Lecture Outline

- The problem of timetable creation
- Existing solutions
- Solutions used at PUT
- Proposition for a new system
- Conclusions
Lecture Outline

- The problem of timetable creation
- Existing solutions
- Solutions used at PUT
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Creating timetables requires taking into account the problems with:

- Teachers
- Students (groups of students)
- Classrooms
- Laboratories
- Courses
The problem of timetable creation

Teachers:
- The same person can't teach two different groups at the same time
- Teachers may have some other duties they need to attend
- Teachers may have individual preferences in terms of time and length of classes (some prefer morning hours, some evenings)
- Some teachers may have special preferences or needs regarding classrooms (e.g. disabled teachers)
The problem of timetable creation

Students:

- Students typically prefer larger blocks of classes
- Students should be given enough time to get from one campus to another if such need arises
- Fridays should be free of classes... ;)}
The problem of timetable creation

Classrooms:

- Each classroom has unique number of seats and different equipment
- Some classrooms are shared between different Faculties
- Some classrooms may have access limitations (no elevator)
- Classroom may be better or worse for some type of classes (e.g. lectures)
- There might be individual events in some of the classrooms from time to time
The problem of timetable creation

Laboratories:

- Each laboratory has different equipment design for specific courses
- Each laboratory is assigned to Research Laboratory (such as Laboratory of Computing Systems)
The problem of timetable creation

Courses:

- Each course should be assigned proper number of hours
- Courses should be planned in a manner maximising quality of education (e.g. lectures preceding laboratory classes, more demanding classes planned in earlier hours etc.)
The problem of timetable creation

Existing solutions

Solutions used at PUT

Proposition for a new system

Conclusions
Examples of existing solutions of timetable problems:
- CELCAT Timetabler
- FET – Free Timetable Software
- Mimosa
Existing solutions

- CELCAT Timetabler
  - Commercial software
  - Assisted timetable creation (not automatic)
  - Standalone and web application
Existing solutions

CELCAT Timetabler – main features
- Advanced configuration features (time of classes, individual events, teachers and more)
- Classroom configuration (number of seats, equipment)
- Automatic publication of timetables
- Support for standard and external studies
- Support for constraints with different weights
- Some support for desideratum
- Different levels of conflict solving
- Statistics
Existing solutions

- CELCAT Timetabler – disadvantages
  - Commercial software – not too cheap
  - Outdated interface
  - Some common commands require many “clicks”
  - Not that easy to integrate with current University systems
  - Support of only up to four windows at the same time
Existing solutions

**CELCAT Timetabler – screen 1**
Existing solutions

CELCAT Timetabler – screen 2
## Existing solutions

### CELCAT Timetabler – screen 3

### Wincote College 2003-2004 (g)

#### Staff statistics (Wks 1-30, 05/09/2005 - 27/03/2006)

<table>
<thead>
<tr>
<th>Staff</th>
<th>Target hrs</th>
<th>Actual hrs</th>
<th>Breakdown (by Event category)</th>
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<tbody>
<tr>
<td>Creese, Jessica [JC]</td>
<td>0h 00m 00s</td>
<td>1416h 10m 00s</td>
<td>Undefined 12h 00m 00s Holiday 442h 30m 00s Lecture 355h 30m 00s Seminar 332h 00m 00s Tutorial 347h 30m 00s</td>
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<tr>
<td>Kent, Fraser [FK]</td>
<td>0h 00m 00s</td>
<td>1635h 10m 00s</td>
<td>Undefined 10h 00m 00s Holiday 573h 37m 06s Lecture 586h 22m 06s Seminar 345h 00m 00s Tutorial 271h 15m 00s</td>
</tr>
</tbody>
</table>

**Hours by Week**

- **Total:**
  - Target hrs: 0h 00m 00s
  - Actual hrs: 305h 20m 00s

- **Average:**
  - Target hrs: 0h 00m 00s
  - Actual hrs: 1525h 40m 00s
Existing solutions

FET – Free Timetable Software

- Free (GNU GPL)
- Manual or automatic timetable creation
- Support for HTML, XML and CSV formats
Existing solutions

FET – Free Timetable Software – main features

- Automatic timetable creation – generation algorithm
- Import/export from CSV format
- Support for constraints with different weights
- Conflict solving on different levels
- Flexible students groups structures
FET – Free Timetable Software – disadvantages

- Standalone application only
- Outdated interface
- Not that easy to integrate with current University systems
- Not intuitive interface...

