

Control Satisfaction Problem: Timetabling

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Introduction

This document illustrates how a time-tabling problem can be resolved using the constraint satisfaction approach.

Constraint satisfaction problems are mathematical questions that are defined by a set of variables with incorporated domains and a set of constraints that must be satisfied when assigning values to the variables.

Properties of CSP

- **Variables:** States of the scenario that need to be determined such that they agree with the provided constraints. A variable may have multiple possible values, but it can only have one value at a time.
- **Domains:** The range or set of values that each variable can hold
- **Constraints:** Conditions that must be satisfied when assigning values to the variables.

Timetabling as a CSP

The time-tabling problem requires assigning time slots and rooms without any overlap between certain types of subjects, so that students will be able to manage their time accordingly.

This problem can be formed into a constraint satisfaction problem by considering each property of CSP in the context of the timetabling problem.

- **Variables:** Time slot and room for each subject
- **Domains:** Each subject has its own possible time slots (M1, M2, Tu1, We2,...). The available rooms are also pre-defined (R1, R2, R3,...).
- **Constraints:**
 - A given subject can be assigned only to one of the possible time slots given for that subject.
 - Two compulsory subjects cannot be in the same time slot (optional subjects may).
 - Two subjects cannot be assigned to the same room if they are assigned to the same time slot.

Hence, the timetabling problem can be modeled as a constraint satisfaction problem.