
Software Requirements and Specifications

ER Tutoring System

The A-Team



University of Massachusetts Amherst

Abstract

Purpose of System:

The purpose of this system is to be an online tutor for students at the University of Massachusetts Amherst. This learning tool would help teach the students and allow them to create ER diagrams and submit them as homework assignments. They can then be graded by solutions uploaded by the instructor of a course. Feedback will then be provided to help the student learn from their mistakes. The benefits of this system is that it makes submitting learning in the course and submitting homework much easier for both the students and instructor.

Scope:

This document will clearly outline the requirements and the system requirements of ER Diagram Tutoring System. This document should cover all key concepts and fundamental requirements. The requirements should satisfy the standards of the client and provide accuracy in the functionality of the system.

CONTENTS

| | | |
|------|--|----|
| i | DIAGRAMS | 5 |
| 1 | DATA DICTIONARY | 6 |
| 2 | CONTEXT LEVEL DIAGRAM | 8 |
| 3 | LEVEL 0 DIAGRAM | 10 |
| ii | FUNCTIONAL REQUIREMENTS | 12 |
| 4 | FUNCTIONAL REQUIREMENTS | 13 |
| 4.1 | Allow Student to Draw a Diagram | 13 |
| 4.2 | Submit Answer | 14 |
| 4.3 | Allow Teacher to Create Questions/Feedback | 15 |
| 4.4 | Select Question to Answer | 16 |
| 4.5 | Student Logs In | 17 |
| 4.6 | Student Views Assignments | 17 |
| 4.7 | Student Views Question | 18 |
| 4.8 | Student Submits Answer to Question | 19 |
| 4.9 | Student Views Feedback | 19 |
| 4.10 | Author Logs In | 20 |
| 4.11 | Author Views the Question Bank | 21 |
| 4.12 | Author Adds a New Question to Question Bank | 21 |
| 4.13 | Author Edits a Question From the Question Bank | 22 |
| 4.14 | Author Removes a Question From the Question Bank | 23 |
| 4.15 | Author Views a Question | 24 |
| 4.16 | Author Copies a Question | 25 |

| | | |
|------|--|----|
| 5 | ENVIRONMENTAL REQUIREMENTS | 26 |
| 5.1 | ToolBox for Drawing Diagram | 26 |
| 5.2 | Save Progress of Current Assignment | 26 |
| 5.3 | List of Available Questions and Their Status | 27 |
| 5.4 | Open Space to Draw Diagram | 27 |
| 5.5 | Compatibility With Multiple Browsers | 27 |
| 6 | PERFORMANCE REQUIREMENTS | 28 |
| 6.1 | Correctness Analysis | 28 |
| 6.2 | Question Loading | 28 |
| 7 | SAFETY/SECURITY REQUIREMENTS | 29 |
| 7.1 | Student Navigates to the Main Page | 29 |
| 7.2 | Professor Navigates to the Main Page | 30 |
| 7.3 | Student Closes Application With Unsaved Answers in the Window | 31 |
| 7.4 | Student Submits Page with Blank Answers | 32 |
| 7.5 | Student Submits Assignment That Was Already Submitted | 32 |
| 7.6 | Student or Professor Tries to Log Into Someone Else's Account | 33 |
| 7.7 | User (Student/Instructor/Author) Correctly Logs into the Online Tutor System | 34 |
| 7.8 | User Incorrectly Logs into the Online Tutor System | 35 |
| 7.9 | User Correctly Logs out of the Online Tutor System | 36 |
| 7.10 | User Creates an Account on the Online Tutor System | 36 |
| 7.11 | User Has Unlimited Amount of Attempts to Log In | 37 |
| 8 | ACCURACY REQUIREMENTS | 39 |
| 8.1 | Student Submits Correct Diagram | 39 |
| 8.2 | Student Submits Incorrect Diagram | 40 |

