CS2310 Exercise 4

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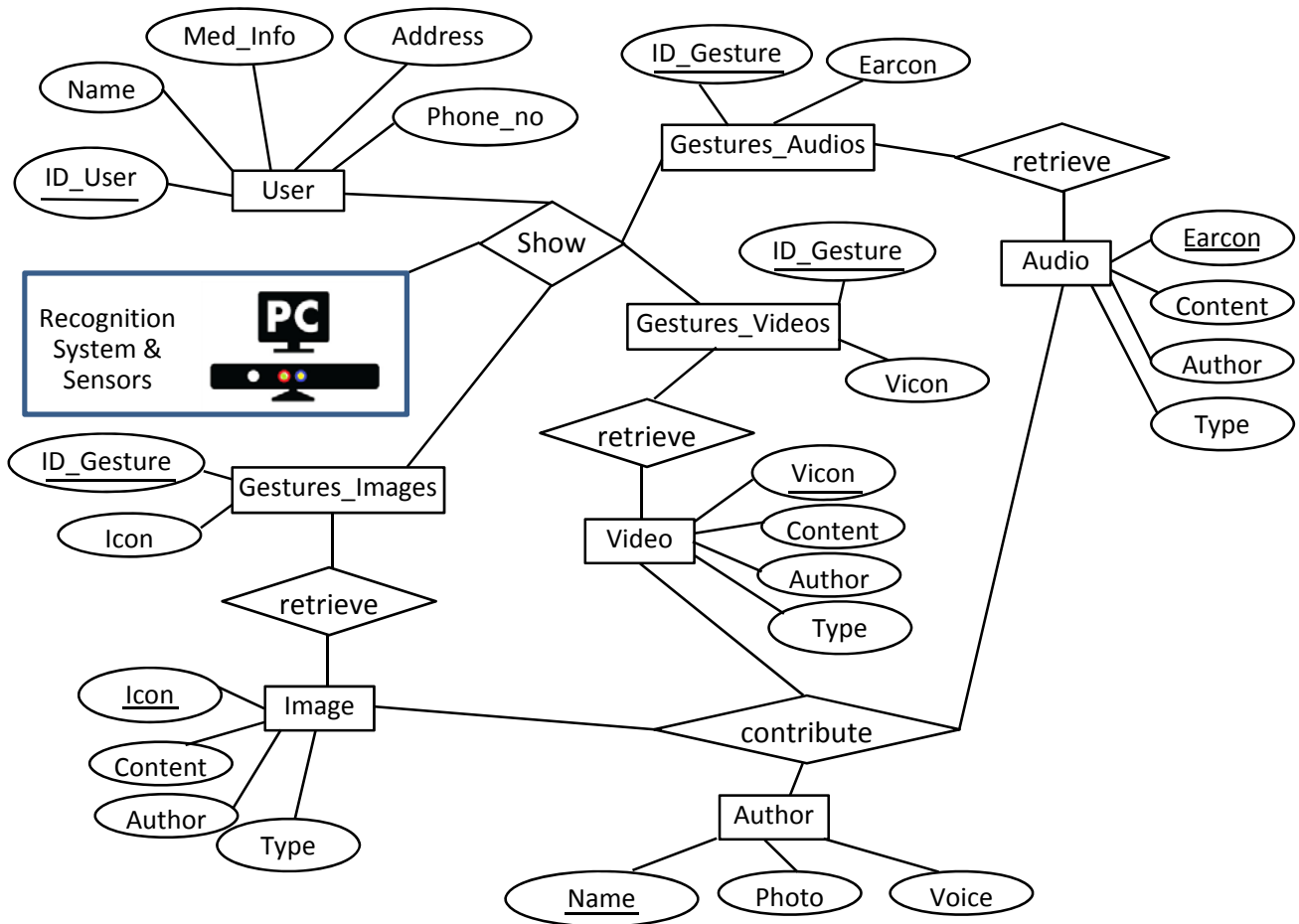**(a) The design of the multimedia database**

Figure 1: The ER diagram of the multimedia database

This multimedia application allows users use their gestures to query related multimedia documents similar to an earcon (a known audio search key), a vicon (video search key) or an icon (image search key). The recognition system can capture human gestures, extract the features of the gesture images and compare them with known patterns. After a gesture is recognized, the system will translate the gesture into an earcon, a vicon or an icon access

command and use it to search for the multimedia document which contains certain audio, video or image multimedia objects requested by the user.

For example, the user can use an earcon gesture to search for an audio contributed by a certain author in the multimedia database. After an audio (multimedia object) is chosen, the system will play it to the user. The multimedia database is normalized based on the concept of type-M functional dependency (MFD) and users can retrieve different types of personal health care multimedia documents efficiently by just showing their gestures.

