INFO-H-415 Advanced Databases
Temporal Databases Part 1
Traduction of EA schema to relational databases

13 octobre 2021
Relational model

- In this model the principal concept is the relation (∼ table)
- The entities, the associations and multivalued attributes are translated by relations
- Model: Relation(Key(s), Attribute, Optionnal Attribute, . . . )
- Translation:
  Employee(SSN, Name)
(1) multivalued attributes

<table>
<thead>
<tr>
<th>Livre</th>
<th>ISBN</th>
<th>Auteur (1,n)</th>
</tr>
</thead>
</table>

Question: why (ISBN, Auteur) and not (ISBN, Auteur)?
(1) multivalued attributes

<table>
<thead>
<tr>
<th>Livre</th>
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</thead>
<tbody>
<tr>
<td>ISBN</td>
</tr>
<tr>
<td>Auteur (1,n)</td>
</tr>
</tbody>
</table>

Livre(\texttt{ISBN, ...})

\texttt{LivreAuteur(ISBN, Auteur)}


▶ Question : why (\texttt{ISBN, Auteur}) and not (\texttt{ISBN, Auteur}) ?
(2) Translation of composed attributes

<table>
<thead>
<tr>
<th>Client</th>
</tr>
</thead>
<tbody>
<tr>
<td>ClientNo</td>
</tr>
<tr>
<td>Nom</td>
</tr>
<tr>
<td>Adresse</td>
</tr>
<tr>
<td>Rue</td>
</tr>
<tr>
<td>Ville</td>
</tr>
<tr>
<td>Pays</td>
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</tbody>
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<td>Pays</td>
</tr>
</tbody>
</table>

Client(ClientNo, Nom, AdresseRue, AdresseVille, AdressePays)
(3) Translation of 'one to one' or 'one to many' associations

Employee (SSN, Name) \(\rightarrow\) WorksFor \(\rightarrow\) Department (Dno, Name)

- 'one to one' association: if one is optional, the reference goes to the mandatory side!
- 'one to many' association: the reference goes to the 'one' side.
(3) Translation of ’one to one’ or ’one to many’ associations

- ’one to one’ association : if one is optional, the reference goes to the mandatory side!
- ’one to many’ association : the reference goes to the ’one’ side
(3) Translation of ‘many to many’ associations

Employee(SSN, Name)\n\nProject(PNo, Name)\n
EmpProj(SSN, PNo)\nEmpProj.SSN references Employee.SSN\nEmpProj.PNo references Project.PNo

▶ Careful, (SSN, PNo) \(\neq\) (SSN, PNo)
(3) Translation of 'many to many' associations

Employee(SSN, Name)
Project(PNo, Name)
EmpProj(SSN,PNo)
  EmpProj.SSN references Employee.SSN
  EmpProj.PNo references Project.PNo

▶ Careful, (SSN,PNo) \neq (SSN,PNo)
(4) Translation of generalisations: solution 1

Employee (SSN, FName, MInit, LName, BirthDate)
Secretary (SSN, TypingSpeed)
Secretary.SSN reference Employee.SSN
Technician (SSN, TechGrade)
Technician.SSN reference Employee.SSN
Engineer (SSN, EngType)

(t,e)
(4) Translation of generalisations : solution 1

Employee(SSN, FName, MInit, LName, BirthDate, Address)
Secretary(SSN, TypingSpeed)
Technician(SSN, TechGrade)
Engineer(SSN, EngType)

Employee(SSN, FName, MInit, LName, BirthDate, Address)
Secretary(SSN, TypingSpeed)
Technician(SSN, TechGrade)
Engineer(SSN, EngType)

- integrity constraints
(4) Translation of generalisations : solution 2

Employee

SSN
Name
BirthDate

(t,e)

Secretary
TypingSpeed

Technician
TechGrade

Engineer
EngType
(4) Translation of generalisations : solution 2

Secretary(SSN, FName, MInit, LName, BirthDate, Address, TypingSpeed)
Technician(SSN, FName, MInit, LName, BirthDate, Address,, TechGrade)
Engineer(SSN, FName, MInit, LName, BirthDate, Address,, EngType)

▶ + integrity constraints
(4) Translation of generalisations: solution 3

Employee
  SSN
  Name
  BirthDate

(t,e)

Secretary
  TypingSpeed

Technician
  TechGrade

Engineer
  EngType
(4) Translation of generalisations : solution 3

Employee(SSN, FName, MInit, LName, BirthDate, Address, TypingSpeed, TechGrade, EngType)

- + integrity constraints
What can we say about these generalisations?
- Total, non-exclusive?
- Partial, exclusive?
- Partial, non-exclusive?
(5) Translation sequences relations

Employee(name, startTime, birthDate, endTime)
EmployeeAddress(name, startTime, address, endTime)
EmployeeSalary(name, startTime, salary, endTime)
EmployeeProject(name, startTime, project, endTime)

▶ integrity constraints
(5) Translation sequences relations

<table>
<thead>
<tr>
<th>Name</th>
<th>Start Time</th>
<th>End Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peter</td>
<td>8/9/64</td>
<td>7/94-7/98</td>
</tr>
<tr>
<td>Bd St Germain</td>
<td>1/85-12/87</td>
<td></td>
</tr>
<tr>
<td>Bd St Michel</td>
<td>1/88-12/94</td>
<td></td>
</tr>
<tr>
<td>Rue de la Paix</td>
<td>1/95-now</td>
<td></td>
</tr>
<tr>
<td>4000</td>
<td>7/94-7/95</td>
<td></td>
</tr>
<tr>
<td>5000</td>
<td>8/95-now</td>
<td></td>
</tr>
<tr>
<td>{MADS}</td>
<td>7/94-8/95</td>
<td></td>
</tr>
<tr>
<td>{MADS, HELIOS}</td>
<td>9/95-now</td>
<td></td>
</tr>
</tbody>
</table>

**Employee**

- name
- birthDate
- address
- salary
- projects (1,n)

```
Employee(name, startTime, birthDate, endTime)
EmployeeAddress(name, startTime, address, endTime)
EmployeeSalary(name, startTime, salary, endTime)
EmployeeProject(name, startTime, project, endTime)
```

▶ + integrity constraints