关系演算
—与关系代数的等价性

讲授内容

- 关系代数的基本运算等价的元组关系演算公式

五种基本操作
并
差
广义笛卡尔积
投影
选择

并运算

$$R \cup S \equiv \{t \mid R(t) \vee S(t)\}$$

R

A	B	C
a	b	c
d	a	f
c	b	d

R(t) =T

S

A	B	C
d	a	f
b	g	a

S(t) =T

R∪S

A	B	C
a	b	c
d	a	f
c	b	d
b	g	a

R(t) =T

S(t) =T

差运算

$$R - S \equiv \{t \mid R(t) \wedge \neg S(t)\}$$

R

A	B	C
a	b	c
d	a	f
c	b	d

R(t) =T

S

A	B	C
d	a	f
b	g	a

S(t) =T

R–S

A	B	C
a	b	c
c	b	d

R(t) =T
S(t) =F

投影

$$\pi_{i1,\ i2,\ldots ik}(R) \equiv \{t^{(k)} \mid (\exists u)(R(u) \wedge t[1]=u[i_1] \wedge \ldots \wedge t[k]=u[i_k])\}$$

$$\{t^{(2)} \mid (\exists u)\ (R(u) \wedge t[1]=u[1] \wedge t[2]=u[3])\}$$

R

A	B	C
a	b	c
d	a	f
c	b	d

u

$\pi_{A,\ C}(R)$

A	C
a	c
d	f
c	d

t

选择

$$\sigma_F(R) \equiv \{t \mid R(t) \land F'\}$$

$$\{t \mid R(t) \land t[2] = \text{‘b’}\}$$

R

A	B	C
a	b	c
d	a	f
c	b	d

R(t) =T

$\sigma_{B=\text{‘b’}}(R)$

A	B	C
a	b	c
c	b	d

R(t) =T

广义笛卡尔积

$$R \times S \equiv \{t^{(m+n)} | (\exists u^{(m)})(\exists v^{(n)})(R(u) \wedge S(v) \wedge t[1]=u[1] \wedge \ldots \wedge t[m]=u[m] \wedge t[m+1]=v[1] \wedge \ldots \wedge t[m+n]=v[n])\}$$

$$\{t^{(5)} | (\exists u)(\exists v)(R(u) \wedge S(v) \wedge t[1]=u[1] \wedge t[2]=u[2] \wedge t[3]=u[3] \wedge t[4]=v[1] \wedge t[5]=v[2])\}$$

R

A	B	C
a1	b1	c1
a1	b2	c3

u

S

D	E
b1	c1
b1	c2
b2	c2

v

RxS

A	B	C	D	E
a1	b1	c1	b1	c1
a1	b1	c1	b1	c2
a1	b1	c1	b2	c2
a1	b2	c3	b1	c1
a1	b2	c3	b1	c2
a1	b2	c3	b2	c2

小 结

并： $R \cup S \equiv \{t \mid R(t) \vee S(t)\}$

差： $R - S \equiv \{t \mid R(t) \wedge \neg S(t)\}$

积： $R \times S \equiv \{t^{(m+n)} \mid (\exists u^{(m)})(\exists v^{(n)})(R(u) \wedge S(v) \wedge t[1]=u[1] \wedge \ldots \wedge t[m]=u[m] \wedge t[m+1]=v[1] \wedge \ldots \wedge t[m+n]=v[n])\}$

投影： $\pi_{i1,\ i2,\ldots ik}(R) \equiv \{t^{(k)} \mid (\exists u)(R(u) \wedge t[1]=u[i_1] \wedge \ldots \wedge t[k]=u[i_k])\}$

选择： $\sigma_F(R) \equiv \{t \mid R(t) \wedge F'\}$