

A functional dependency is a property of the relation schema R , not of a particular legal relation state r of R .. Therefore an FD cannot be inferred automatically from a given relation extension r but must be defined explicitly by someone who the semantics of the attributes of R . By semantics we mean the "the meaning of the attribute", so for e.g. Teacher attribute of department means Teacher ~~can~~ can give name of the department in which he/she is teaching/working so

Teacher $\rightarrow$ DName is true
while DName $\rightarrow$ Teacher is not true as one department may have several teachers.

Let us take the following ex. (11)

TEACH

Teacher	Course	Text
Amita	Algebra	SSARORA
Amita	Real Analysis	Martin
L. Sinha	Python	Navreen
Sunita	Data bases	Navathe
Ramesh	Algebra	SSARORA

So you can observe a possible state of TEACH Relation may have

Text $\rightarrow$ Course as a valid FD
while Teacher $\rightarrow$ Course is ruled out
as teacher may teach more than
one course as Amita is teaching
Algebra and Real Analysis, while
each course Algebra has text book as
SSARORA, Real Analysis as Martin,
Python as Navreen and Data Bases
as Navathe i.e. only one text
even course $\rightarrow$ Teacher is not valid
as one course can be taught by
more than one teacher as in the
above algebra is taught by Amit
and Ramesh.

The following figure is an introduction to diagrammatic notation of displaying FD's. Each FD is displayed as a horizontal line. This is a representation of our sample model of relations as described earlier.

PK		FK		
Enroll	<u>SSN</u>	Bdate	Address	Dnumber

FK		FK	
Dname	<u>Dnumber</u>	Dmgr	<u>SSN</u>
		PK	

PK → Primary key
FK → Foreign key

FK	
<u>Dnumber</u>	Dlocation
PK	

FK → Dnumber
PK → Dnumber, Dlocation combined.

Project

FK			F.K.	
Iname	<u>Pnumber</u>	Plocation	Dnum	
		PK		

Works_on

F.K.		F.K.	
<u>SSN</u>	<u>Pnumber</u>	Hours	
		P.K.	

F.K is SSN
F.K is Pnumber
P.K is SSN, Pnumber combined.

Figure 14.2 Sample database state for the relational database schema in Figure 14.1.

EMPLOYEE

Ename	Ssn	Bdate	Address	Dnumber
Smith, John B.	123456789	1965-01-09	731 Fondren, Houston, TX	5
Wong, Franklin T.	333445555	1955-12-08	638 Voss, Houston, TX	5
Zelaya, Alicia J.	999887777	1968-07-19	3321 Castle, Spring, TX	4
Wallace, Jennifer S.	987654321	1941-06-20	291 Berry, Bellaire, TX	4
Narayan, Ramesh K.	666884444	1962-09-15	975 Fire Oak, Humble, TX	5
English, Joyce A.	453453453	1972-07-31	5631 Rice, Houston, TX	5
Jabbar, Ahmad V.	987987987	1969-03-29	980 Dallas, Houston, TX	4
Borg, James E.	888665555	1937-11-10	450 Stone, Houston, TX	1

DEPARTMENT

Dname	Dnumber	Dmgr_ssn
Research	5	333445555
Administration	4	987654321
Headquarters	1	888665555

DEPT_LOCATIONS

Dnumber	Dlocation
1	Houston
4	Stafford
5	Bellaire
5	Sugarland
5	Houston

WORKS_ON

Ssn	Pnumber	Hours
123456789	1	32.5
123456789	2	7.5
666884444	3	40.0
453453453	1	20.0
453453453	2	20.0
333445555	2	10.0
333445555	3	10.0
333445555	10	10.0
333445555	20	10.0
999887777	30	30.0
999887777	10	10.0
987987987	10	35.0
987987987	30	5.0
987654321	30	20.0
987654321	20	15.0
888665555	20	Null

PROJECT

Pname	Pnumber	Plocation	Dnum
ProductX	1	Bellaire	5
ProductY	2	Sugarland	5
ProductZ	3	Houston	5
Computerization	10	Stafford	4
Reorganization	20	Houston	1
Newbenefits	30	Stafford	4

Following are the guidelines that informally describe the relation schemas

1. Make sure that the semantics (meaning) of the attributes is clear in the schema
2. Reduce the redundant information in tuples (records).
3. Reduce the NULL values in tuples
4. Disallow the possibility of generating spurious tuples.

Examples of violating Guideline 1

The relation schema on previous pages have clear meaning (semantics).
tuple in the EMP-Dept relation schema is given below

Emp-Dept

Empno	SSN	Bdate	Address	Dnumber	Dname	Mgr-SSN

Emp-Proj

SSN	Project	Hours	Ename	Pname	Plocation

FD1
FD2
FD3

A tuple in the Emp-~~Dept~~^{Proj} relation in above figure contains three FD's as described as FD1, FD2 and FD3 for Emp-~~Dept~~^{Proj} and two FD's FD4 & FD5 for Emp-~~Dept~~. The Emp-~~Dept~~ represents a single employee but includes additional (wasteful) information - namely, the name (Dname) of the department for which the employee works and the social security number (Dmgr-SSN) of the department manager. For the Emp-~~Dept~~^{Proj} relation in the fig above, each tuple relates an employee to a project but also includes the employee name (Ename), project name (Pname), and project location (Plocation). These two relations violate guideline 1 by mixing attributes from real world entities as employee is one entity and department is other. Similarly Employee & project are two separate entities. So this is a case of poor design of schema.