Islamic University Of Technology

CSE 4618 : Artificial Intelligence Lab

RoutineAI Project Details

Team members:

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Project Link : https://github.com/msi1427/RoutineAI

Introduction:

We tried to automate routine formation system of a department of a university. Managing the scheduling system manually is very time consuming and ineffective and even after that we cannot achieve an optimal scheduling. We have seen most of our Lecturers' and Professor's preferences not kept due to the inability to optimize the problem with bare hands resulting in conflicting routine and dissatisfaction among teachers and/or students. This system offer us as an opportunity to model the problem and form an optimal solution. This system will save many man hours and give us a better routine.

Motivation:

Due to being class representatives, we found that the manual system, which is actually man-made, for routine generation cannot look after all the requirements and build up a optimal routine considering teachers' and students' requirement and also it's not very flexible. Some simple change can destroy the whole thing. This is a very big problem for IUT and also other universities. That's what motivated us to build a dynamic, optimal and flexible system.

Operational Details:

No external GUI or other language is used. There are two files **RoutineAI.mzn** and **RoutineAI.dzn**. If we run the .mzn file in the Minizinc IDE and plug in the data file .dzn we will see the output.

Code Demonstration:

Header Files

include "globals.mzn" generally contains most of the header files

Parameter Definitions

Everything that will be given through .dzn file.

COURSE1 : Courses of 1st Semester
COURSE2 : Courses of 3rd Semester
COURSE3 : Courses of 5th Semester
COURSE4 : Courses of 7th Semester
PERIODS : Name of Periods
NUMROOM : Number of rooms Allocated
DAILYPERIODS : daily maximum periods of a course
TOTALPERIODS : total periods for a course in a week

Decision variable declarations

Everything that will not be predetermined. The AI solver will find those which includes timetable for all sections of all years and some tables to find out on which day we can have which courses.

timetable : routine table
checker : this arrays are to find out on which day we can have which classes

Constraints

NB: CS1-11 refers to the comments on main code

CS1: Every cell of checker can't have a bigger value than the assigned DAILYPERIODS of the respective courses
CS2: this is to specify the lab classes, the lab classes will be of two periods in a day
CS3: every column of checker table won't have a sum more than TOTALPERIODS, because total periods define the number of periods required in one week.
CS4: every row of checker table won't have a sum more than 6, because in one day there can't be more than 6 periods.
CS5: there won't be more than two lab classes in a day.
CS6: Everyday there will be at least a gap period
CS7: this constraint is basically reforming timetable using checker table by equalizing the number of courses in the same day.
CS8: these constraints are to specify that the lab classes will be in consequent periods ignoring break time.
CS9: both section won't have same course on the same period of the same day.
CS10: This constraint is to check if we can allocate every period of everyday of every section of every semester within my allocated rooms
CS11: We can fix the class for a particular required course on a particular period of a particular day

Objective:

Our objective is to satisfy all the constraints.

Output:

