Relationalisation Eliminates Theory

Identification

Domination Normal Form - Decomposing Relational Database Schemas (sic)

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5 An Example

A (sic) university has oral examinations at the end of each semester, and wants to manage related data using a relational database. The relevant attributes to be stored are

R = {Student, Course, Chapter, Time, Room}

Here Chapter denotes a chapter from the course textbook the student will be examined about. Every student can get examined about multiple chapters, and chapters may vary for each student. Multiple students can get examined at the same time in the same room, but the course must be the same. Further constraints are that a student gets examined for a course only once, and can't be in multiple rooms at the same time.

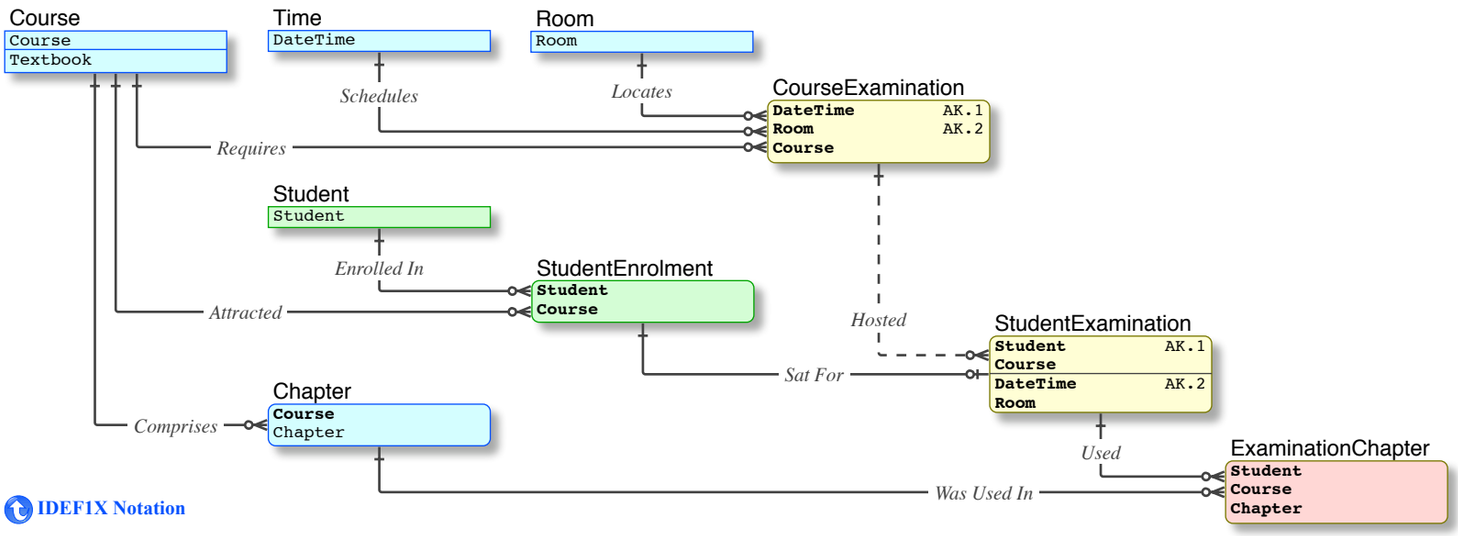
Errata

The gentleman expresses himself backwards. Second, some requirements are missing. Based on the possibility that the instance table given on page 6 is the universal relation, by "multiple chapters" apparently he means:

- multiple courses per student
- one exam per course
- multiple chapters per exam, in one sitting.

Data Model

In order to record the facts given (above), and to understand the data, a Relational data model was erected. This layout employs the Explorer style, the data hierarchies are horizontal, and indented.



Note

1 The facts regarding the data, given in text form in the paper, were translated into Relational form, the Relational context. Verification was requested.

2 No keys were given in the source document. Other than to support the given facts, Key determination (formal Normalisation) was not attempted.
- `StudentExamination.PK` provides: *a student gets examined for a course only once*
- `StudentExamination.AK` provides: *a student can't be in multiple rooms at the same time*
- `CourseExamination.AK` provides (restated): *one course per {DateTime, Room}*

3 The "functional dependencies" given in the referenced document had not been examined. Key determination *from* "functional dependencies" had not been attempted.

