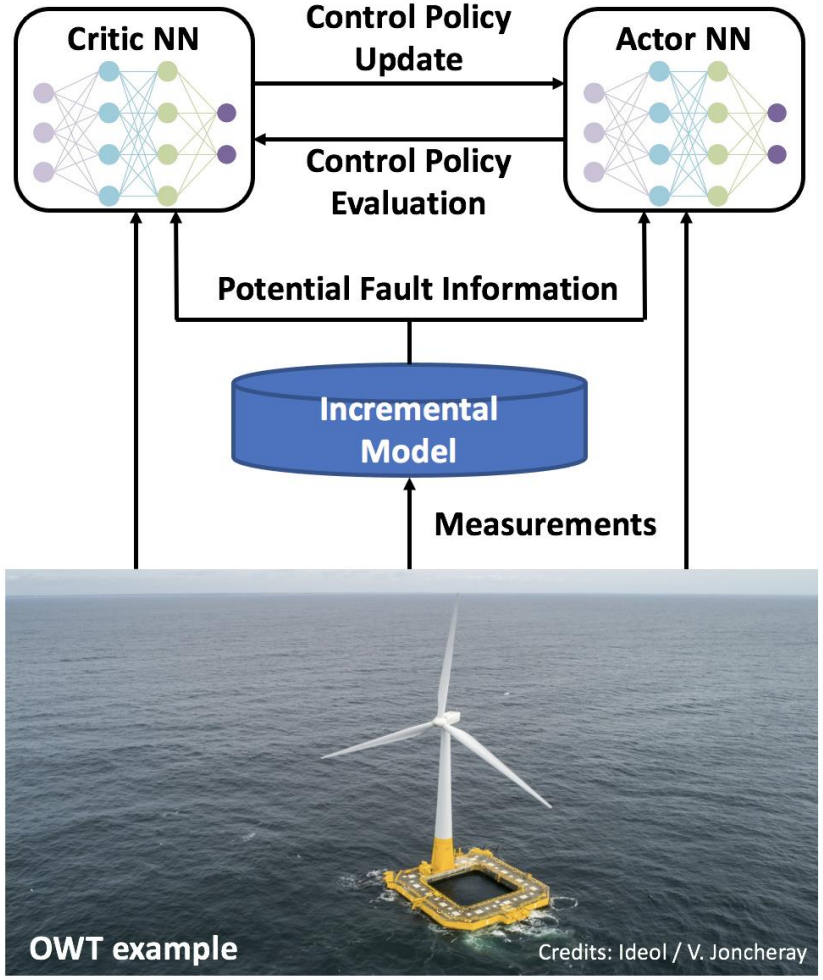

Figure: A brief illustration
of the proposed control strategy.

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- An incremental model to capture potential online system changes with real-time measurements.
- A critic-actor RL structure to achieve high-performance fault-tolerant control.
- Better performance than commonly-used methods (incl. PI and MPC) under faulty conditions.

