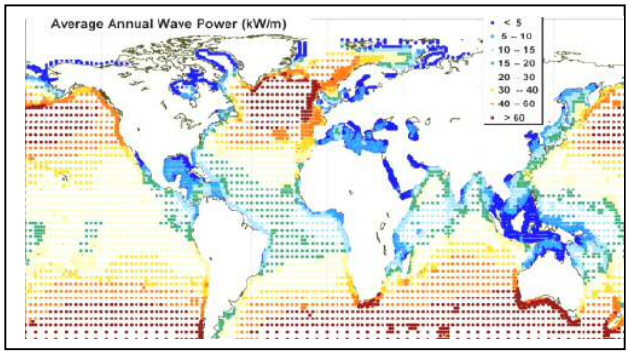
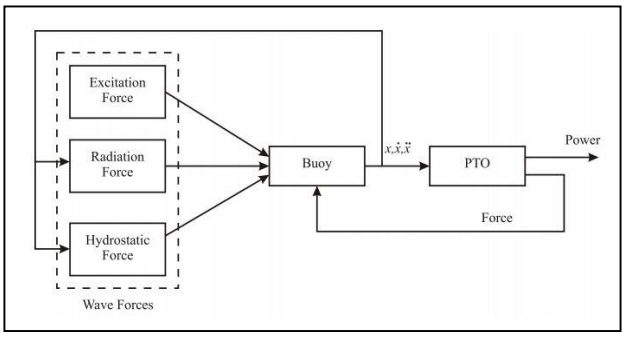
The Centre for
Power Transmission
and Motion Control

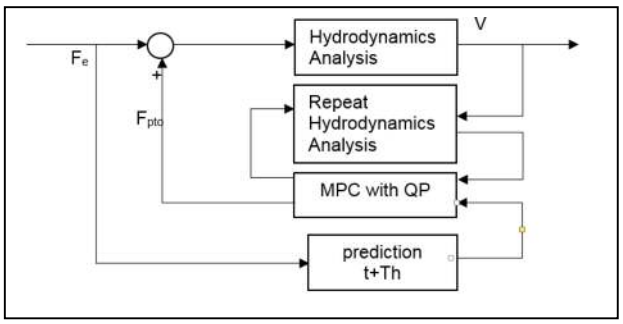
UNIVERSITY OF BATH

Research Project

Power Transmission & Control for Wave Energy Converters







Motivation

In recent years, generating utility scale electricity using wave energy has been considered as an option to fulfil increasing energy demand by renewable energy. Despite the other renewable energy sources (biomass, solar and wind), the energy from ocean waves is still largely untapped. In the UK, up to 15% of gross electricity demand could be supplied by wave energy.

Objective

A major challenge in Wave Energy conversion is how to extract the power from ocean waves efficiently, while keeping reliability high and costs low. The wave energy converter (WEC) is the device converting original wave energy input to the electrical energy output. To maximise the output, a careful design of WEC device and a control strategy that is both robust and efficient is necessary. WEC mechanisms aim to extract energy from irregular sea waves. The Power Take-Off (PTO) system is responsible for converting the irregular energy absorbed by the primary hardware into a smoothed, controlled form for use by the electrical generator.

Methodology

The primary task is to develop a novel Model Predictive Controller. MPC is a control strategy intended to capture the most power output while taking certain physical constraints into account. By applying MPC, the optimum WEC response is determined in real time according to the instantaneous state of the incoming sea waves. This will be tested on a hydraulic transmission circuit designed as a PTO system with high power density, robustness and controllability. The overall conversion efficiency will be assessed.

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