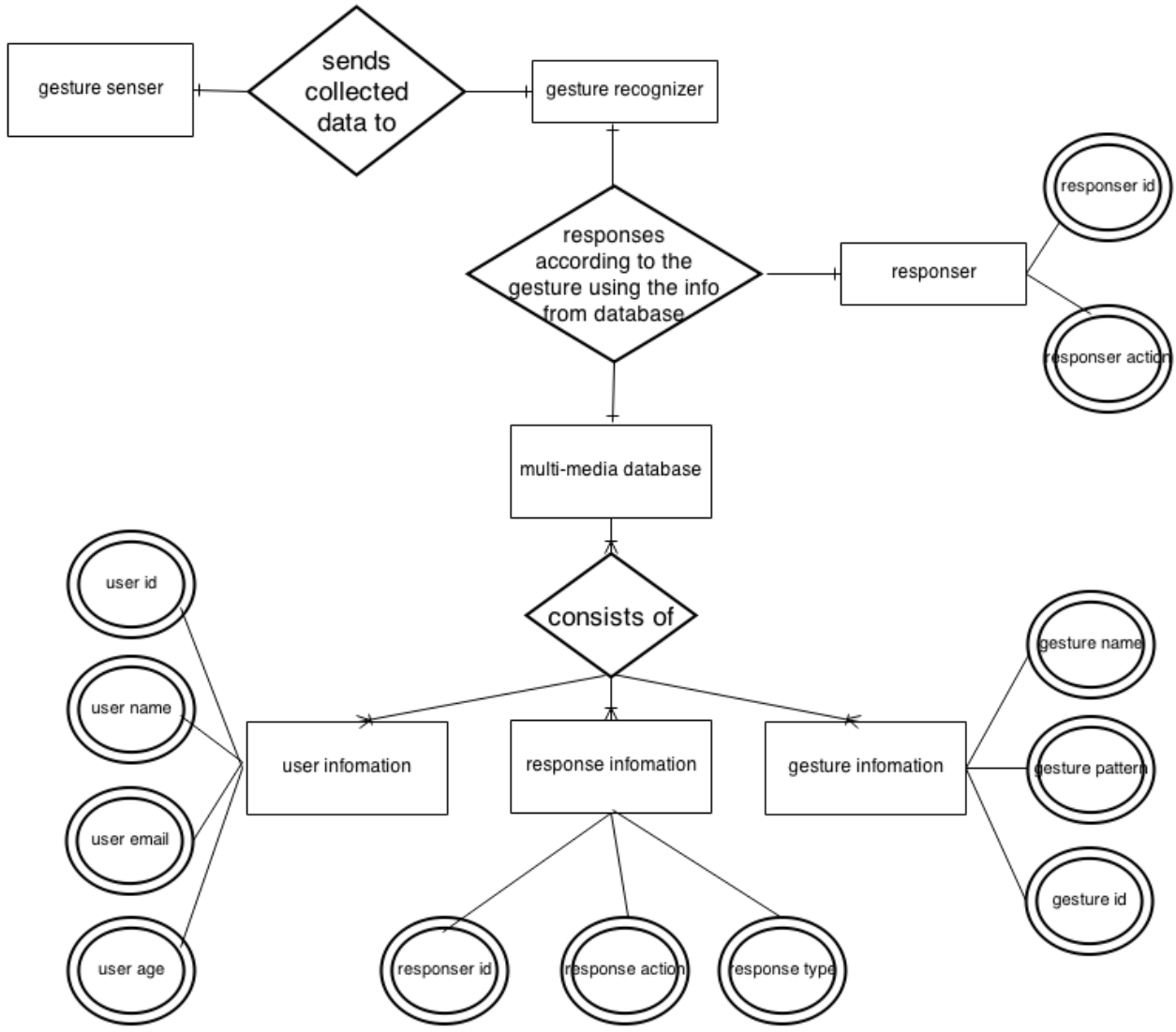
CS2310 Exercise 4: Qihang Chen (qic23@pitt.edu)

The purpose of this exercise is to apply multimedia functional dependency to multimedia applications design. Given an application (its requirements), design the multimedia database using multimedia functional dependency theory. Then specify the patterns (IC cards) associated with the multimedia database. The application is the personal health care system that allows the user (a senior citizen) to access related multimedia documents using gestures. A new classification scheme based upon the gestures associated with the multimedia documents is to be introduced. This would allow users to search for multimedia documents similar to a known audio search key (such as the voice of a certain author). Your task is to design the multimedia database and associate patterns (IC cards), which can in turn be transformed into IC index and finally an implementation. (Note: Exercise 4 is similar to previous Exercise 4, except the application was changed from distance learning to personal healthcare in 2011)

