Dynamic analysis of a floating wind turbine using the Moving Frame Method

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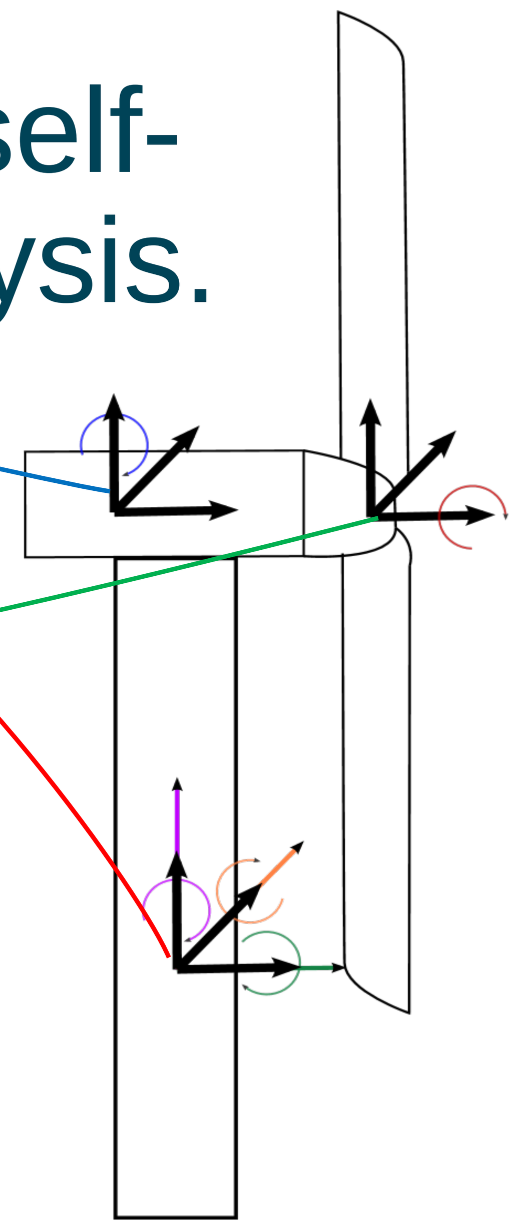
•Aim of the project

Leverage the Moving Frame Method (MFM) to create self-contained software systems for complex dynamic analysis.

•Process

•Assert frames for the nacelle, platform and rotor



•Determine kinematic expression for each body through use of the Special Euclidean group

