school of computing, informatics, & decision systems engineering

ASU Ira A. Fulton Schools of Engineering Arizona State University

CSE 560: Software Analysis and Design

Sport Concussion Assessment System Project

Purpose:

Students will develop an application called “Sport Concussion Assessment System” that can help sport medical practitioners monitor athletes’ conditions for symptoms of concussion. Currently, one of the most commonly-used tools for assessing concussions is the SCAT2, a paper-based diagnostic tool. The app students develop aims to help sport medical practitioners make a more timely diagnosis of concussions and avoid subsequent issues that could put the athletes’ well-being at risk. Students developing the app will get hands-on experience with topics discussed in the unit, including actors, use cases, use-case diagrams, object identification, class diagram development, and Java implementation.

Objectives:

Students will be able to:

- Elicit requirements for a software system using user scenarios and diagrams.
- Identify objects from a given scenario.
- Develop class diagrams for identified objects.
- Properly apply UML notation to develop class diagrams and use-case diagrams.
- Implement an application using Java.

Technology Requirements:

- Astah
- Java

Project Overview:

Phase I:	Eliciting requirements using use cases, use-case diagrams, and CRC diagrams.
Phase II:	Object identification and class diagram development.
Phase III:	Implementation using Java

Project Description:

Develop a software system called "Sport Concussion Assessment System," an app that helps sport medical practitioners receive and evaluate the conditions or symptoms of athletes after each game/training session for a possible concussion.

The system will have two groups of users: athletes and sport medical practitioners.
Athletes enter their health conditions or concerns based on well-defined symptoms * (Figure 1: SCAT2 Documentation) through the athlete application (ideally, this could be deployed on a smartphone or hand-held device), as well as their pain levels on a numerical scale from zero (no pain) to six (severe pain). The app should use the criteria in the table below to determine the difference in athlete symptoms between two successive games or practices and report on the athlete's condition, which the sport medical practitioner may use to advise athletes as needed.

*All symptom information required for this project is available in the right column of the first page of the Sport Concussion Assessment System Submission Document.

Basic Operation: Input symptom evaluation (twenty-two factors) after each game. Your app should then store data for the five most recent games in a suitable data structure. Athletes can see the symptoms summary for each game by selecting a symptom summary button. The symptom summary includes:

- Total number of symptoms
- Symptom severity score
- Overall rating (no difference, very different, unsure) - after comparing with the summary of the previous game

Once athlete submits his or her symptoms through the application, sports medical practitioners should be able to review the symptoms and view the "risky condition indicator" for each athlete. "Risky condition" is defined as "a dramatic change in the athlete's symptom severity in two successive games" (i.e. "very different" overall rating). The overall severity rating is used to confirm the risky condition in the athlete. Based on the "risky condition indicator," the sport medical practitioners can advise each athlete as needed.

Overall Severity Rating	**Criteria[1] comparing the last two games' symptom summaries**	**When athlete selects "Am I at Risk?" button...**
No difference:	total symptom difference < 3 && severity score < 10	Display a green image
Unsure:	total symptom difference < 3 && severity score ≥ 10	Display a yellow image
Very different:	total symptom difference ≥ 3 || severity score ≥ 15	Display a red image

[1] This is **not** the criteria doctors use. Do **not** use this for any actual diagnostic purposes.

Symptom Evaluation

How do you feel? Score yourself on the following symptoms listed below, based on how you feel now.

