Project 5.

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1. Introduction

To change the given tables from their given format to the normal form, we used 2 sql scripts to search dependencies. We created these scripts in Assignment 10. Then from the dependencies we found, we created a new version of the tables which fit the normal from.

2. Checking for FDs and MVDs

In Assignment 10, we created 2 python scripts, which generate an sql script each. These scripts are used to find the dependencies in each table.

2.1 Checking for FDs

The following script we run for every table and every pair of elements in that table. It prints “gildir” if the dependency it checks for is present. In this example it checks if A depends on B in table R1.

```
SELECT 'Rentals: PID -- > HID' AS FD, CASE WHEN COUNT(*)=0 THEN 'GILDIR'
ELSE 'gildir ekki' END AS VALIDITY
FROM(
SELECT PID
FROM Rentals
GROUP BY PID
HAVING COUNT(DISTINCT HID) > 1
) X;
```

2.2 Checking for MVDs

The following script we run for every table and see if the keys in that table have a multi valued dependency.

```
SELECT CASE
    WHEN COUNT(*) = 0 THEN 'Rentals: PID-->HID,MAYBE MVD'
    ELSE 'Rentals: PID-->HID,NO MVD'
    END
```

```
    AS MVD
FROM (SELECT PID
    FROM Rentals
    GROUP BY PID
    HAVING (COUNT(DISTINCT HID)
        <> COUNT(*))
) X;
```

3. Normalization of Rentals

3.1 Analysis

Primary key: PID, HID
Determined FDs: PID → PN, HID → HS, HID → HZ, HID → HC, HZ → HC
Minimal cover: PIDHID → S, PID → PN, HID → HS, HID → HZ, HZ → HC
Other keys: None
Normal form: 2NF, because it has transitive dependencies.
Decomposition: Rentals_PID_HID_S, Rentals_PID_PN, Rentals_HID_HIS_HZ, Rentals_HZ_HC

3.2 Table: Rentals_PID_HID_S

Colums: PID, HID, S
Key: PID, HID
FDs: PIDHID → S
Normal forms:

- Since all FDs are the key FDs, the table is in BCNF
- Since the key has a single column, the table is in 4NF

3.3 Table: Rentals_PID_PN

Colums: PID, PN
Key: PID
FDs: PID → PN
Normal forms:

- Since all FDs are key FDs, the table is in BCNF
- Since the key has a single column, the table is in 4NF

3.4 Table: Rentals_HID_HS_HZ

Colums: HID, HS, HZ
Key: HID
FDs: HID → HS, HID → HZ
Normal forms:

- Since all FDs are key FDs, the table is BCNF
- Since the key has a single column, the table is in 4NF

3.5 Table: Rentals_HZ_HC

Colums: HZ, HC
Key: HZ
FDs: HZ → HC
Normal forms:

- Since all FDs are key FDs, the table is BCNF
- Since the key has a single column, the table is 4NF

4. Normalization of Coffees

4.1 Analysis

Primary key: DID, CID, HID
Determined FDs: DID → DN, DID → DS, CID → CN, CID → CM
Minimal cover: DIDCIDHID → DIDCIDHID, DID → DN, DID → DS, CID → CN, CID → CM
Other keys: None
Normal form: 3NF
Decomposition: Coffees_DID_DN_DS, Coffees_CID_CN_CM, Coffees_DIH_HID_CID

4.2 Coffees_DID_DN_DS

Colums: DID, DN, DS
Key: DID
FDs: DID → DN, DID → DS
Normal forms:

- Since all FDs are key FDs, the table is BCNF

- Since the key has a single column, the table is 4NF

4.3 Coffees_CID_CN_CM

Colums: CID, CN, CM
Key: CID
FDs: CID → CN, CID → CM
Normal forms:

- Since all FDs are key FDs, the table is BCNF
- Since the key has a single column, the table is 4NF

4.4 Coffees_DID_HID_CID

Colums: DID, HID, CID
Key: DIDHIDCID
FDs: DIDHIDCID → DIDHIDCID
Normal forms:

- Since all FDs are key FDs, the table is BCNF

5. Normalization of Projects

5.1 Analysis

Primary key: ID, PID, SID
Determined FDs: ID → MID, ID → MN, MID → MN, MN → MID, PID → PN, SID → SN, SN → SID
Minimal cover: IDPIDSID → IDPIDSID, ID → MID, ID → MN, PID → PN, SID → SN
Other keys: None
Normal form: 1NF
Decomposition: Projects_SID_SN, Projects_SID_SN, Projects_ID_MID_MN, Projects_ID_PID_SID

5.2 Projects_SID_SN

Colums: SID, SN
Key: SID
FDs: SID → SN
Normal forms:

- Since all FDs are key FDs, the table is BCNF

- Since the key has a single column, the table is 4NF

5.3 Projects_PID_PN

Colums: PID, PN
Key: PID
FDs: PID → PN
Normal forms:

- Since all FDs are key FDs, the table is BCNF
- Since the key has a single column, the table is 4NF

5.4 Projects_ID_MID_MN

Colums: ID, MID, MN
Key: ID
FDs: ID → MID, ID → MN
Normal forms:

- Since all FDs are key FDs, the table is BCNF
- Since the key has a single column, the table is 4NF

5.5 Projects_ID_PID_SID

Colums: ID, PID, SID
Key: IDPIDSID
FDs: IDPIDSID → IDPIDSID
Normal forms:

- Since all FDs are key FDs, the table is BCNF

6. Normalization of Customers

6.1 Analysis

Primary key: CID
Determined FDs: CID → CN, CID → CS, CID → CNr, CID → CZ, CID → CC, CID → EID, CZ → CC
Minimal cover: CID → CN, CID → CS, CID → CNr, CID → CZ, CID → CC, CID → EID,
Other keys: None
Normal form: 2NF

Decomposition: Customers_CZ_CC, Customers_CID_CN__CS_CNr_EID

6.2 Customers_CZ_CC

Colums: CZ, CC
Key: CZ
FDs: CZ → CC
Normal forms:

- Since all FDs are key FDs, the table is BCNF
- Since the key has a single column, the table is 4NF

6.3 Customers_CID_CN_CS_CNr_CZ_EID

Colums: CID, CN, CS, CNr, CZ, EID
Key: CID
FDs: CID → CN, CID → CS, CID → CNr, CID → CZ, CID → EID
Normal forms:

- Since all FDs are key FDs, the table is BCNF
- Since the key has a single column, the table is 4NF