(b) The tuple distance function

The multimedia relation R = {gesture, query}, where the mfd: $gesture_{g1(t1)} \rightarrow query_{g2(t2)}$ holds, the gesture can be characterized by its image features: posture, skin_color, finger_region

$g_{i=1-3}$ are composite functions and $t_{i=1-3}$ are thresholds, R can be replaced by

R1 = {gesture, query} and

R2 = { posture, skin_color, finger_region, query }, on which

mfd1: $gesture_{g1(t1)} \rightarrow$ { posture, skin_color, finger_region }$_{g3(t3)}$ and

mfd2: { posture, skin_color, finger_region }$_{g3(t3)} \rightarrow query_{g2(t2)}$ hold respectively.

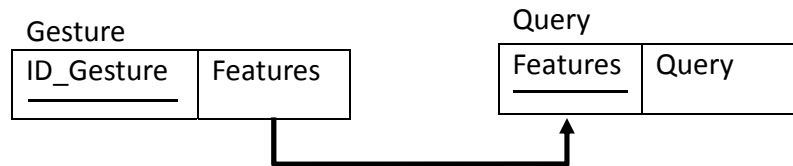Figure 2 shows the normalized relation schema.

Figure 2: The relation schema

(c) IC cards

The activities involved in the personal health care system are specified using IC cards as follows:

  i. Gesture query input
 ii. Multimedia objects retrieve
iii. Multimedia objects display
 iv. Add multimedia objects to database
  v. Delete multimedia objects from database
 vi. Update multimedia database according to refined MFDs

IC Card

IC Name: Gesture_Query_Input

Description: Translate user gestures into search commands
Interaction Pattern:

By Myself with Interaction

My Task: Recognize user gestures and translate into search command
Time Critical Condition: must finish in 10 seconds
Name of Other IC: PersnalHealthCareSystem
Message to Other IC: use command to search the multimedia database
Other IC's Task: use command to get the queried multimedia document
Card 1of 1 (If necessary please use several IC cards to describe an IC)

IC Card

IC Name: PersonalHealthCareSystem

Description: retrieve the requested multimedia document
Interaction Pattern:

By Myself with Interaction

My Task: retrieve the multimedia document according to query commands
Time Critical Condition: must finish in 15 seconds
Name of Other IC: Multimedia_Player
Message to Other IC: Play the queried multimedia document
Other IC's Task: Play the queried multimedia document
Card 1of 5 (If necessary please use several IC cards to describe an IC)

IC Card

IC Name: PersonalHealthCareSystem

Description: Play the specified multimedia document
Interaction Pattern:

By Myself no Interacton

My Task: Play the specified multimedia documents
Time Critical Condition: Must start to play the MOB in 10 seconds
Name of Other IC: None
Message to Other IC: None
Other IC's Task: None
Card 2of 5 (If necessary please use several IC cards to describe an IC)

IC Card

IC Name: PersonalHealthCareSystem

Description: Add multimedia objects to database
Interaction Pattern:

By Myself no Interacton
My Task: Add multimedia objects to database
Time Critical Condition: none
Name of Other IC: none
Message to Other IC: none
Other IC's Task: none
Card 3of 5 (If necessary please use several IC cards to describe an IC)

IC Card

IC Name: PersonalHealthCareSystem

Description: Delete multimedia objects from database
Interaction Pattern:

By Myself no Interacton
My Task: Delete multimedia objects from database
Time Critical Condition: none
Name of Other IC: None
Message to Other IC: None
Other IC's Task: None
Card 4of 5 (If necessary please use several IC cards to describe an IC)

IC Card

IC Name: PersonalHealthCareSystem

Description: Update the multimedia database according to refined MFDs
Interaction Pattern:

By Myself no Interacton
My Task: Update the multimedia database according to refined MFDs
Time Critical Condition: none
Name of Other IC: none
Message to Other IC: none
Other IC's Task: none
Card 5of 5 (If necessary please use several IC cards to describe an IC)

The associated patterns (IC cards) illustrated above together with the multimedia database can be transformed into an active index system to interact with the user and provide the inquired multimedia document. The gesture recognition IC can interpret the gesture of the user as a query command, either an individual or a set of multicons which can be customer-oriented defined and used to search for similar types of multimedia objects in the normalized multimedia database efficiently.

The tuning of the system can be carried out base on the frequency of queries and the refined multimedia functional dependencies (MFDs). The MFDs are employed to normalize the schema in database design and to embed slow intelligence into software engineering applications to achieve better performances.