1 Project Plan

1.1 Introduction

Industrial maintenence scheduling seen as a mathematical optimization problem presents a unique challenge to develop state of the art modelling and solution approaches. The scope of modern industrial maintenance operations can be extremely vast, consisting of 1000s of work orders, 100s of technicians on assets that have up to 5 year asset maintenance plans and designed to be operational for decades Palmer (2019). This combined with high levels of uncertainty, real-time changes, and optimizing across multiple levels of stakeholder, means that maintenance scheduling touches on many of the known current limitation in the operation research/metaheuristic literature.

Further it remains challenging for human planners, schedulers, and maintenance supervisors to plan and schedule maintenance manually. This creates a demand for software tools that can effectively utilize available manpower and prioritize the most critical maintenance operations whereever in the scheduling process they occur. The cost of planning maintenance in an inefficient manner can be extensive as processes in large-scale equipment are often linked together. If a single piece of equipment fails it can cause whole subsystems to shut down. To migigate this, it is important to prioritize maintenance operations correctly. This is especially true in circumstances, where it is infeasible to perform all maintenance operations, due to either financial or physical constraints.

1.2 Purpose

Given the complexity of such operations and the maturity of the practical part of the field, the maintenance scheduling has throughout many decades designed an effective though often inefficient way of planning and scheduling these activities. This Ph.D. project seeks to model the practical knowledge and rules of thumb that have been gathered over decades and model and optimize these using industry proven techniques coming from other mathematical optimization problems Talbi (2009), Gendreau and Potvin (2019). Further as this process presents unique challenges due to many

1.3 Research Questions

- How to model and optimize across multiple stakeholder each optimizing a part of the total maintenance scheduling process?
- How can simulations guide decision-making in maintenance planning?
- How to implement metaheuristics that can adapt to changing requirements in near real-time?
- How to create a heuristic that is effective for both corrective and preventive maintenance?
- How can the maintenance planning problem be solved with imperfect data?
- What is the effect of the maintenance process on the ability to create a robust maintenance plan?

References

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