~~Maintenance and Reliability Analysis of Medical Equipment~~ (Need to change the topic slightly, we will brainstorm the suitable topic)

**Abstract**

A pulse-oximeters are one of the most important clinical devices that is used for measuring oxygen saturation (SpO2) in blood. In order to predict the clinical problems in the early stages (i.e. initial stage(s) of liver or kidney diagnosis), the physicians always need the most accurate results.

Haemodialysis machines are important medical equipment that is used to treat renal failures. That’s why minimum downtimes of these machines are thus essential. Uninterrupted and constant use of these machines in hospitals worldwide makes them vulnerable to failures if not maintained properly. Consequently, the maintenance cost for dialysis machine is high. A method to implement a cost-effective maintenance strategy is demonstrated in this work.

The above issues are addressed by implementing appropriate maintenance strategies and by improving design methods. The work is twofold; Implementation of RCBM maintenance strategy for HM, and development of software for improving the performance of pulse oximeter.

A Root Cause Based Maintenance (RCBM) strategy is employed at the component level to optimize the Reliability Based Maintenance schedules derived from the existing maintenance and failure data. In order to minimize the average cost of maintenance for Haemodialysis machines and ensure their high operational availability, a Cost-Model is derived, and Genetic Algorithm is employed for optimization in this work. The application of RCBM strategy results in cost saving of about 60% of the cost incurred using current maintenance scheme.

Different issues associate with the accuracy of SpO2 and heart rate measurement accuracy are studied in this work. With the understanding of these issues, a new SpO2 monitoring system (Do you need to include hardware part in your thesis ? yes sir, I will touch the hardware part little bit) is proposed that comprises of a better detection method, a custom-made oximeter probe head and a reliable Oximeter signal processing algorithm, that can determine low levels of spo2 present in human blood and produce the results in a short time that enable real time monitoring of a patient SpO2.