Solution:

1) **First we design the multmedia database using ER diagram as the following:**



Explanation of the above ER-diagram:
There are 6 entities in the ER-diagram: gesture senser, gesture recognizer, multimedia database, user infomation database, response infomation database, gesture infomation database.
The relationship among these entities are:
The gesture senser collectes the sensed data and send those data to the gesture recognizer. And the recognizer receives the collected data and begins matching the pattern of the data according to information in the gesture database. After analysis of the gesture with the information from the user and gesture database, the recognizer will invoke the responser using the information in the response database. The user, response and gesture database all belong to the multimedia database. In a nutshell, the
multimedia database consists of the gesture, user and response and the gesture recognizer handles the interactions among multimedia database, gesture senser and the responser

2) Multimedia Functional Dependencies:

MFD1: {Gestures ID, Gestures Pattern, Gesture Name}g1(t1) -> {Response ID, Response Type, Response Action}g2(t2)
MFD2:{Gestures ID, Gestures Pattern, Gesture Name}g1(t1) -> {User ID, User Name, User Age, User Email}g3(t3)

3) Associated IC card

IC Card IC Name: gesture senser

Description: sense a gesture and sent the igesture to the recognizer
Interaction Pattern:

○ Quiet State ○ By Myself no Interaction ◉ By Myself with Interaction ○ By Others no Interaction ○ By Others with Interaction ○ Mixed

My Task: send the collected data to the recognizer
Time Critical Condition: None
Name of Other IC: gesture recognizer
Message to Other IC: sensed data
Other IC's Task: receive the collected data
Card 1 of 1 (If necessary please use several IC cards to describe an IC)

IC Card IC Name: gesture recognizer

Description: recognize a gesture using the multimedia database

Interaction Pattern:

Quiet State	By Myself no Interaction	By Myself with Interaction	By Others no Interaction	By Others with Interaction	Mixed
○	○	◉	○	○	○

My Task: send query to the multimedia database to analyze the data

Time Critical Condition: None

Name of Other IC: multimedia database

Message to Other IC: queries containing the formated sensed data

Other IC's Task: fetch the matched multimedia data and send them back

Card 1 of 1 (If necessary please use several IC cards to describe an IC)

IC Card IC Name: multimedia database

Description: User database

Interaction Pattern:

Quiet State	By Myself no Interaction	By Myself with Interaction	By Others no Interaction	By Others with Interaction	Mixed
○	○	◉	○	○	○

My Task: receive query from the gesture recognizer to analyze the data

Time Critical Condition: None

Name of Other IC: gesture recognizer

Message to Other IC: messages containing the corresponding user info

Other IC's Task: combine the user info with the gesture info to response

Card 1 of 3 (If necessary please use several IC cards to describe an IC)

IC Card IC Name: multimedia database

Description: gesture database

Interaction Pattern:

Quiet State	By Myself no Interaction	By Myself with Interaction	By Others no Interaction	By Others with Interaction	Mixed
○	○	◉	○	○	○

My Task: receive query from the gesture recognizer to analyze the data

Time Critical Condition: None

Name of Other IC: gesture recognizer

Message to Other IC: messages containing the corresponding gesture info

Other IC's Task: combine the user info with the gesture info to response

Card 2 of 3 (If necessary please use several IC cards to describe an IC)

IC Card IC Name: multimedia database

Description: response database

Interaction Pattern:

Quiet State	By Myself no Interaction	By Myself with Interaction	By Others no Interaction	By Others with Interaction	Mixed
○	○	◉	○	○	○

My Task: receive query from the gesture recognizer to analyze the data

Time Critical Condition: None

Name of Other IC: gesture recognizer

Message to Other IC: messages containing the corresponding reaction info

Other IC's Task: use the reaction info and send it to the responser

Card 3 of 3 (If necessary please use several IC cards to describe an IC)

IC Card IC Name: responser

Description: react according to the info given by the gesture recognizer

Interaction Pattern:

Quiet State	By Myself no Interaction	By Myself with Interaction	By Others no Interaction	By Others with Interaction	Mixed
○	◉	○	○	○	○

My Task: do the required reaction

Time Critical Condition: None

Name of Other IC: gesture recognizer

Message to Other IC: none

Other IC's Task: none

Card 1 of 1 (If necessary please use several IC cards to describe an IC)