

P1 : Timetable Management System for an Academic Institution

Review 4 Report

Team 7 - DB4C

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FUNDAMENTALS OF PROGRAMMING AND SOFTWARE DEVELOPMENT

ABSTRACT

A timetable management system is a project that is intended to provide greater assistance for an institution's workers. The timetable management system allows you to create and see particular staff and student timetables, as well as the lab timetables. This system also includes files that hold subject information for both staff and students. A timetable is a temporal organization of a group of personnel and students that ensures that all stated constraints are satisfied. As a result, we devised a realistic strategy for developing staff, student, and lab timetable systems that can be tailored to any institution's timetable. Once a semester's timetable is completed, any member of staff and student can access it. The schedule module serves as a solid forecasting base.

INTRODUCTION

Solving the timetabling problem involves arranging a university course timetable for all lectures in a week for a specific programme, where each lecture is assigned to a classroom and a time-slot. Students in indivisible groups who attend lectures at the same time are classified as homogeneous units called "sections". Each lecture contains one or more sections, as well as one or more faculty members assigned to it. The scheduler's job is to make sure that the teachers are available for the lecture at the scheduled time and that there are no scheduling conflicts between the various allocated lectures.

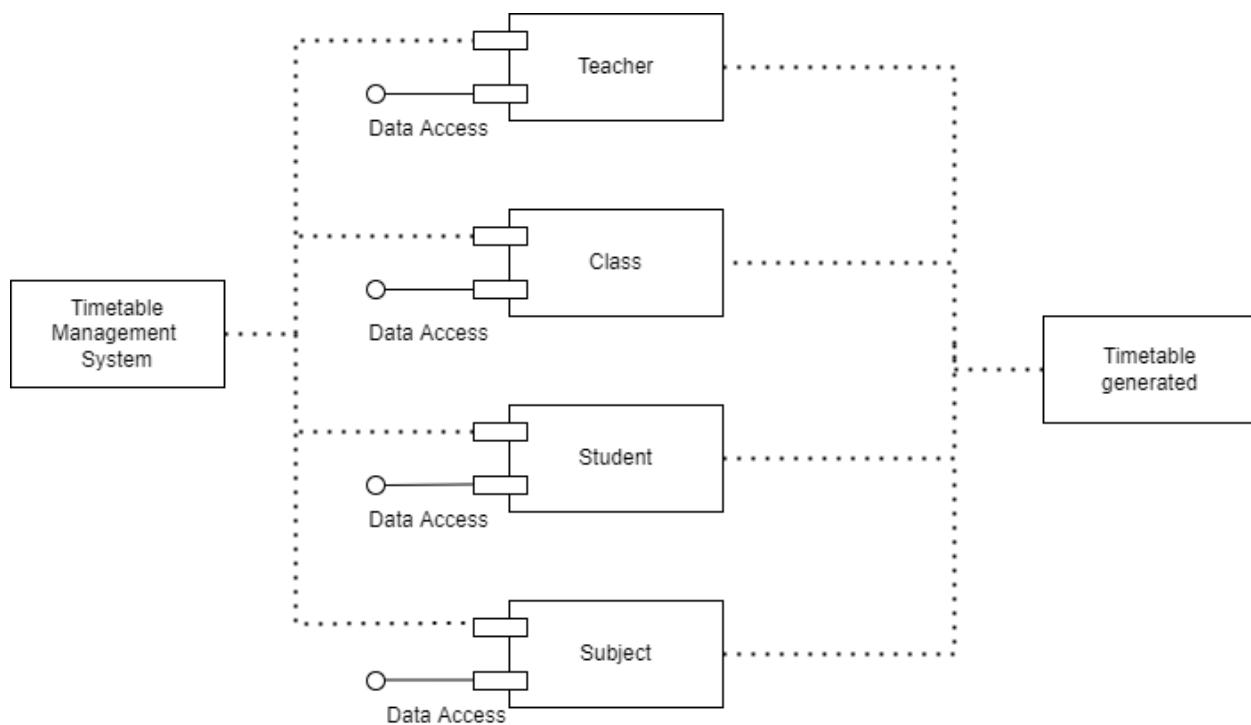
The essential need of the application is to submit information about the branch, topics, number of laboratories, and total number of periods. The tool then builds a timetable based on your specifications. It will aid in automating the time-consuming task of manually creating a timetable.