The only "intuitive" interface is the nipple. After that it's all learned.

- Bruce Ediger
Existing solutions

FET – Free Timetable Software – screen 1
Existing solutions

- FET – Free Timetable Software – screen 2

Current timetable: 136 out of 136 activities placed, 0h 0m 0s

Timetable no: 1 => Timetable has 0 soft conflicts factor and was generated in 0 hours, 0 minutes and 1 seconds
Timetable no: 2 => Timetable has 0 soft conflicts factor and was generated in 0 hours, 0 minutes and 0 seconds
Timetable no: 3 => Timetable has 0 soft conflicts factor and was generated in 0 hours, 0 minutes and 0 seconds
Timetable no: 4 => Timetable has 0 soft conflicts factor and was generated in 0 hours, 0 minutes and 1 seconds
Timetable no: 5 => Timetable has 0 soft conflicts factor and was generated in 0 hours, 0 minutes and 0 seconds

FET information

Simulation terminated successfully. The results are saved in directory /home/vdf/fet-results/timetables/Semana14-multi in html and xml mode and the soft conflicts in txt mode.

The data+timetables are also saved as .fet files (data+constraints to lock the timetable), so you can open-modify-regenerate the same timetables after that

Total searching time was 0h 0m 4s
Existing solutions

- FET – Free Timetable Software – screen 3
Existing solutions

- **Mimosa**
  - Commercial software (Free small school edition)
  - Assisted timetable creation (not automatic)
  - Configurable look & feel
Mimosa – main features

- Automatic conflict checking and conflict prevention
- Context-sensitive help
- Displaying of available resources
- Imitating of previous solutions and room selections
- Selection optimalization
- Tree view browsing of courses
Existing solutions

Mimosa – disadvantages

- Standalone application only
- No standardized import mechanism to import data from outside sources
- Commercial software – not too cheap
Existing solutions

Mimosa – screen 1
Existing solutions

Mimosa – screen 2
## Existing solutions

**Mimosa – screen 3**

### LineC A0, 15/08/2011-19/08/2011

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*Mimosa Scheduling Software*
The problem of timetable creation
Existing solutions
**Solutions used at PUT**
Proposition for a new system
Conclusions
Solution used at PUT

**Current solution**

- No integrated solution for all Faculties
- Different planner at each Faculty
- Some of the tools that are used:
**Current solution**
- Desideratum provided personally or via email
- Manual creation of timetable
- Manual data input
- Manual publication of timetables
- Manual conflict detection...
- ...some automatic conflict detection using excel files and formulas
Excel file with formulas (1)
Solution used at PUT

**Excel file with formulas (2)**

![Excel file screenshot](image_url)

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**Example formula:**

```
=CONCATENATE(P21;AB21;AN21;AZ21;BL21;BX21;CJ21;CV21;DH21;DT21;EF21;ER21;FD21;FF21)
```
Lecture Outline

- The problem of timetable creation
- Existing solutions
- Solutions used at PUT
- Proposition for a new system
- Conclusions
Proposition for a new system

New system features:
- Easy to use web-interface
- Integration with Deans office data
- Conflict solving
- Support for gathering desideratums
- ...

The problem of timetable creation
Existing solutions
Solutions used at PUT
Proposition for a new system
Conclusions
Conclusions:

- Timetable problem is complicated and multi-leveled
- PUT needs a new solution for timetables
- No existing solution can solve all the problems out of the box
- Full automation of the process is very hard (if possible at all)
- Timetables may always be better!
Questions?
Thank you for your attention