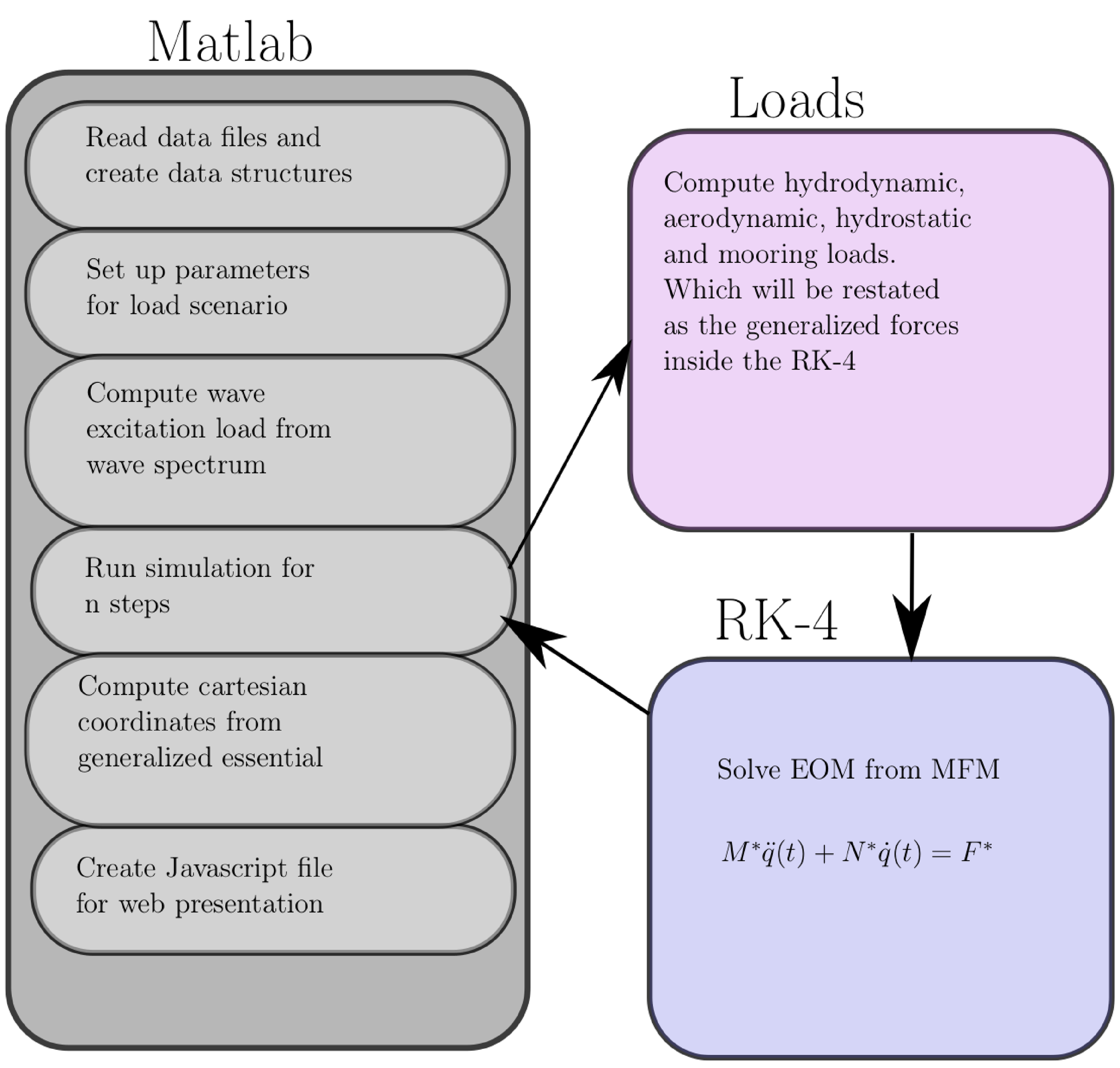
$$\dot{x}_c^{(3)}(t) = \begin{pmatrix} R^{(2)}(t)\overleftrightarrow{s_c^{(3/J)}(t)}^T\omega^{(2)}(t)+ \\ R^{(1)}(t)\overleftrightarrow{s_c^{(J/1)}(t)}^T\omega^{(1)}(t)+ \\ \dot{x}_c^{(1)}(t) \end{pmatrix}$$

$$\omega^{(3)}(t) = \begin{pmatrix} R^{(3/1)T}(t)\omega^{(1)}(t)+ \\ R^{(3/2)T}(t)\omega^{(2/1)}(t)+\omega^{(3/2)}(t) \end{pmatrix}$$

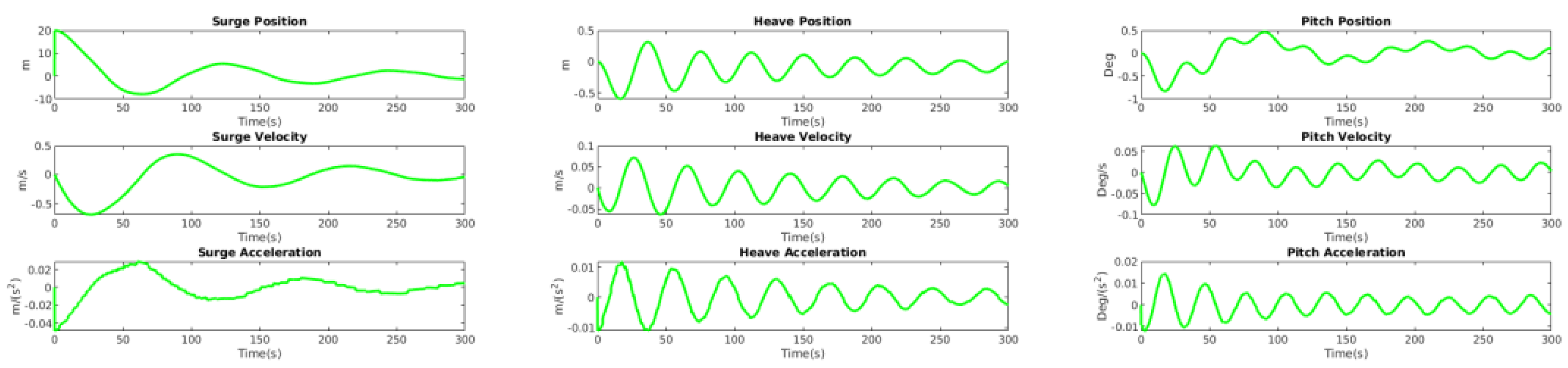
•Obtain equations of motion through Hamilton's Principle extended by Principle of Virtual Work.