The proponents' way of tackling the timetabling problem comprises a Constraint Logic Programming approach implemented in a Constraint Logic Programming language such as MiniZinc.

EXISTING WORK

Postgraduates and undergraduates employ a manual timetable system in the current Time Table Management System. This manual system may result in data conflicts in the generated timetable. The current timetable was constantly changing, requiring numerous lecturers to handle it. It is consuming much too much of their time. The conclusion is that they require a system to assist and enhance the process of developing the timetable.

DATA FLOW DIAGRAM

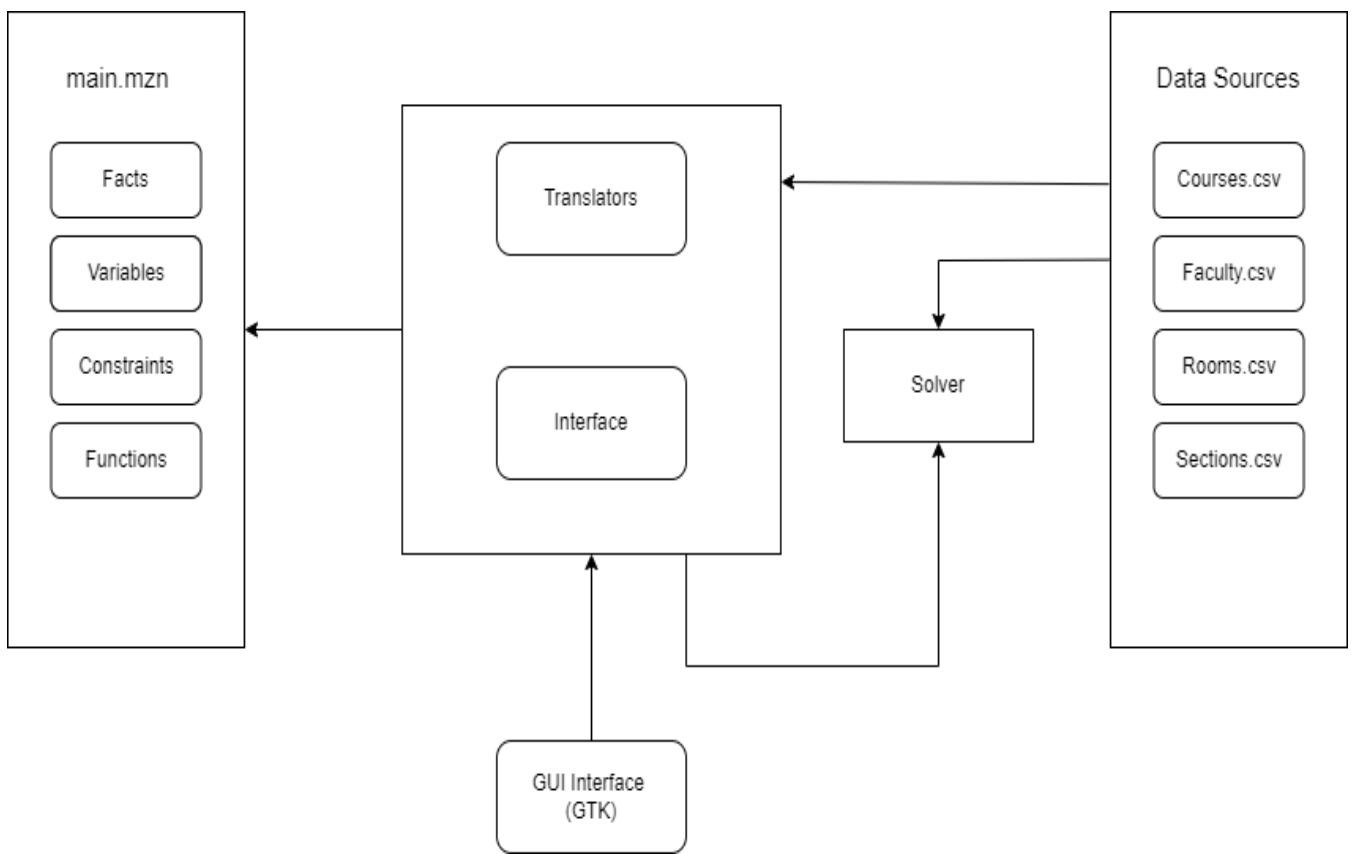


ARCHITECTURAL DIAGRAM

The application features a front-end built in C (using GTK) that will allow the user to generate a timetable after passing data and arguments to the MiniZinc solver. The solver runs the query and returns the results in a file stream, which can then be read by the C application and finally be displayed to the end user after formatting. The internals of the problem solver are hidden from the end user.

