# ABSTRACT

Monitoring of diesel engines on large ships has existed for many years to prevent engines breaking down at critical moments and to enhance the engines lifetime, which will reduce the shipping companies expenses. In recent years focus has been on making the engine monitoring automatic, thus the engine problems can be detected earlier. In this way precautions can be taken earlier, thereby providing a better chance of preventing engine breakdowns and further enhancement of the engines lifetime.

In this work, data from a test on a ship diesel engine, where the engine load and the oil lubrication system have been changed, is applied. The engine is monitored by four acoustic emission (AE) sensors, which have shown superior performance compared to the traditional sensors. Feature signals are generated from the sensor signals in three ways:

- The mean value of the sensor signals for each engine revolution.
- The standard deviation of the sensor signals for each engine revolution
- The residual error provided by principal components analysis (PCA) for each engine revolution.

These feature signals are assumed to be Gaussian distributed, and subsequently the feature signals are segmented by use of a hierarchic system, which consists of three parts:

- A fast on-line algorithm, which sets an alarm, when it believes that the engine has left its normal condition, and an alarm, when it believes that the engine has entered a new condition.
- An off-line hypothesis test, which tests whether or not the engine actually has changed condition.
- A more precise off-line algorithm, which estimates the condition change points, if the off-line hypothesis test confirms that the engine has changed condition.

The original data set is enlarged by means of re-sampling to investigate how the system performance is in general. The system is tested on both the original data and on the re-sampled data, and is also investigated for different signal-to-noise ratios. The system is capable of detecting all changes and estimating all change points in the data set.

Abstract