

Operations Scheduling

Team #7: Kin Yong, Teng Jin, Ernest, Luvena, Julianna, Phoebe, Asher

PROBLEM STATEMENT

This project aims to create a Material Requirements Planning (MRP) system with different subsystems. The main goal is to create an optimised system which uses mixed-integer linear programming (MILP) to generate an operation schedule by utilizing the following inputs: Bill-of-Materials, Routings of Make Parts, Processing Time, Due Dates, and Operation Network.

DESCRIPTION

We aim to start production as late as possible without compromising production due dates. By doing so, inventory holding costs will be kept to a minimum. This goal is achieved by minimizing the time between the production start time and the production due date of each operation and also minimizing tardiness.

OBJECTIVES

- Implement a robust notification mechanism that alerts users within 5 seconds of unexpected terminations during the scheduling process.
- Allow for compatibility with various operational scenarios and input types, accommodating different BOMs, due dates, and routing configurations.

METHODOLOGY

- 1 Define and Measure: We performed stakeholder analysis and formulated requirements.
- 2 Explore and Optimise: We discovered various design concepts to find the best for the project.
- 3 Develop and Validate: We identified any unintended effects of our system while conducting design reviews.
- 4 Execute: We built our system based on carefully engineered design choices.

KEY FEATURES OF OUR INTERFACE

- ★ Autofill or Manual Input of the Data
The users may input their Bill-of-Materials of the product manually or upload the csv/excel file. The system will automatically read the csv/excel file and autofill the manual section. Take note that there will be a standard format for the excel/csv file.
- ★ Gurobi Optimizer
The schedule is generated using a MILP formulation and is optimized by the Gurobi optimizer.
- ★ Generating Gantt Chart & Table
The output should be the operation schedule in the form of a table and Gantt chart.
- ★ Navigation Bar
The navigation bar will help users to better understand our system. It serves as a guide on how to use the interface, view the team profile and the scheduling page.

SOFTWARES USED: RSHINY (INTERFACE) & GUROBI (OPTIMISER)

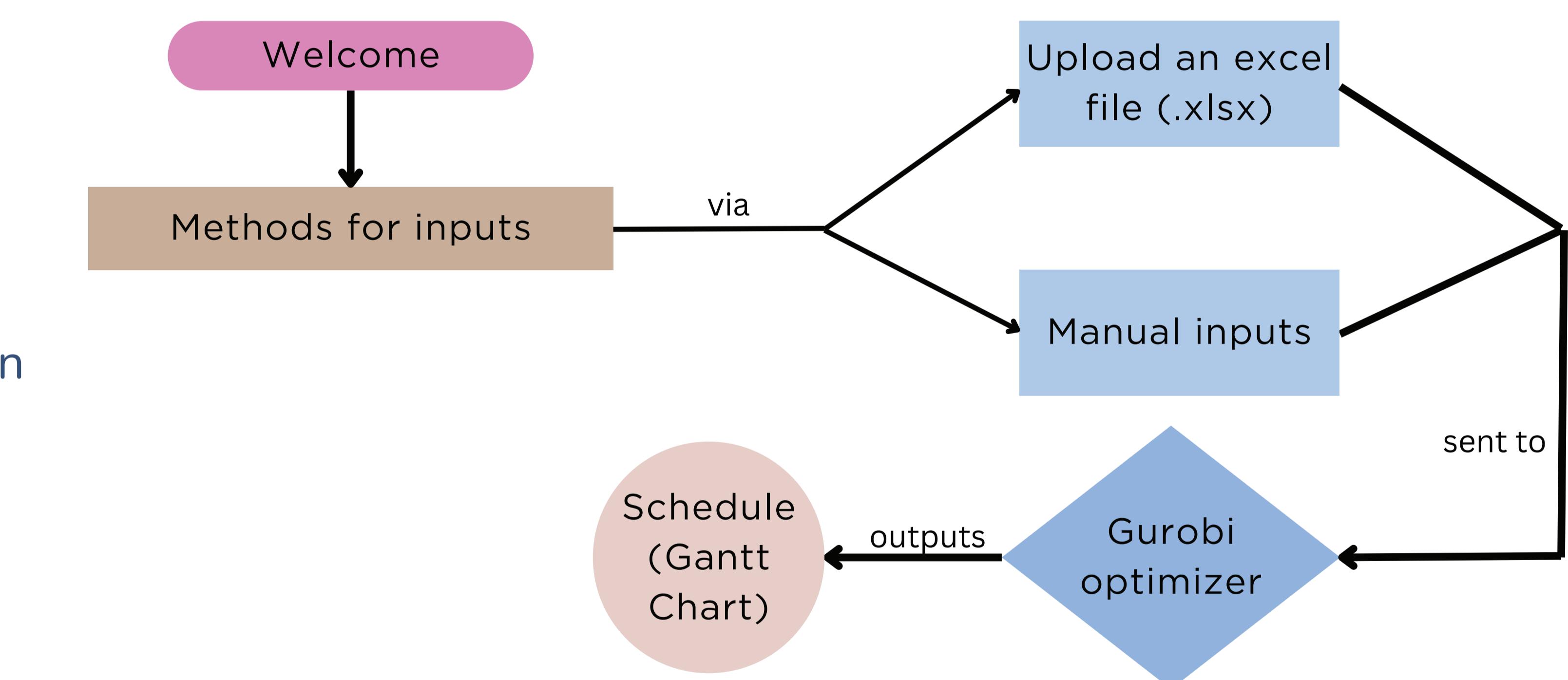
MILP FORMULATION

OBJECTIVE FUNCTION

Start time of the production operation to be delayed as late as possible.

CONSTRAINTS

- Due date of the final product shall be respected.
- Relationship between the start and completion times of the operations are respected.
- Downstream operations' start time is always later than the completion time of the upstream operation.
- Unidirectional nature of the process precedence relationships between operations are followed.



SNIPPETS OF OUR INTERFACE