	none	mild		moderate			severe
Headache	0	1	2	3	4	5	6
Pressure in head	0	1	2	3	4	5	6
Neck pain	0	1	2	3	4	5	6
Nausea or vomitting	0	1	2	3	4	5	6
Dizziness	0	1	2	3	4	5	6
Blurred vision	0	1	2	3	4	5	6
Balance problems	0	1	2	3	4	5	6
Sensitivity to light	0	1	2	3	4	5	6
Sensitivity to noise	0	1	2	3	4	5	6
Feeling slowed down	0	1	2	3	4	5	6
Feeling like "in a fog"	0	1	2	3	4	5	6

	none	mild		moderate			severe
"Don't feel right"	0	1	2	3	4	5	6
Difficulty concentrating	0	1	2	3	4	5	6
Difficulty remembering	0	1	2	3	4	5	6
Fatigue or low energy	0	1	2	3	4	5	6
Confusion	0	1	2	3	4	5	6
Drowsiness	0	1	2	3	4	5	6
Trouble falling asleep	0	1	2	3	4	5	6
More emotional	0	1	2	3	4	5	6
Irritability	0	1	2	3	4	5	6
Sadness	0	1	2	3	4	5	6
Nervous or anxious	0	1	2	3	4	5	6

Results

Total number of symptoms
(*Maximum possible 22*)

Symptom severity score
(*Add all scores in table, maximum possibe: 22 x 6 = 132*)

Do the symptoms get worse with physical activity? Yes No

Do the symptoms get worse with mental activity? Yes No

Overall rating

If you know the athlete well prior to the injury, how different is the athlete acting compared to his/her usual self? *Please circle one in response*

no different | very different | unsure

Figure 1 - SCAT2 Documentation

Submission Directions for Project Deliverables

Use the Sport Concussion Assessment System Submission Document to submit Phases I and II as a **single** PDF titled “Last Name_First Name_Unit 2 Project_Phases 1 and 2_Submission”.

Submit Phase III as a **separate** zip file named “Last Name_First Name_Unit 2 Project_Phase III_Submission”.

Phase I - Directions:

Refer to the Sport Concussion Assessment System Submission Document to complete Phase I.

1. Use Astah to draw a use case diagram. When you have completed your diagram, take a clear screenshot of the diagram and include it in the Sport Concussion Assessment System Submission.
    a. Identify the actors and major use cases of the system.
    b. Draw the use-case diagram using Astah. Use proper UML notations while drawing your use-case diagram

Phase II - Directions:

Refer to the Sport Concussion Assessment System Submission Document to complete Phase II. Use as many pages as you need to complete Phase II.

1. Using the basic operation scenario given in the Sport Concussion Assessment System description, develop two major use-case descriptions for the athlete and sport medical practitioner. Include this in the Sport Concussion Assessment System Submission Document.
2. Use these use-case scenarios in question 1 in phase II to identify potential objects and create a CRC card for each object. Include this in the Sport Concussion Assessment System Submission Document.
3. Draw the UML class diagram using the identified objects using Astah. When you have completed your diagram, take a clear screenshot of the diagram and include it in the Sport Concussion Assessment System Submission Document.

Phase III - Directions:

Use Java to develop a *console application* (NO need to have a graphical user interface) that implements the functionalities described in parts A, B, and C below.

1. Save and submit your code as a zip file named “Last Name_First Name_Unit 2 Project_Phase III_Submission”.

Part A

Input symptom evaluation (twenty-two factors) after each game. The application should then store data for the five most recent games in a suitable data structure. (See Figure 2 sample interface for collecting symptom severity information from injured athletes by the system.)

Part B

Athletes can see the symptoms summary for each game by selecting the symptom summary option. The symptom summary includes:

- Total number of symptoms

Criteria[2]:

No difference:	total symptom difference < 3 && severity score < 10
Unsure:	total symptom difference < 3 && severity score ≥ 10
Very different:	total symptom difference ≥ 3 || severity score ≥ 15

- Symptom severity score
- Overall rating (no different, very different, unsure) – after comparing with the summary of the previous game. No overall rating if no previous game (i.e the first game)

Part C

Display the risky condition indicator. “Risky condition” is defined as a dramatic change in athlete’s symptoms severity in two successive games. An overall severity rating (no difference, very different, and unsure) is used to confirm the risky condition in an athlete. When the athlete selects the “Am I at Risk?” button, the athlete will be notified of his or her condition after comparing the last two games symptoms:

If no difference:	Display a green image.
If unsure:	Display a yellow image.
If very different:	Display a red image.