There are three main resources that need to be considered by the MiniZinc solver in the timetabling problem - the sections, the faculty and the classroom. Professors and Sections are already assigned to each other, and the system's only purpose is to assign a classroom to a particular section and professor pair for a particular time-slot. The solver ensures that none of the hard constraints are broken and also maximizes the number of soft constraints satisfied.

Predetermined data (such as available faculty and assigned sections) can be fed to the system by means of a .dzn file, where the data is formatted in a similar manner to defining variables in MiniZinc, or by directly reading a suitable data file (such as CSV).

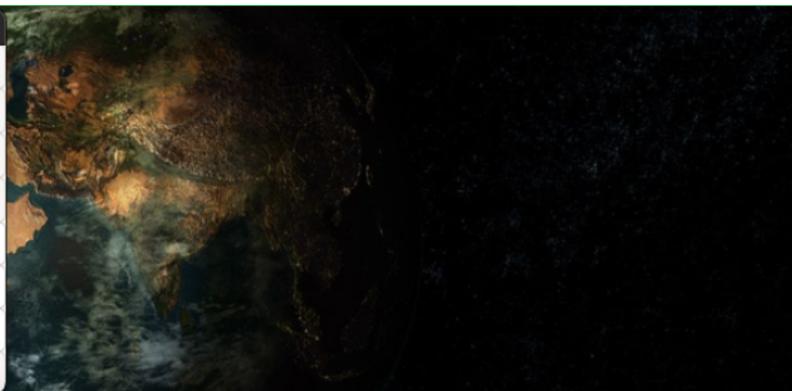


TEST CASES:

T1) A faculty can have maximum of 2 theory hours and one lab session per day.

MiniZinc TimeTable Generator

<code>ClassTimeTable/inputdata/t2/t2c.csv</code>	Set Courses CSV File		
<code>ClassTimeTable/inputdata/t2/t2f.csv</code>	Set Faculty CSV File		
<code>ClassTimeTable/inputdata/t2/t2s.csv</code>	Set Sections CSV File		
<code>ClassTimeTable/inputdata/t2/t2r.csv</code>	Set Rooms CSV File		
Days Per Week:	6	-	+
Slots Per Day:	7	-	+
Slot for FN/AN Break [0 For No Break]:	5	-	+
Solve for Timetable			