| | | |
|------|--|----|
| 8.3 | Student Submits Correct Answer Diagram | 41 |
| 8.4 | Student Submits Incorrect Answer Diagram | 42 |
| 9 | PROFESSOR UI REQUIREMENTS | 44 |
| 9.1 | Professor Clicks on Side or Top Navigation Buttons | 44 |
| 9.2 | Professor Clicks on the Assignment Submission Ticker | 45 |
| 9.3 | Professor Clicks on the Class or Student Ticker | 45 |
| 9.4 | Professor Clicks to Expand the Assignment Creation Sandbox | 46 |
| 9.5 | Professor View | 47 |
| 9.6 | Create | 48 |
| 9.7 | Login | 49 |
| 9.8 | Student | 50 |
| iii | USE CASES | 51 |
| 10 | ROBUSTNESS USE CASES | 52 |
| 10.1 | Student Enters Diagram | 52 |
| 10.2 | Student Enters Variant of Incorrect Diagram | 53 |
| 10.3 | Professor or Content | 53 |
| 10.4 | Online Tutor System Should Never Crash | 54 |
| 10.5 | UI Should React Correctly to User Actions | 54 |
| 10.6 | Student Submits Variant of Correct Answer Diagram | 54 |
| 10.7 | Author Must Completely Fill Out the Question Creation Form | 56 |
| 11 | LOGIN/LOGOUT SYSTEM USE CASES | 57 |
| 11.1 | Student or professor correctly logs into the system | 57 |
| 11.2 | Student or professor incorrectly logs into the system | 58 |

11.3 Student or professor correctly logs out of the
system 59

Part I

DIAGRAMS

DATA DICTIONARY

| | | | |
|---|--|---|--|
| Student Info | Instructor Info | Author Info | Retrieve Question |
| - student ID - password | - instructor ID - password | - author ID - password | - question ID - question - assignment ID |
| Submit Answer | Send Student Score | Send Feedback | Display Class Info |
| - student ID - question ID - student answer | - student ID - instructor ID - student score | - question ID - feedback information | - class ID |
| Display Feedback | Class Info | Update Question | Create New Questions/ Answers |
| - student ID - student answer - question ID | - student ID | - question ID - question info | - question ID - question info - answer(s) info |
| Check Scores | Check Answers | Update Scores | |
| - student ID - question ID | - question ID - student ID - student answer - question answer | - student ID - question ID - student answer | |

