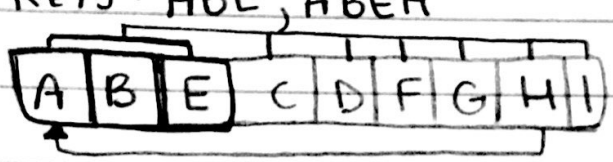
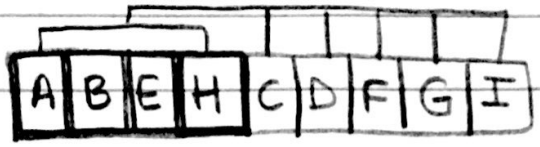
VALERIE ANGULO DBS HW6 4/25/2018

1) KEYS: ABE, ABEH





Relation is not in BCNF because for ABE key, H → A but $H^+ \neq BE$, H → HAI and doesnt contain B, E keys

2)

[1]
A → B
ADE → C
ADF → G
CF → GH

RHS

[2] A → B
ADE → C
ADF → G
* CF → G

[3] A → B
ADE → C
ADF → G
* CF → H

CAN I DERIVE CF → GH with [2] or [3]?

$CF^+_{[2]} \neq G$ NO $CF^+_{[3]} \neq H$ NO

NO EQUIVALENCE

LHS

[4] A → B
* AD → C
ADF → G
CF → GH

[5] A → B
* AE → C
ADF → G
CF → GH

[6] A → B
* DE → C
ADF → G
CF → GH

CAN I DERIVE C from [4] [5] [6]?

$AD^+_{[4]} \neq AD$ $AE^+_{[5]} = AE$ $DE^+_{[6]} = DE$

NO EQUIVALENCE

[7] A → B
* A → C
ADF → G
CF → GH

[8] A → B
* D → C
ADF → G
CF → GH

[9] A → B
* E → C
ADF → G
CF → GH

CAN I DERIVE C from [7] [8] [9]?

$A^+_{[7]} \neq AB$ $D^+_{[8]} \neq D$ $E^+_{[9]} = E$

NO EQUIVALENCE

We already know G cant be derived from AD, A or D

[10] A → B
ADE → C
* AF → G
CF → GH

[11] A → B
ADE → C
* DF → G
CF → GH

[12] A → B
ADE → C
* F → G
CF → GH

CAN G BE DERIVED from [10] [11] [12]?

$AF^+_{[10]} \neq AF$ $DF^+_{[11]} \neq DF$ $F^+_{[12]} \neq F$

NO EQUIVALENCE

[13] A → B
ADE → C
ADF → G
* C → GH

[14] A → B
ADE → C
ADF → G
* F → GH

CAN I DERIVE GH from C or F?

$C^+_{[13]} \neq C$ $F^+_{[14]} \neq F$

NO EQUIVALENCE

FD's form a minimal coverage because
① No 2 FDs can be combined in union
② No attribute can be removed from RHS without changing power
③ No attribute can be removed from LHS without changing power

3)

[1] A→BC, AB→D, B→C

[2] A→BC, *A→D, B→C

[3] A→B *, A→D, B→C

LHS (stronger) RHS (weaker)

A+ |= ABCD

[1] |= [2] ✓

A+ |= ABCD

[3] |= [2] ✓

A→B, A→D, B→C → UNION → A→BD, B→C

minimal cover: A→BD, B→C

4)

[1] A→HI, AB→CD, CD→EF, E→F, G→AD, H→B, I→AG

RHS [2] A→H [3] A→I

[2] A→H, AB→CD, CD→EF, E→F, G→AD, H→B, I→AG

[4] A→HI, *AB→C, [5] *AB→D, CD→EF, E→F, G→AD, H→B, I→AG

[6] A→HI, AB→C, *CD→E, E→F, G→AD, H→B, I→AG

[7] A→HI, AB→C, CD→E, E→F, * G→A *G→D, H→B, I→AG

[8] A→HI, AB→C, CD→E, E→F, G→AD, H→B, *I→G

[9] A→HI, AB→C, CD→E, E→F, G→AD, H→B, I→G

[10] A→HI, * A→C, CD→E, E→F, G→AD, H→B, I→G

[11] A→HI, A→C, * C→E * D→E, E→F, G→AD, H→B, I→G

[12] A→HI, A→C, C→E, *D→E, E→F, G→AD, H→B, I→G

RHS derive A→HI from [2] [3]

- $A^+_{[2]}$ |= AHBCDEFX $A^+_{[3]}$ |= AIGDX

derive AB→CD from [4] [5]

- $AB^+_{[4]}$ |= ABCHIGDEF ✓
- $AB^+_{[5]}$ |= ABDHIG

Derive CD→EF from CD→E

- $CD^+_{[6]}$ |= CDEF ✓

Derive G→AD from G→A [7] or G→D [8]

- $G^+_{[7]}$ |= GAHIBCX $G^+_{[8]}$ |= GDX

Derive I→AG from I→G

- $I^+_{[9]}$ |= IGADHBC ✓

LHS Check if B can be removed. Derive A→C using all FD's

$A^+_{[10]}$ |= AHIBGDCEF ✓

Check if D can be removed. Derive C→E using all FD's. Check removal of C, derive D→E using all FD's.

$C^+_{[11]}$ |= CEFX $D^+_{[12]}$ |= DEFX

UNION A→HI, A→C |= A→HIC

MINIMAL COVER: A→HIC, CD→E, E→F, G→AD, H→B, I→G

5)

1. ABDG key ABD & functional dependency G → B
2. AGE key AG
3. BDC key BD
4. CFA key CF
5. ABDCF key ABDCF

ABDCF → ABDGECF

6)

1. AB key A
2. BDE key B
3. CFDE key CF
4. DGCF key DG
5. ADG key ADG

ADG → ABDEGCF