CMPT 354 Assignment 4

Junchen Li

301385486

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Question1:

(1) isrc→mln

It is not implied by F. According to these given functional dependencies "isrc→artist, genre", "artist→members, genre", "isrc, artist→title, album", "isrc, title, album, artist→syear", we could get the 'isrc' contain {isrc, artist, genre, members, title, album, syear} which not contain 'mln'. So it is not implied by F.

(2) isrc, rep → end

A: rep→label B: artist, label→end, rep C: isrc→artist, genre (Assumption)

1. isrc → artist (Decomposition of C)
2. artist, label → end (Decomposition of B)
3. (∵X → Y, WY → Z ∴ XW → Z) (X:rep, Y:label, W:artist, Z:end)
   rep, artist → end (Pseudo transitivity of A and 2)
4. (∵X → Y, WY → Z ∴ XW → Z) (X:isrc, Y:artist, W: rep, Z:end)
   isrc, rep → end (Pseudo transitivity of 3 and 1)

(3) label, msin, artist → inst, mfn, rep

A: artist, label → end ,rep B: msin→mln,inst C: msin,mln→msin,mfn (Assumption)

1. artist, label→ rep (Decomposition of A)
2. msin → inst (Decomposition of B)
3. msin → mln (Decomposition of B)
4. msin, mln → mfn (Decomposition of C)
5. msin → mln,msin (Augmentation of 3)
6. msin → mfn (Transitivity of 4 and 5)
7. msin → inst, mfn (Union of 6 and 2)
8. artist, label, inst, mfn → inst, mfn, rep (Argumentation of 1)
9. (∵X → Y, WY → Z ∴XW → Z) (X: msin, Y: inst, mfn, W: artist, label, Z: inst, mfn, rep)
   msin, artist, label → inst,mfn,rep (Pseudo transitivity of 7 and 8)

(4) wsin, artist → genre, royalty

It is not implied by F. According to these given functional dependencies "wsin → wfn, wln", "artist → members, genre", we could get the 'wsin, artist' constain {wsin, artist, wfn, wln, members, genre} which not contain 'royalty'. So it is not implied by F.

Question2:

(1) What is the attribute closure of (msin, wsin)?

Answer: {msin,wsin,mln,inst,wfn,wln,mfn}

(2) What is the attribute closure of (isrc, label)?

Answer: {isrc, label, artist, genre, lcity, lcountry, member, title, album, syear, end, rep}

(3) Identify a minimal superkey for the entire set of attributes, R?

Answer: The minimal superkey is {isrc, msin, label, wsin}

Question3:

Compute F_c (the canonical cover of F)

1. artist → members, genre	artist → members, genre
2. msin → mln inst	msin → mln, inst
3. msin, mln → msin ,mfn	msin, ~~mln~~ → ~~msin~~ ,mfn
4. isrc, title, album, artist → syear	isrc, ~~title~~, ~~album~~, ~~artist~~ → syear
5. isrc, artist → title, album	isrc, ~~artist~~ → title, album
6. artist, label → end, rep	artist, label → end, rep
7. rep → label	rep → label
8. label → lcity, lcountry	label → lcity, lcountry
9. isrc, wsin, title → royalty, title, album	isrc, wsin, ~~title~~ → royalty, ~~title~~, ~~album~~
10. wsin → wfn, wln	wsin → wfn, wln
11. isrc → artist, genre	isrc → artist, ~~genre~~

artist → members, genre

msin → mfn, mln, inst

isrc → title, album, syear, artist

artist, label → end ,rep

rep → label

label → lcity, lcountry

isrc, wsin → royalty

wsin → wfn, wln

Question4:

1. lossless join decomposition Yes it is satisfied
2. dependency preservation No, it is not satisfied. B/c the {artist, label → end, rep} is not preserved
3. BCNF Yes, it is satisfied
4. 3NF Yes, it is satisfied

Question5:

1. lossless join decomposition No it is not satisfied. B/c there is no join between Artist and Song, and for 'isrc', 'msin', 'wsin' only appears once in relations.
2. dependency preservation Yes, it is satisfied.
3. BCNF No, it is not satisfied. B/c Artist and Song are not in BCNF, so it is not satisfied.
4, 3NF No, it is not satisfied. B/c Artist and Song are not in 3NF. Also, there is exists a transitive dependency in Song, so it is not satisfied.

Question6:

1. Lossless join decomposition No, it is not satisfied. B/c for 'isrc', 'msin', 'wsin' only appears once in relations, and missing the relation 'Plays' as well.
2. dependency preservation Yes, it is satisfied.
3. BCNF No, it is not satisfied. B/c Publishes need do more decomposition operation, so it is not satisfied.
4. 3NF Yes, it is satisfied.