Table 1: Data Dictionary

CONTEXT LEVEL DIAGRAM

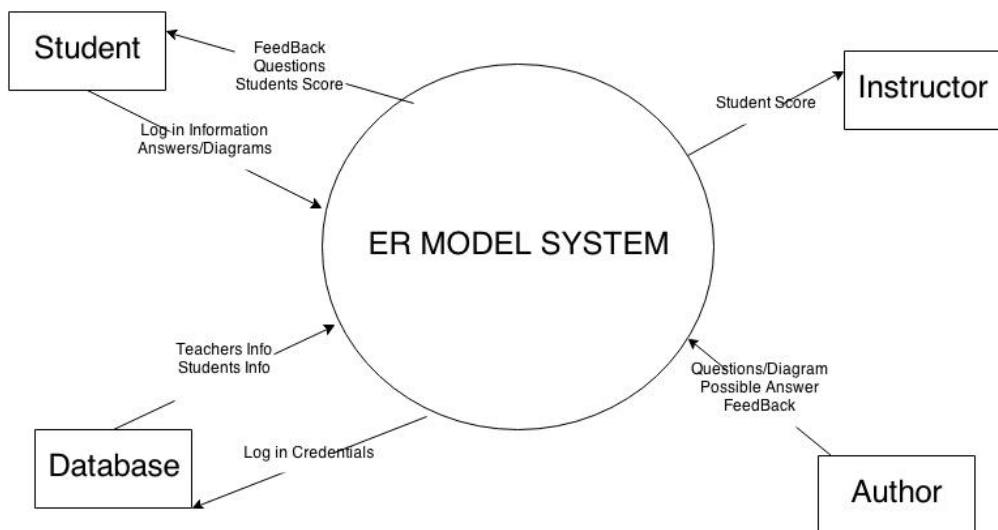


Figure 1: DFD Context Diagram

3

LEVEL o DIAGRAM

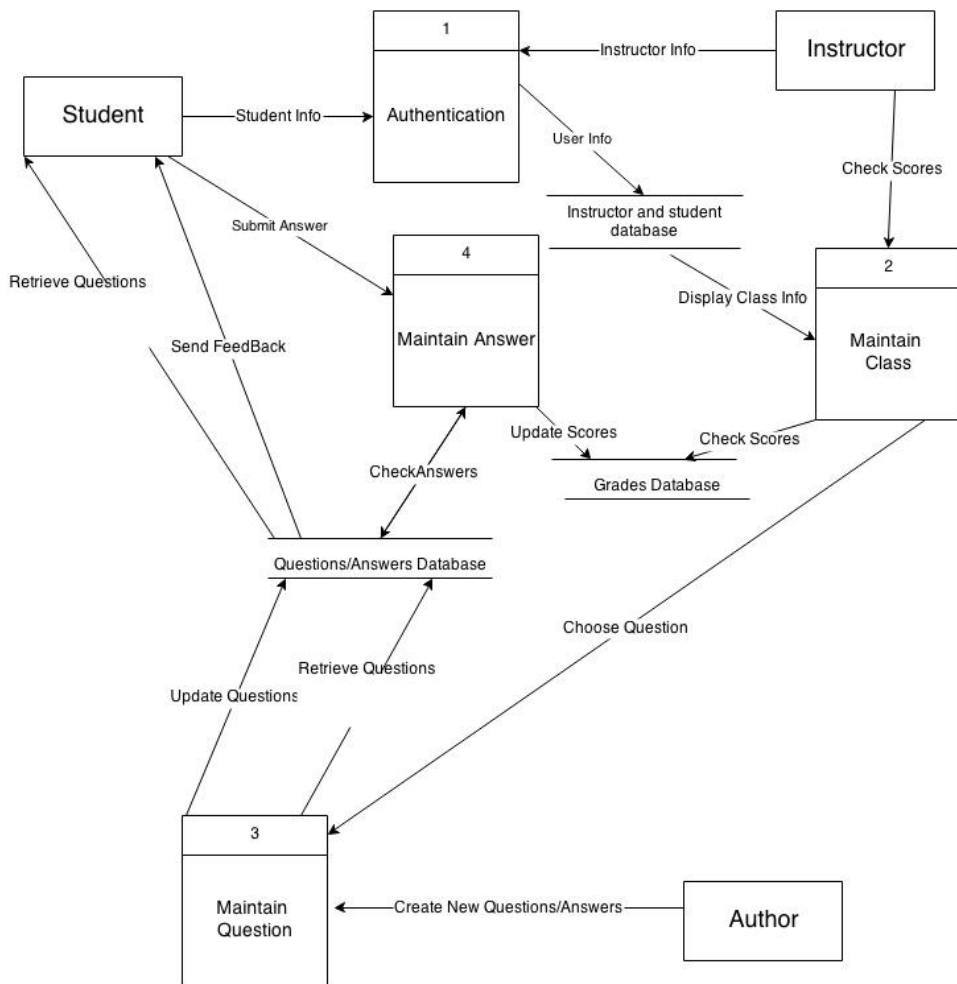


Figure 2: DFD Level 0 Diagram

Part II

FUNCTIONAL REQUIREMENTS

FUNCTIONAL REQUIREMENTS

4.1 ALLOW STUDENT TO DRAW A DIAGRAM

Description: Student given tools and space to draw an ER diagram

Primary Actor: Student

Precondition: Student is logged in and viewing a question

Trigger: Student chooses a question to work on

Success end condition: Student can submit answer

Failed end condition: Diagram is not drawn

Steps:

1. Empty space available to draw diagram
2. Student picks a diagram type (Chen's/Crow's Foot)
3. Student picks shapes from toolbox and places in diagram
4. Student places text inside shapes
5. Student places links between shapes
6. Student can edit or remove anything already placed on the diagram before finalizing

Exceptions:

- Teacher draws diagram that students must edit
*Draw space will not be empty, student will be able to make changes to present diagram

4.2 SUBMIT ANSWER

Description: Student submits answer to be checked and saved by the system

Primary Actor: Student

Precondition: Student is ready to submit answer

Trigger: Pressing the submit button

Success end condition: Feedback and/or grade is given

Failed end condition: Nothing is given back to student

Steps:

1. Student submits answer by pressing the submit button
2. System processes answer and decides validity
3. Outputs feedback and/or grade for student to see
4. Answer is saved into database

Exceptions:

- Student leaves area blank
*Answer is just marked as wrong
- Author never properly input the correct answer or feedback
*Student is told that there's nothing to report

4.3 ALLOW TEACHER TO CREATE QUESTIONS / FEEDBACK

Description: Teacher creates a question and adds it to a specific assignment

Primary Actor: Instructor

Precondition: Author is logged into the Online Tutor System.

