Relational Data Model

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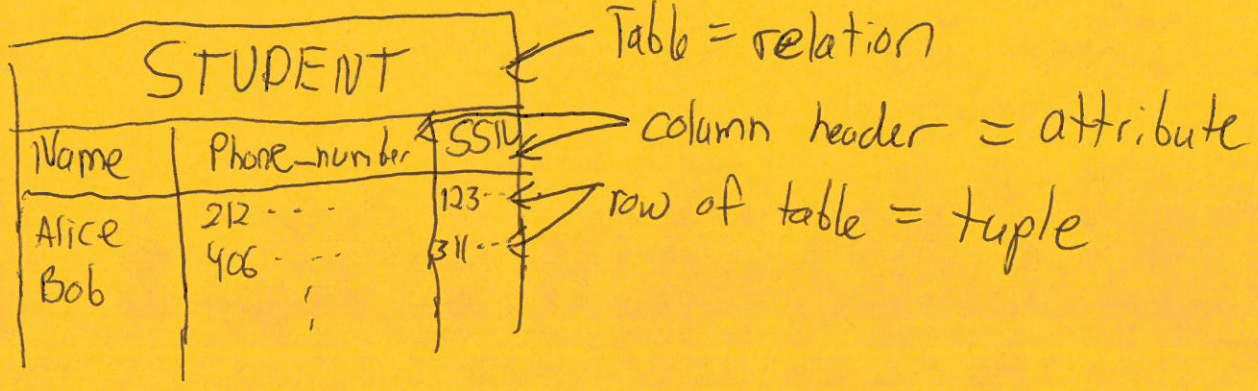
DB collection of relations



Defs:

atomic value: each value is indivisible

domain: set of atomic values

Eg. SSN: 9 digits

Name: set of character strings

- Data type (format): d is decimal

SSN: ddd-dd-dddd

Phone: (ddd)␣ddd-dddd

Relational Schema: denoted $R(A_1, --, A_n)$

- R is relation name
- attributes $A_1, --, A_n$
- $dom(A_i)$ is the domain of A_i
- degree (airity): # of attributes in relation

E.g.

STUDENT(

Name: string,
Ssn: string of 9 char,
Age: int,
GPA: real,

)

$dom(GPA) = real\ \overset{\text{between}}{\wedge}\ [0, 4]$

degree = 4

Attributes = Name, SSN, Age, GPA

Name of relation = STUDENT

relation: given by relational schema $R(A_1, \dots, A_n)$

- relation $r(R)$ is a set of n-tuples

$r = \{t_1, \dots, t_m\}$

w/ each n-tuple t as an ordered list of n values $t = \langle v_1, v_2, \dots, v_n \rangle$

w/ each $v_i \in dom(A_i)$ $i \in \{1, \dots, n\}$

or NULL

notate v_i as $t.A_i$

Eg STUDENT(Name, SSn, Age, Gpa) ← relational schema

A_1 = Name

A_2 = SSn

A_3 = Age

A_4 = Gpa

STUDENT			
Name	SSn	Age	Gpa
Alice	212...	21	2.9
Bob	406...	22	3.2

$t_1 = (Alice, 212\dots, 21, 2.9)$

$t_2 = (Bob, 406\dots, 22, 3.2)$

$t_m = (Zed, 123\dots, 25, 3.8)$

$r(STUDENT) = \{t_1, t_2, \dots, t_m\}$

A_1 = Name

$\Rightarrow$ Alice, Bob, Zed $\in dom($Name$)$

Characteristics of relations

- order doesn't matter

&

- order of attributes

(Bob, 406--, 311--)
(Alice, 212--, 123...)
(Zed, 973--, 456--)

Other way to write

(Name: Bob, Phone: 406--, Sss: 311--)
(SSn: 456, Phone: 973--, Name: Zed)
(, Name: Alice)

Values and Nulls

- all values are atomic ← (no composite, or multivalued attributes)

- NULL: unknown or does not apply

Eg. STUDENT(Name, Ssn, Cell_phone, Office_phone)

Cell_phone: or don't value

Office_phone: no office phone

Several meanings of Null:

- value unknown
- attribute does not apply
- value for attribute does not exist (value exists but not available)
- value undefined

Why value of NULL matters:

- comparisons (relatively complicated)
- generally try to avoid allowing null