ROUTINE for CSE Department

```
Winter Semester
First Semester Section A
DOP  PERIOD1  PERIOD2  PERIOD3  PERIOD4  PERIOD5  PERIOD6  PERIOD7
=====================================================================
MON  CSE4104  CSE4104  -------  -------  BRKTIME  HUM4142  -------
TUE  CSE4108  CSE4108  -------  -------  BRKTIME  CSE4107  -------
WED  PHY4142  PHY4142  HUM4142  -------  BRKTIME  CSE4107  -------
THU  CSE4105  PHY4141  MAT4145  HUM4147  BRKTIME  HUM4145  -------
FRI  CSE4105  PHY4141  MAT4145  -------  BRKTIME  HUM4145  HUM4147

First Semester Section B
DOP  PERIOD1  PERIOD2  PERIOD3  PERIOD4  PERIOD5  PERIOD6  PERIOD7
=====================================================================
MON  -------  -------  CSE4104  CSE4104  BRKTIME  -------  HUM4142
TUE  -------  -------  CSE4108  CSE4108  BRKTIME  -------  CSE4107
WED  -------  -------  PHY4142  PHY4142  BRKTIME  HUM4142  CSE4107
THU  -------  CSE4105  PHY4141  MAT4145  BRKTIME  HUM4147  HUM4145
FRI  -------  CSE4105  PHY4141  MAT4145  BRKTIME  HUM4147  HUM4145

Third Semester Section A
DOP  PERIOD1  PERIOD2  PERIOD3  PERIOD4  PERIOD5  PERIOD6  PERIOD7
=====================================================================
MON  CSE4308  CSE4308  =======  =======  BRKTIME  CSE4307  =======
TUE  CSE4304  CSE4304  CSE4302  CSE4302  BRKTIME  =======  CSE4307
WED  =======  =======  EEE4384  EEE4384  BRKTIME  =======  CSE4305
THU  =======  CSE4303  CSE4301  EEE4383  BRKTIME  MAT4341  =======
FRI  CSE4305  CSE4303  CSE4301  EEE4383  BRKTIME  MAT4341  =======
```

```
Third Semester Section B
DOP  PERIOD1  PERIOD2  PERIOD3  PERIOD4  PERIOD5  PERIOD6  PERIOD7
=================================================================
MON  =======  =======  CSE4308  CSE4308  BRKTIME  =======  CSE4307
TUE  CSE4302  CSE4302  CSE4304  CSE4304  BRKTIME  CSE4307  =======
WED  EEE4384  EEE4384  =======  CSE4305  BRKTIME  =======  =======
THU  =======  =======  CSE4303  CSE4301  BRKTIME  EEE4383  MAT4341
FRI  =======  CSE4305  CSE4303  CSE4301  BRKTIME  EEE4383  MAT4341

Fifth Semester Section A
DOP  PERIOD1  PERIOD2  PERIOD3  PERIOD4  PERIOD5  PERIOD6  PERIOD7
=================================================================
MON  CSE4551  CSE4551  -=-=-=-  -=-=-=-  BRKTIME  CSE4539  -=-=-=-
TUE  CSE4508  CSE4508  -=-=-=-  -=-=-=-  BRKTIME  -=-=-=-  MAT4541
WED  CSE4502  CSE4502  CSE4504  CSE4504  BRKTIME  -=-=-=-  CSE4539
THU  -=-=-=-  CSE4513  CSE4511  CSE4503  BRKTIME  CSE4501  -=-=-=-
FRI  MAT4541  CSE4513  CSE4511  CSE4503  BRKTIME  CSE4501  -=-=-=-

Fifth Semester Section B
DOP  PERIOD1  PERIOD2  PERIOD3  PERIOD4  PERIOD5  PERIOD6  PERIOD7
=================================================================
MON  -=-=-=-  -=-=-=-  CSE4551  CSE4551  BRKTIME  -=-=-=-  CSE4539
TUE  -=-=-=-  -=-=-=-  CSE4508  CSE4508  BRKTIME  MAT4541  -=-=-=-
WED  -=-=-=-  CSE4539  CSE4502  CSE4502  BRKTIME  CSE4504  CSE4504
THU  -=-=-=-  -=-=-=-  CSE4513  CSE4511  BRKTIME  CSE4503  CSE4501
FRI  -=-=-=-  MAT4541  CSE4513  CSE4511  BRKTIME  CSE4503  CSE4501

Seventh Semester Section A
DOP  PERIOD1  PERIOD2  PERIOD3  PERIOD4  PERIOD5  PERIOD6  PERIOD7
=================================================================
MON  CSE4700  CSE4700  =-=-=-=  =-=-=-=  BRKTIME  CSE4733  =-=-=-=
TUE  CSE4734  CSE4734  =-=-=-=  =-=-=-=  BRKTIME  CSE4733  =-=-=-=
WED  =-=-=-=  CSE4739  CSE4703  HUM4741  BRKTIME  CSE4709  MAT4741
THU  CSE4710  CSE4710  =-=-=-=  =-=-=-=  BRKTIME  CSE4739  =-=-=-=
FRI  CSE4709  CSE4703  =-=-=-=  HUM4741  BRKTIME  =-=-=-=  MAT4741

Seventh Semester Section B
DOP  PERIOD1  PERIOD2  PERIOD3  PERIOD4  PERIOD5  PERIOD6  PERIOD7
=================================================================
MON  =-=-=-=  =-=-=-=  CSE4700  CSE4700  BRKTIME  =-=-=-=  CSE4733
TUE  =-=-=-=  =-=-=-=  CSE4734  CSE4734  BRKTIME  =-=-=-=  CSE4733
WED  CSE4703  =-=-=-=  CSE4739  CSE4709  BRKTIME  MAT4741  HUM4741
THU  =-=-=-=  =-=-=-=  CSE4710  CSE4710  BRKTIME  =-=-=-=  CSE4739
FRI  =-=-=-=  =-=-=-=  CSE4709  CSE4703  BRKTIME  MAT4741  HUM4741
```

Future Plans:

There are still some more remarkable developments possible in this project. Improvements that we plan to make are allocating particular room for each period of each course, allocating teachers for each period of each course according to some specified rules, giving priority of choices, making the break-time between periods optimal and making this more dynamic using a GUI which will just give the course codes and course credits and the routine will be generated automatically.