4 Upon further evaluation, it was determined that the Keys were correct and complete.

5 The simple act of placing the data in a Relational context eliminated the problem that the paper proposes to solve. All requirements are fulfilled, all reports can be produced via natural joins.
- That is not to say the paper no value: outside the Relational context, such as in Record Filing systems, with no Keys, etc, it may well have value.

6 A number of additional constraints that are above and beyond the simple requirements identified, these are either 'obvious', or the minimum a standard-compliant practitioner would implement. Eg. Reference tables have been inferred from the given facts. While such additions elevate the model, they are not the cause of *Relationalisation Eliminates the Theory*, [5] remains the cause.

StudentExamination::Chapter

Student	Course	DateTime	Room	Ch
J.C. Denton	Networks	3/10, 1pm	101	2
				6
J.C. Denton	Security	4/10, 1pm	104	1
				5
L. Nasher	Networks	3/10, 1pm	101	3
				4
L. Nasher	Security	4/10, 1pm	104	4
				7
O. Shrek	Networks	3/10, 1pm	101	2
				8
O. Shrek	Security	4/10, 1pm	104	5
				2
M. Smith	Security	4/10, 2pm	104	4
				6
M. Anderson	Networks	3/10, 1pm	101	3
				5
A. Cheng	Networks	3/10, 1pm	103	2
				4
A. Cheng	Security	4/10, 2pm	104	4
				5
N. Cheng	Networks	3/10, 1pm	103	1
				7
N. Cheng	Security	4/10, 2pm	104	5
				6
J.Zhao	Networks	3/10, 1pm	103	2
				5

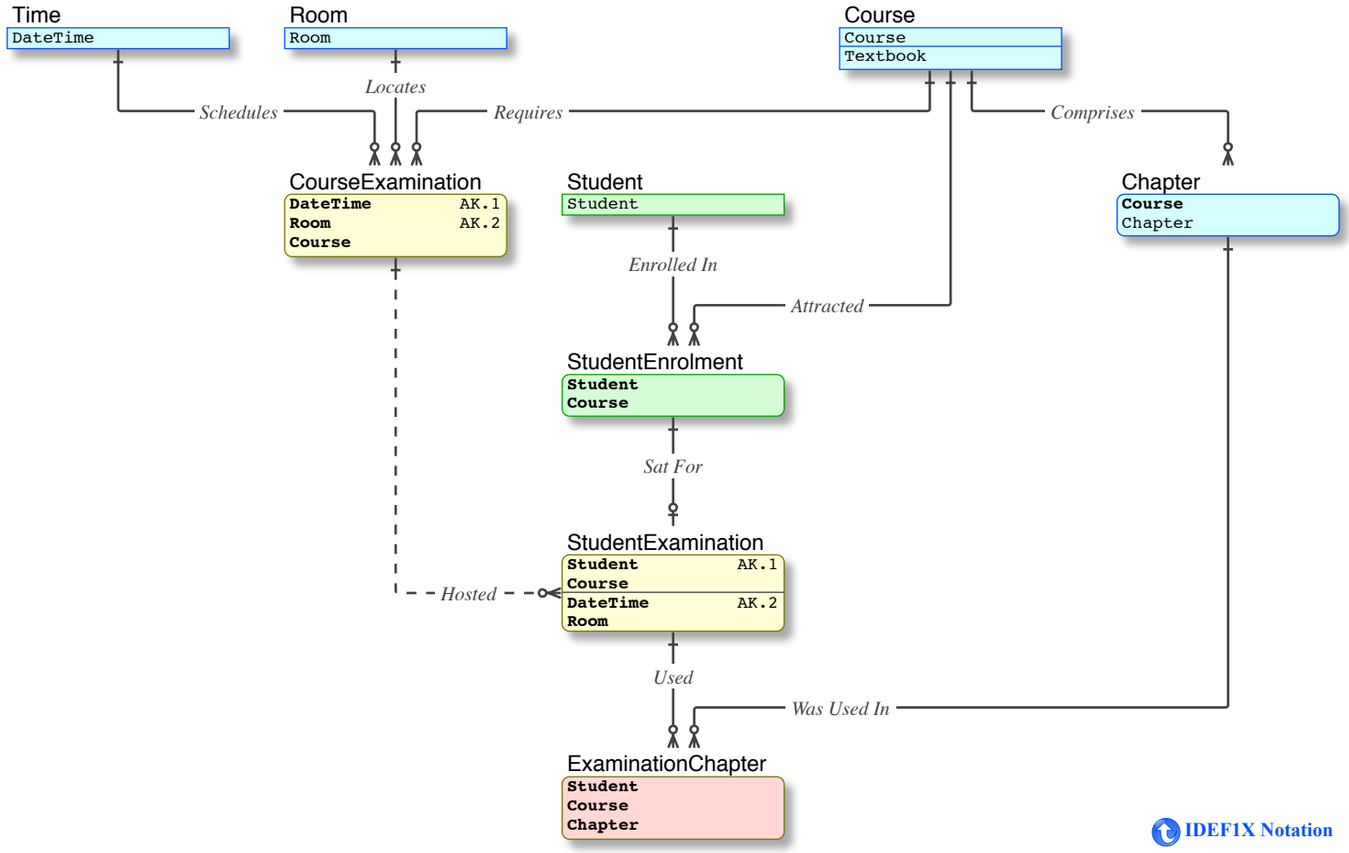
7 The data model is Relational, in the original 3NF, with no Redundancies; no Update Anomalies ("5NF" to the theoreticians). No further Normalisation; decomposition; or reduction, is possible.