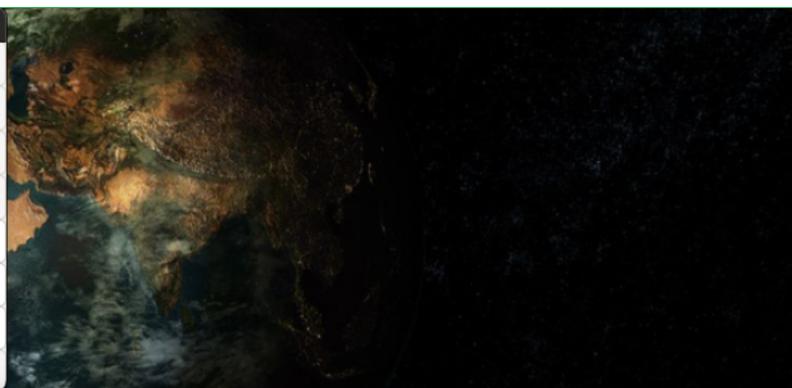
TimeTable Output

Day\Slot	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Monday	UXX0000						
Tuesday	UXX0000						
Wednesday	UXX0000						
Thursday	UXX0000						
Friday	UCS2201	UCS2201	UCS2201	UXX0000	UXX0000	UXX0000	UXX0000

Faculty Dr. R. Kanchana

MiniZinc TimeTable Generator

<code>ClassTimeTable/inputdata/t2/t2c.csv</code>	Set Courses CSV File		
<code>ClassTimeTable/inputdata/t2/t2f.csv</code>	Set Faculty CSV File		
<code>ClassTimeTable/inputdata/t2/t2s.csv</code>	Set Sections CSV File		
<code>ClassTimeTable/inputdata/t2/t2r.csv</code>	Set Rooms CSV File		
Days Per Week:	6	-	+
Slots Per Day:	7	-	+
Slot for FN/AN Break [0 For No Break]:	5	-	+
Solve for Timetable			



TimeTable Output

Day\Slot	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Monday	UEE2276	UXX0000	UEHS2242	UMA2276	UXX0000	UEHS2242	UCY2276
Tuesday	UEHS2242	UCS2202	UEHS2242	UCY2276	UXX0000	UEN2241	UEE2276
Wednesday	UEN2241	UCS2202	UEN2241	UCS2202	UXX0000	UEHS2242	UEN2241
Thursday	UEHS2242	UXX0000	UMA2276	UEN2241	UXX0000	UEE2276	UMA2276
Friday	UCS2201	UCS2201	UCS2201	UCY2276	UXX0000	UMA2276	UEN2241

Section cse A Sem 1

MiniZinc TimeTable Generator

ClassTimeTable/Inputdata/t2/t2c.csv	Set Courses CSV File		
ClassTimeTable/Inputdata/t2/t2f.csv	Set Faculty CSV File		
ClassTimeTable/Inputdata/t2/t2s.csv	Set Sections CSV File		
ClassTimeTable/Inputdata/t2/t2r.csv	Set Rooms CSV File		
Days Per Week:	6	-	+
Slots Per Day:	7	-	+
Slot for FN/AN Break [0 For No Break]:	5	-	+
Solve for Timetable			

TimeTable Output

Day\Slot	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Monday	Dr. Martha Karunakar	Dr C Lakshmi	Dr. N. Priyadarshini	Unknown Professor	Unknown Professor	Dr. N. Priyadarshini	Dr. D. Praveen Sam
Tuesday	Dr. J. Suresh	Dr C Lakshmi	Dr. Martha Karunakar	Dr C Lakshmi	Unknown Professor	Dr. J. Suresh	Dr C Lakshmi
Wednesday	Dr. Tanusree Sengupta	Dr. R. Kanchana	Dr. D. Praveen Sam	Dr C Lakshmi	Unknown Professor	Dr. M. Shyamala Bharathy	Dr. Martha Karunakar
Thursday	Dr. S. Yugesh	Dr. N. Priyadarshini	Dr. M. Shyamala Bharathy	Dr C Lakshmi	Unknown Professor	Dr C Lakshmi	Dr C Lakshmi
Friday	Dr C Lakshmi	Dr. R. Kanchana	Dr. J. Suresh	Dr. S. Yugesh	Unknown Professor	Dr. Tanusree Sengupta	Dr. D. Praveen Sam
Room	RoomID 0						

