A Review of Sea State Estimation Procedures Based on Measured Vessel Responses

The operation of ships requires careful monitoring of the related costs while, at the same time, ensuring a high level of safety. A ship's performance with respect to safety and fuel efficiency may be compromised by the encountered waves. Consequently, it is important to estimate the surrounding seastate, and any shipboard decision support system (DSS) needs to have as input information about the encountered waves for the DSS to be the most accurate and reliable. Trustful means for sea state estimation (SSE) include floating wave rider buoys. However, for ships navigating the oceans, wave rider buoys are not practical, as sea state information in real-time and at the actual geographical position of the ship is needed. On the other hand, the analogy between a ship and a floating buoy naturally suggests to using the ship itself as a wave buoy. This paper presents a status on techniques for shipboard SSE using measured vessel responses, resembling the concept of traditional wave rider buoys. Moreover, newly developed ideas for shipboard sea state estimation are introduced. The presented material is all based on the author’s personal experience, developed within extensive work on the subject in the last fifteen years; work conducted alone and together with national as well as international colleagues.