[2] This is **not** the criteria doctors use. Do **not** use this for any actual diagnostic purposes.

Your application should have the user interface similar to the following. You are free to make some changes needed as long as main requirements are met.

Initially, when a user run the application, the user should be prompted with the following menu.

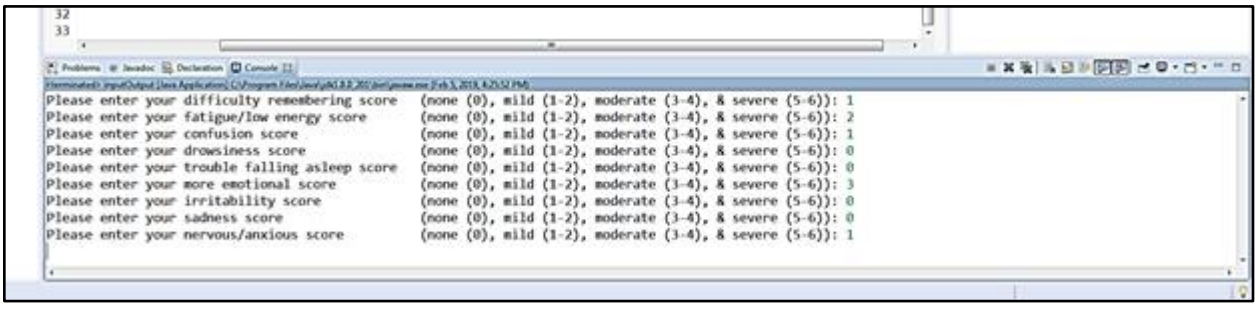
Welcome to Sport Concussion Assessment System

Please select one of the following options

1. Enter Symptoms
2. Display Symptoms Summary
3. I am I at Risk?
4. Exit

Enter your choice (1-4):

Following is an example of the UI if the user selected Option 1:



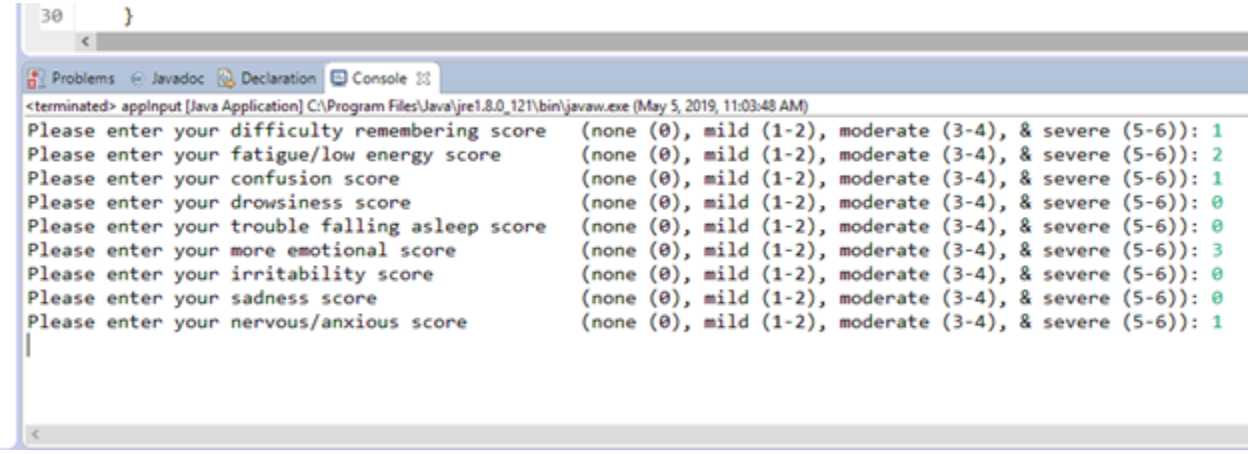


Figure 2 - sample interface for collecting symptom severity information from injured athletes by the system

Develop required UI for options 2 and 3 similarly.