T2) Electives are scheduled at the same time across departments

MiniZinc TimeTable Generator

ClassTimeTable/Inputdata/t1/t1C.csv	Set Courses CSV File		
ClassTimeTable/Inputdata/t1/t1F.csv	Set Faculty CSV File		
ClassTimeTable/Inputdata/t1/t1S.csv	Set Sections CSV File		
ClassTimeTable/Inputdata/t1/t1R.csv	Set Rooms CSV File		
Days Per Week:	5	-	+
Slots Per Day:	7	-	+
Slot for FN/AN Break [0 For No Break]:	5	-	+
Solve for Timetable			

TimeTable Output

Day\Slot	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Monday	UXX0000	UXX0000	UXX0000	UEHS2242	UXX0000	UEHS2242	UXX0000
Tuesday	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000	UEHS2242
Wednesday	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000
Thursday	UXX0000	UEHS2242	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000
Friday	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000
Faculty	Dr. S. Thiruvenkataswami						

MiniZinc TimeTable Generator

ClassTimeTable/Inputdata/t1/t1C.csv	Set Courses CSV File		
ClassTimeTable/Inputdata/t1/t1F.csv	Set Faculty CSV File		
ClassTimeTable/Inputdata/t1/t1S.csv	Set Sections CSV File		
ClassTimeTable/Inputdata/t1/t1R.csv	Set Rooms CSV File		
Days Per Week:	5	-	+
Slots Per Day:	7	-	+
Slot for FN/AN Break [0 For No Break]:	5	-	+
Solve for Timetable			

TimeTable Output

Day\Slot	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Monday	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000
Tuesday	UXX0000	UXX0000	UXX0000	UHS2241	UXX0000	UXX0000	UXX0000
Wednesday	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000
Thursday	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000
Friday	UHS2241	UXX0000	UXX0000	UHS2241	UXX0000	UHS2241	UXX0000
Faculty	Dr. Divya John						
	Dr. S. Thiruvenkataswami						
	Dr. Divya John						
	Dr. M. Shyamala Bharathy						
	Dr. Martha Karunakar						

TimeTable Output

Day\Slot	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Monday	Unknown Professor	Unknown Professor	Unknown Professor	Dr. S. Thiruvenkataswami	Unknown Professor	Dr. S. Thiruvenkataswami	Unknown Professor
Tuesday	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor
Wednesday	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor
Thursday	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor
Friday	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor	Dr. Divya John	Unknown Professor

Room

RoomID 3

MiniZinc TimeTable Generator

lassTimeTable/Inputdata/t1/t1C.csv	Set Courses CSV File		
lassTimeTable/Inputdata/t1/t1F.csv	Set Faculty CSV File		
lassTimeTable/Inputdata/t1/t1S.csv	Set Sections CSV File		
lassTimeTable/Inputdata/t1/t1R.csv	Set Rooms CSV File		
Days Per Week:	5	-	+
Slots Per Day:	7	-	+
Slot for FN/AN Break [0 For No Break]:	5	-	+

Solve for Timetable

TimeTable Output

Day\Slot	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Monday	UHS2243	UXX0000	UHS2243	UEHS2242	UXX0000	UEHS2242	UEN2241
Tuesday	UXX0000	UXX0000	UXX0000	UHS2241	UXX0000	UHS2243	UEHS2242
Wednesday	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000
Thursday	UEN2241	UEHS2242	UEN2241	UXX0000	UXX0000	UXX0000	UXX0000
Friday	UHS2241	UXX0000	UHS2243	UHS2241	UXX0000	UHS2241	UEN2241

Section

cse A Sem 2

MiniZinc TimeTable Generator

lassTimeTable/Inputdata/t1/t1C.csv	Set Courses CSV File		
lassTimeTable/Inputdata/t1/t1F.csv	Set Faculty CSV File		
lassTimeTable/Inputdata/t1/t1S.csv	Set Sections CSV File		
lassTimeTable/Inputdata/t1/t1R.csv	Set Rooms CSV File		
Days Per Week:	5	-	+
Slots Per Day:	7	-	+
Slot for FN/AN Break [0 For No Break]:	5	-	+

Solve for Timetable

T3) Faculty are not allotted consecutive teaching hours.