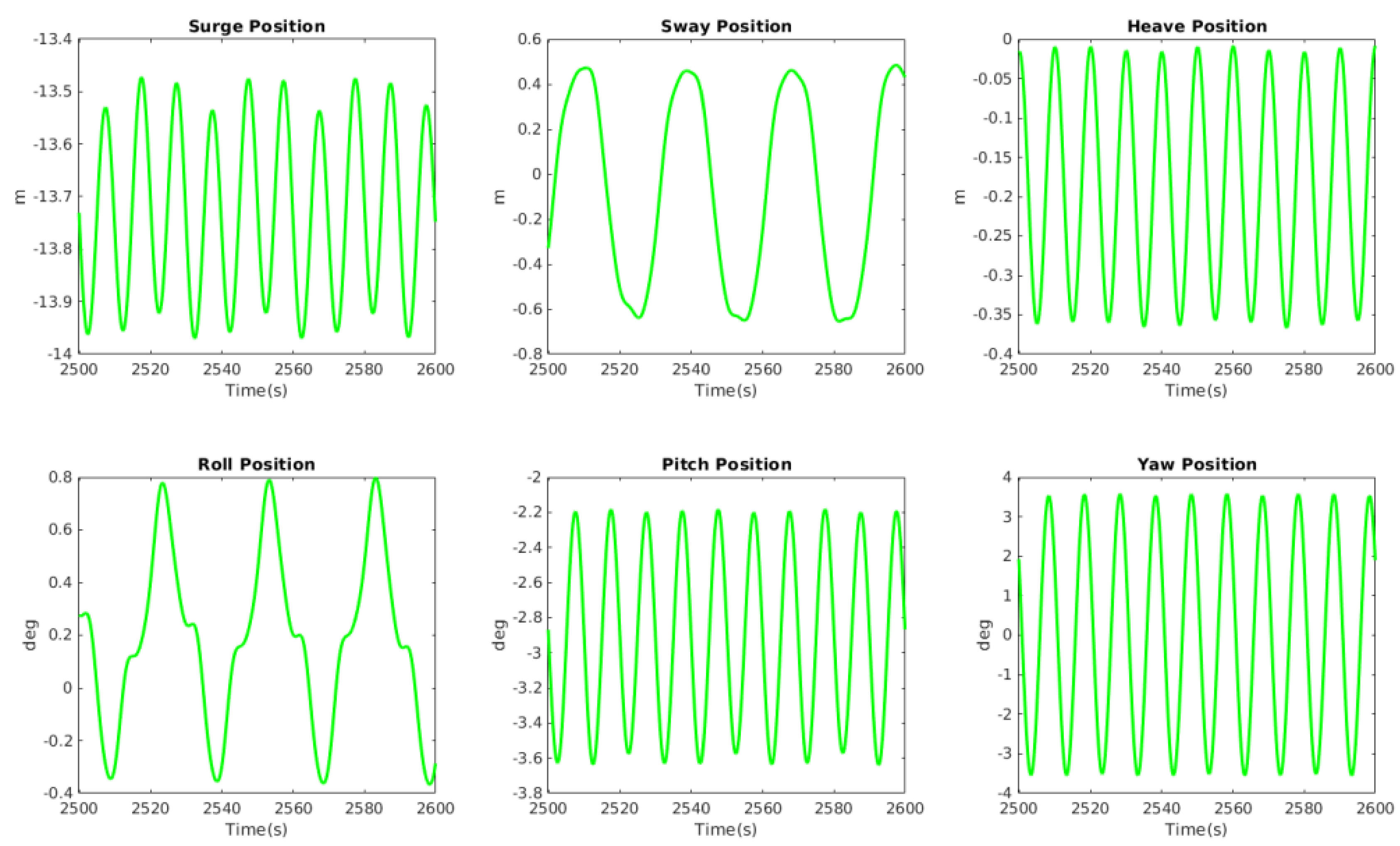
$$\int_{t_0}^{t_1} \left\{\delta\dot{X}(t)\right\}^T [M] \left\{\dot{X}(t)\right\} + \{\delta q(t)\}^T \{F^*(t)\}\, dx$$

$$M^*\{\ddot{q}(t)\} + N^*\{\dot{q}(t)\} = \{F^*(T)\}$$



•Results





SCAN ME

Høgskulen på Vestlandet

expo