8 Although the Relational solution is provided here, it is alien to the paper. In order to furnish some element that can be readily compared, sample data for the universal relation on page 6, if implemented using this data model, is given on the right. The critical table `StudentExamination` can be discerned by omitting (ignoring) the `Chapter` column.

9 The model is complete, awaiting verification of the declared basis [1][4][5][7].

Alternate Layout

An alternate layout, employing the organisation chart style, is presented here. This is easier for novices to understand, the data hierarchies are plain, vertical.



Business Rule

These are *all* the Constraints that govern the data, expressed formally (to the user, not to theoreticians).

```
Chapter is a Dependent of Course, and is an element of 1 Course ( )
    Chapter is Identified by ( Course, Chapter )
    Chapter Identifies, and was used in 0-n ExaminationChapters

Course is Independent
    Course is Identified by ( Course )
    Course is Described by ( Textbook )
    Course Identifies, and requires  0-n CourseExaminations
    Course Identifies, and attracted 0-n StudentEnrolments
    Course Identifies, and comprises 0-n Chapters

CourseExamination is a Dependent of Time, and is a schedule of 1 Time
    CourseExamination is a Dependent of Room, and is located in 1 Room
    CourseExamination is a Dependent of Course, and is a requirement of 1 Course
    CourseExamination is Primarily Identified by   ( DateTime, Room, Course )
    CourseExamination is Alternately Identified by ( DateTime, Room )
    CourseExamination hosted 0-n StudentExaminations

ExaminationChapter is a Dependent of StudentExamination, and is used by 1 StudentExamination
    ExaminationChapter is a Dependent of Chapter, and uses 1 Chapter
    ExaminationChapter is Identified by   ( Student, Course, Chapter )

Room is Independent
    Room is Identified by ( Room )
    Room Identifies, and locates 0-n CourseExaminations

Student is Independent
    Student is Identified by ( Student )
    Student Identifies, and enrolled 0-n StudentEnrolments

StudentEnrolment is a Dependent of Student, and is an enrollment of 1 Student
    StudentEnrolment is a Dependent of Course, and is attracted by 1 Course
    StudentEnrolment is Identified by ( Student, Course )
    StudentEnrolment Identifies, and sat for 0-1 StudentExaminations

StudentExamination is a Dependent of StudentEnrolment, and is a sitting of 1 StudentEnrolment
    StudentExamination is Primarily Identified by   ( Student, Course )
    StudentExamination is Alternately Identified by ( Student DateTime )
    StudentExamination is hosted by 1 CourseExamination
    StudentExamination Identifies, and used 0-n ExaminationChapter

Time is Independent
    Time is Identified by ( DateTime )
    Time Identifies, and schedules 0-n CourseExaminations
```