Faculty and students are not allotted different classes at the same time.

Allotting core subjects in the last slot must be avoided.

MiniZinc TimeTable Generator

/Users/aathishs/Projects/MiniZincC	Set Courses CSV File		
/Users/aathishs/Projects/MiniZincC	Set Faculty CSV File		
/Users/aathishs/Projects/MiniZincC	Set Sections CSV File		
/Users/aathishs/Projects/MiniZincC	Set Rooms CSV File		
Days Per Week:	5	-	+
Slots Per Day:	7	-	+
Slot for FN/AN Break [0 For No Break]:	5	-	+

Solve for Timetable

TimeTable Output

Day\Slot	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Monday	UCS2202	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000
Tuesday	UCS2202	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000
Wednesday	UCS2202	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000
Thursday	UCS2202	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000
Friday	UCS2201	UCS2201	UCS2201	UXX0000	UXX0000	UXX0000	UXX0000

Faculty ▾ Dr. R. Kanchana ▾

MiniZinc TimeTable Generator

/Users/aathishs/Projects/MiniZincC	Set Courses CSV File		
/Users/aathishs/Projects/MiniZincC	Set Faculty CSV File		
/Users/aathishs/Projects/MiniZincC	Set Sections CSV File		
/Users/aathishs/Projects/MiniZincC	Set Rooms CSV File		
Days Per Week:	5	-	+
Slots Per Day:	7	-	+
Slot for FN/AN Break [0 For No Break]:	5	-	+

Solve for Timetable

TimeTable Output

Day\Slot	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Monday	Dr. Anirudh Venkatraman Krishnan	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor
Tuesday	Dr. J. Suresh	Unknown Professor	Dr. Anirudh Venkatraman Krishnan	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor
Wednesday	Dr. J. Suresh	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor
Thursday	Dr. J. Suresh	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor
Friday	Dr. J. Suresh	Dr. J. Suresh	Dr. J. Suresh	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor

Room ▾ RoomID 0 ▾

MiniZinc TimeTable Generator

/Users/aathishs/Projects/MiniZincC	Set Courses CSV File		
/Users/aathishs/Projects/MiniZincC	Set Faculty CSV File		
/Users/aathishs/Projects/MiniZincC	Set Sections CSV File		
/Users/aathishs/Projects/MiniZincC	Set Rooms CSV File		
Days Per Week:	5	-	+
Slots Per Day:	7	-	+
Slot for FN/AN Break [0 For No Break]:	5	-	+
Solve for Timetable			

TimeTable Output

Day\Slot	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7
Monday	UCS2202	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000
Tuesday	UCS2202	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000
Wednesday	UCS2202	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000
Thursday	UCS2202	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000
Friday	UCS2201	UCS2201	UCS2201	UXX0000	UXX0000	UXX0000	UXX0000

Section ▾ cse A Sem 1 ▾

T4) A classroom is just assigned one lecture at a time.

Sessions alternate between core and non-core subjects.

MiniZinc TimeTable Generator

/Users/aathishs/Projects/MiniZincC	Set Courses CSV File		
/Users/aathishs/Projects/MiniZincC	Set Faculty CSV File		
/Users/aathishs/Projects/MiniZincC	Set Sections CSV File		
/Users/aathishs/Projects/MiniZincC	Set Rooms CSV File		
Days Per Week:	5	-	+
Slots Per Day:	5	-	+
Slot for FN/AN Break [0 For No Break]:	4	-	+

Solve for Timetable

TimeTable Output

Day\Slot	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5
Monday	UEN0000	UXX0000	UXX0000	UXX0000	UXX0000
Tuesday	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000
Wednesday	UXX0000	UXX0000	UEN0000	UXX0000	UXX0000
Thursday	UXX0000	UXX0000	UEN0000	UXX0000	UXX0000
Friday	UXX0000	UXX0000	UEN0000	UXX0000	UXX0000