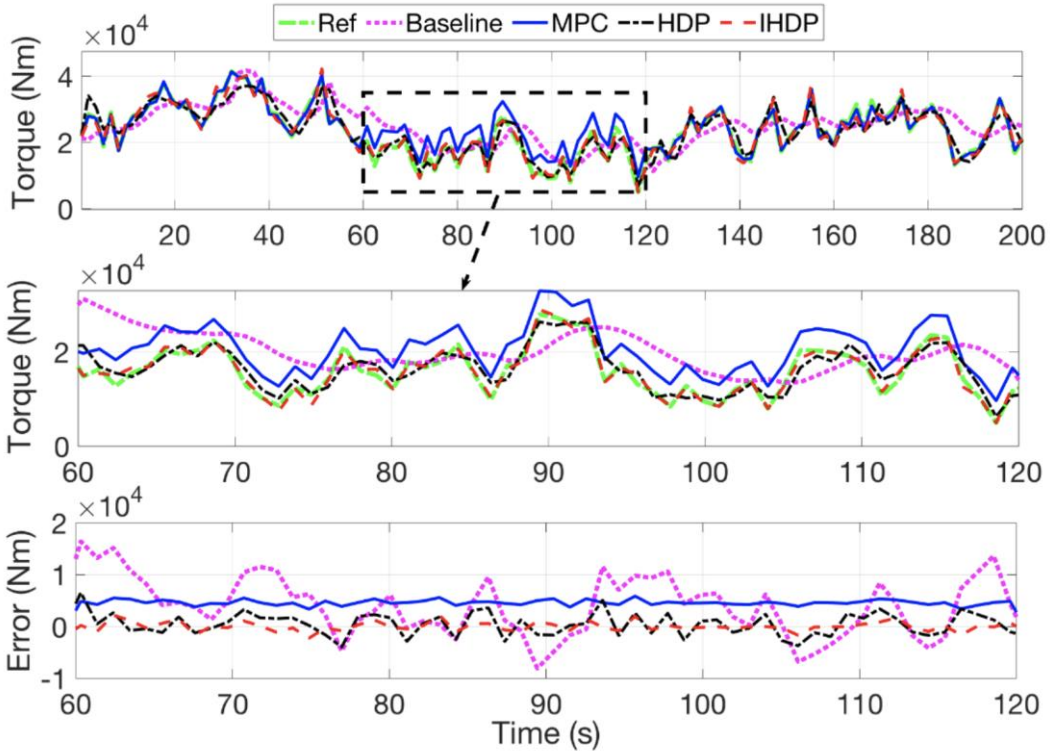

Figure: Generator torques under different controllers subject to the offset fault (+5000 N m) – IHDP is the proposed method, which leads to smallest errors.

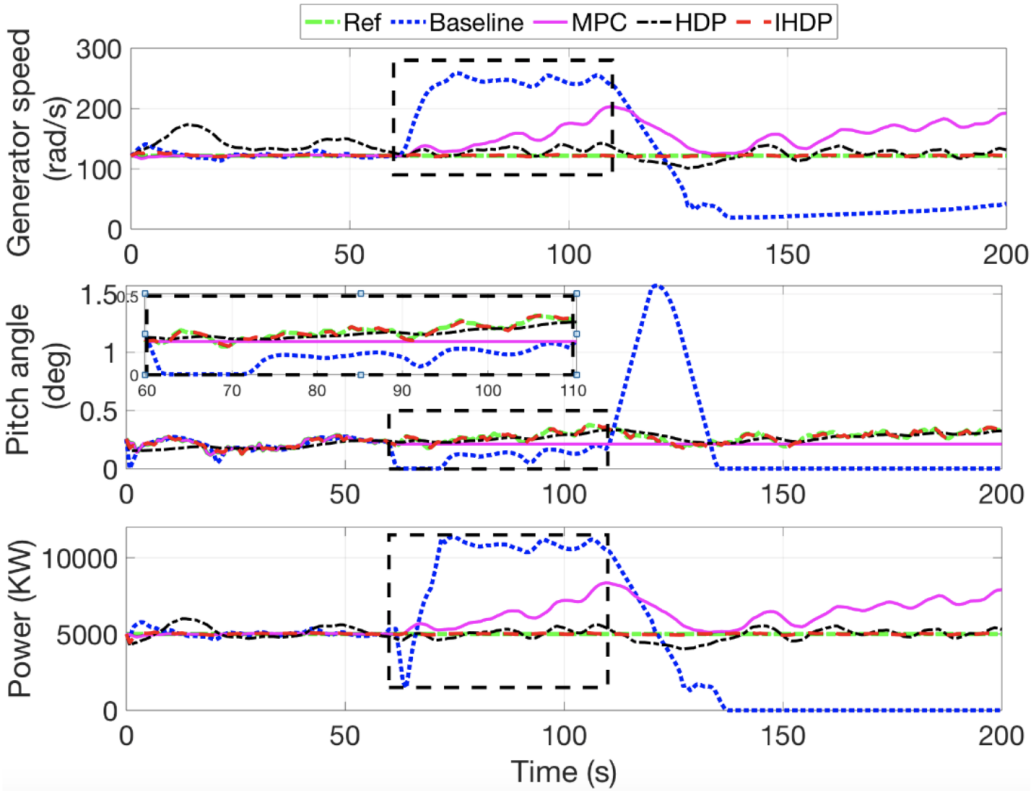

Figure: Control performance of different controllers under partial failure sensors and parameter uncertainties – IHDP is the proposed method, which leads to best performance.