CHAPTER IV
RELATIONAL MODEL

4.1 STRUCTURE OF RELATIONAL DATABASE

A relational database consists of a collection of tables. A row in a table represents a relationship among a set of values. Since a table is a collection of such relationships, there is a close correspondence between the concept of table and the mathematical concept of relation.

4.2 RELATIONS

Mathematicians define a relation as follows:

Given "N" sets, D_1, D_2, ... Dn, R is a relation over these sets, if R is a set of ordered n-tuples of the form (d_1, d_2, ..., dn) where d_1 is an element from D_1. d_2 is an element from D_2, ... , and dn is an element from DN. D1, D2, ... ,DN are called the domains of R.

The meaning of this definition is described by a graphical representation, as in Figure 4.1. In Figure 4.1, there are four domains. Domain D1 is a set of integers, D2 is a set of character strings that are name of things, D3 is a set of character strings that are colors and D4 is another set of integers. The relation shown has six tuples. Each tuple consists of four elements where each element has been picked from a different domain. The order of the elements in the tuples is important. The first element in every tuple is from domain D1, the second element in every tuple is from D2.

A data processing view of a relation is shown in Figure 4.2. The four domains given in Figure 4.1 have been related to four real world items in Figure 4.2 : part number, part name, part color, and part weight. The relation looks like a table, or a file, and the tuples look like rows of a table, or records in file.

The names of the columns, which are called fields in a record, are term attributes, and the values that appear in a given tuple are called attribute values. Thus, the first element in the first tuple has an attribute value of 101, and is taken from a domain of part number. The following sets of terms will be used interchangeably: Relation, table and file; Tuple, row and record; Attribute, column and field.

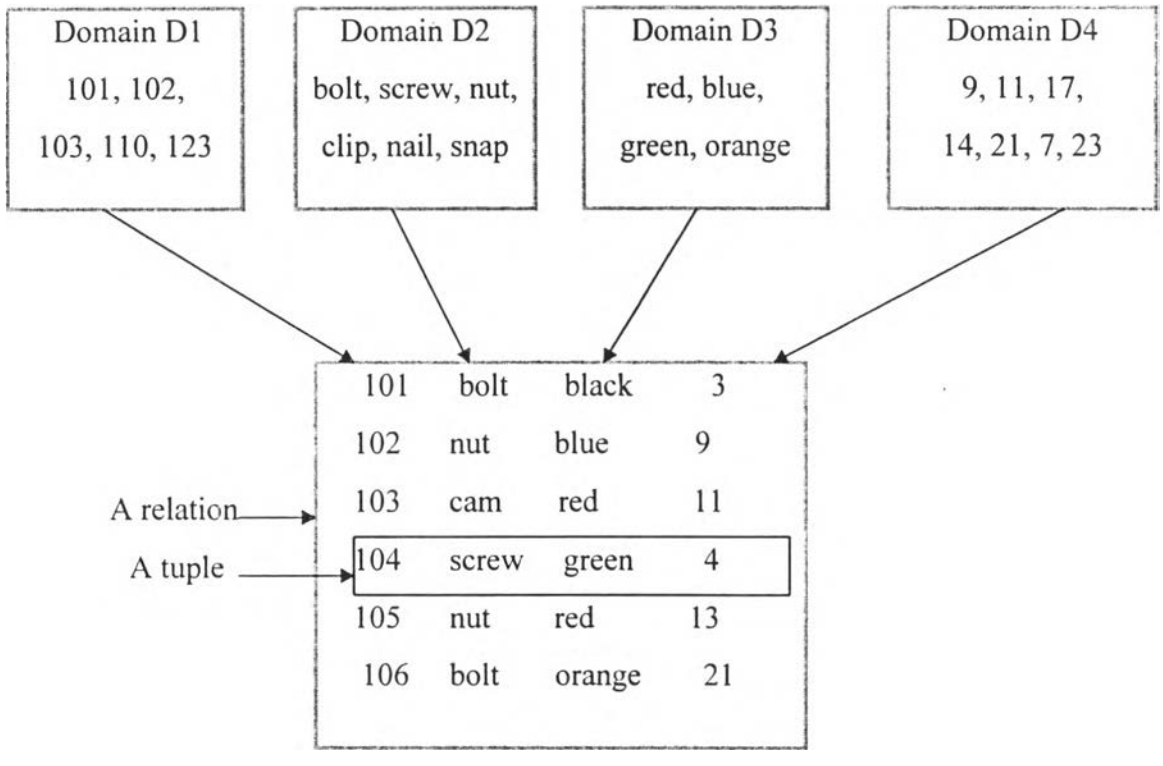

Figure 4.1 Mathematical view of a relation(Jackson, 1988)