Faculty ▼ Dr. Martha Karunakar ▼

MiniZinc TimeTable Generator

/Users/aathishs/Projects/MiniZincC	Set Courses CSV File		
/Users/aathishs/Projects/MiniZincC	Set Faculty CSV File		
/Users/aathishs/Projects/MiniZincC	Set Sections CSV File		
/Users/aathishs/Projects/MiniZincC	Set Rooms CSV File		
Days Per Week:	5	-	+
Slots Per Day:	5	-	+
Slot for FN/AN Break [0 For No Break]:	4	-	+

Solve for Timetable

TimeTable Output

Day\Slot	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5
Monday	Dr. Martha Karunakar	Unknown Professor	Unknown Professor	Unknown Professor	Unknown Professor
Tuesday	Dr. J. Suresh	Dr. J. Suresh	Dr. J. Suresh	Unknown Professor	Unknown Professor
Wednesday	Unknown Professor	Unknown Professor	Dr. D. Praveen Sam	Unknown Professor	Unknown Professor
Thursday	Dr. R. Kanchana	Dr. R. Kanchana	Dr. R. Kanchana	Unknown Professor	Unknown Professor
Friday	Dr. Anirudh Venkatraman Krishnan	Unknown Professor	Dr. Martha Karunakar	Unknown Professor	Unknown Professor

Room ▾ RoomID 0 ▾

MiniZinc TimeTable Generator

/Users/aathishs/Projects/MiniZincC	Set Courses CSV File		
/Users/aathishs/Projects/MiniZincC	Set Faculty CSV File		
/Users/aathishs/Projects/MiniZincC	Set Sections CSV File		
/Users/aathishs/Projects/MiniZincC	Set Rooms CSV File		
Days Per Week:	5	-	+
Slots Per Day:	5	-	+
Slot for FN/AN Break [0 For No Break]:	4	-	+

Solve for Timetable

TimeTable Output

Day\Slot	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5
Monday	UEN0000	UXX0000	UXX0000	UXX0000	UXX0000
Tuesday	UXX0000	UXX0000	UXX0000	UXX0000	UXX0000
Wednesday	UEE2201	UXX0000	UEN0000	UXX0000	UXX0000
Thursday	UEE2201	UXX0000	UEN0000	UXX0000	UXX0000
Friday	UEE2201	UXX0000	UEN0000	UXX0000	UXX0000

Section ▾ mech A Sem 1 ▾

MiniZinc TimeTable Generator

/Users/aathishs/Projects/MiniZincC	Set Courses CSV File		
/Users/aathishs/Projects/MiniZincC	Set Faculty CSV File		
/Users/aathishs/Projects/MiniZincC	Set Sections CSV File		
/Users/aathishs/Projects/MiniZincC	Set Rooms CSV File		
Days Per Week:	5	-	+
Slots Per Day:	5	-	+
Slot for FN/AN Break [0 For No Break]:	4	-	+

Solve for Timetable

TimeTable Output

Day\Slot	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5
Monday	UEN0000	UXX0000	UXX0000	UXX0000	UXX0000
Tuesday	UCS2201	UCS2201	UCS2201	UXX0000	UXX0000
Wednesday	UCS2202	UXX0000	UEN0000	UXX0000	UXX0000
Thursday	UCS2202	UXX0000	UEN0000	UXX0000	UXX0000
Friday	UCS2202	UXX0000	UEN0000	UXX0000	UXX0000

Section ▾ cse B Sem 1 ▾

CONCLUSION

For time table administration, a web application was created. It is a mechanism designed to give improved support to college employees. The schedule module serves as a solid forecasting base. The time table management system includes the ability to create and examine timetables for particular employees and students.

REFERENCES

1. [\[2011.07507\] Automated Large-scale Class Scheduling in MiniZinc](#)
2. [University Course Timetabling with Soft Constraints](#)
3. <https://www.minizinc.org>