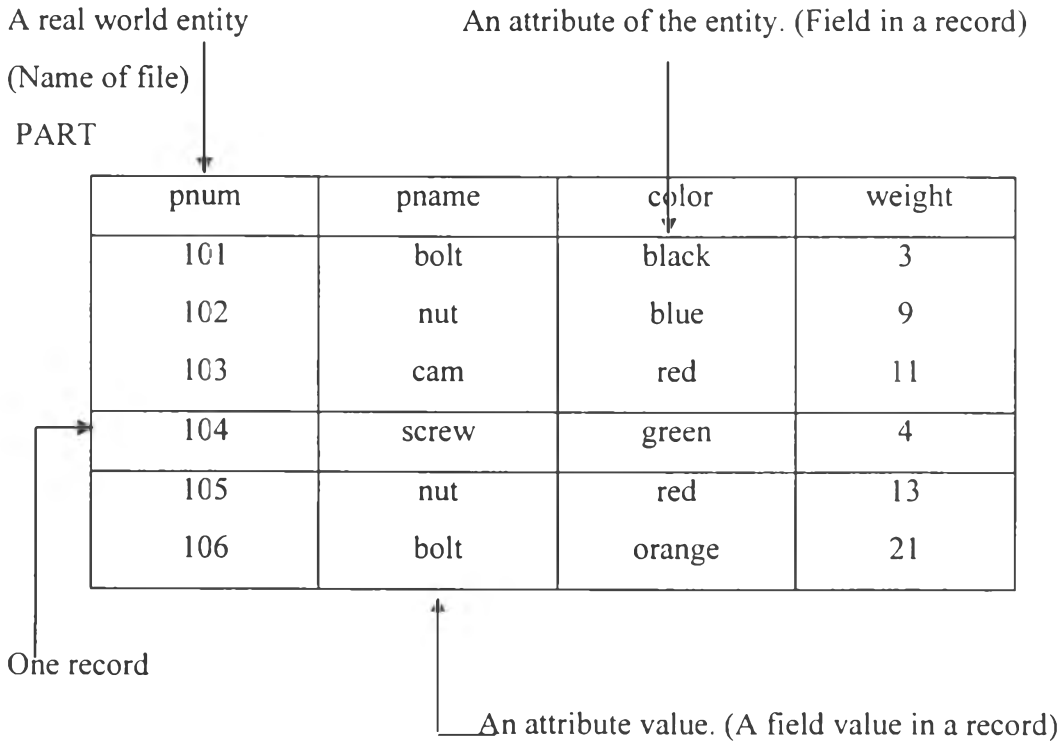

Figure 4.2 Data processing view of relation

(Jackson, 1988)

4.2 RELATIONAL DATABASES

A relational database is collection of data filled into tables. For instance, a relational database called Supplier_Parts is shown in Figure 4.3. This database shows three sets of information of a construction company. Sup relation is information of suppliers who supply parts to the enterprise. Sup relation composed of supplier numbers, which are assumed to be unique, and supplier names, status and home city. Part relation is information of parts used by enterprise. This includes part numbers, which are unique, part names, colors, and weight. SP relation is information of the part numbers and quantities of each part supplied by each supplier.

Each relation in the database is stored as an individual file. The structure of the file used to store a relation is simple, since every record in the file has exactly the same format. On larger DBMS's each relation is stored as indexed file, where the index is an attribute, or set of attributes, that is specified by the creator of the relation. The set of attributes used for the index is called the primary key of the relation. The primary key is defined as that attribute, or set of attributes, which can be used to identify uniquely one tuple in a relation from another. A primary key must not have any extra attributes. In the Supplier_Parts database, the primary key are {snum} for the Sup relation , {pnum} for the Part relation, and {snum, pnum} for the SP relation. Each primary key is suffiient to identify each tuple uniquely in a relation. For example, in the SP relation if snum='S1' and pnum=101, there should be no more than one tuple that can be found that has these particular attribute values. In Figure 4.3, the tuple with these value is {S1, 101, 9}. If another tuple, with the same primary key, {S1, 101, 11}, were to be stored in the relation, confusion would result. It would not be known whether S1 was supplying 9 or 11 of part 101.

In developed relational DBMS, an error message will be generated when a user tries to store a tuple that has a primary key equal to one already in the relation so user should avoid input the same primary key in a database.

PART

pnum	pname	color	weight
101	bolt	black	3
102	nut	blue	9
103	cam	red	11
104	screw	green	4
105	nut	red	13
106	bolt	orange	21

SUP

snum	sname	status	city
S1	Smith	20	London
S2	Jones	15	Detroit
S3	Adder	10	Chicago
S4	House	30	Paris
S5	Blank	20	Paris

SP

snum	pnum	qty		snum	pnum	qty
S1	101	9		S3	102	13
S1	102	4		S3	103	6
S1	103	2		S3	104	1
S1	106	3		S3	105	2
S2	101	3		S3	106	5
S2	102	8		S4	103	7
S2	105	11		S4	106	13
S2	106	9		S5	103	8
S3	101	7		S6	104	9

Figure 4.3 The Supplier_Parts database (Jackson, 1988)