Trigger: Author visits the page to create a question.

Success end condition: Question is created and instructors are able to see the question.

Failed end condition: Instructors aren't able to see the question.

Steps:

1. Author clicks on a "create question" button to create the question.
2. Author writes the database schema of the ER diagram that is going to be drawn by the student, in the available draw space.
3. Author provides a general feedback in a textbox provided..
4. Author writes the database schema of the ER diagram that is going to be drawn by the student, in the available draw space.
5. Author clicks on a "preview question" button to see the students view of the question.
6. Teacher clicks on a "preview" button to see the students point of view of the entire homework.

7. Author clicks on a "submit question" button to submit the question to the question bank.

Exceptions:

- Teacher tries to create question but he/she doesn't have Internet connection.

4.4 SELECT QUESTION TO ANSWER

Description: Student views a question that he would like to answer

Primary Actor: Student

Precondition: Student is logged in and is in an assignment

Trigger: The student attempts to select a new question to attempt to answer

Success End Condition: Question that the student selects successfully loads

Failed End Condition: The question that is selected does not load

Steps:

1. Student scrolls through the list of questions in the assignment.
2. Student selects the question they would like to answer from the list.
3. Webpage for the selected question loads
4. Student can read and answer question

Exceptions: None

4.5 STUDENT LOGS IN

Description: The student is logging in, in order to access the tutor system using their NetID and password.

Primary Actor: Student

Secondary Actor: System

Precondition: The student is on the login page of the system.

Trigger: The student wants to log into the tutoring system.

Successful End Condition: The student successfully logs into the tutoring system.

Failed End Condition: The student is unable to log into the system because of an incorrect NetID or password or both

Steps:

1. The student enters their NetID in the username textbox
2. The student enters their password in the password textbox
3. The student clicks on the LOGIN button to enter the system

Exceptions:

- If the student does not enter the correct NetID or password the system will not log the student in and a message will appear stating that the NetID or password that they entered is incorrect and to please try again.

4.6 STUDENT VIEWS ASSIGNMENTS

Description: Once logged in, the student can view available assignments

Primary Actor: Student

Precondition: Student is already logged in

Trigger: Student logs in

Successful End Condition: Student can view all questions in an assignment

Failed End Condition: Student is unable to see any questions in the assignment

Steps:

1. Student clicks on desired assignment
2. Student can select any of the question(s) in the assignment
3. Student can go back to home page and select any other assignment

Exceptions:

- There are no assignments available, student has nothing to view.

4.7 STUDENT VIEWS QUESTION

Description: The student views a question that is part of an assignment.

Primary Actor: Student

Secondary Actor: System

Precondition: The student is logged into the system.

Trigger: The student clicks on the question to view it.

Successful End Condition: The student views the question they have selected.

Failed End Condition: The student is unable to view the question.

Steps:

1. The student selects an assignment to view.
2. The student then selects a specific question to view.
3. The student views the question.

Exceptions: None

4.8 STUDENT SUBMITS ANSWER TO QUESTION

4.9 STUDENT VIEWS FEEDBACK

Description: After submitting the question the student is able to see the feedback that is given for the question based on if they answered the question correctly or not.

Primary Actor: Student

Secondary Actor: System

Precondition: The student has selected a question and answered the question.

Trigger: The student submits the answer to the question.

Successful End Condition: Feedback is displayed on the screen for the student to read and use to help make their answer correct if it is incorrect.

Failed End Condition: There is no feedback that gets displayed.

Steps:

1. Once the answer has been submitted the system compares it to the correct answer given.

2. If the answer is correct the question page displays the feedback that is written by the author for a correct answer such as good job or correct.
3. If the answer is incorrect the question page displays the feedback that is written by the author for an incorrect answer such as a hint or common mistake.
4. The student reads the feedback that is displayed on the screen.

Exceptions:

- The author does not enter in any feedback for correct answers so no feedback will be displayed.
- The author does not enter in any feedback for incorrect answers so no feedback will be displayed.

4.10 AUTHOR LOGS IN

Description: The author is logging in, in order to access the tutor system using their NetID and password.

Primary Actor: Author

Secondary Actor: System

Precondition: The author is on the login page of the system.

Trigger: The author wants to log into the tutoring system.

Successful End Condition: The author successfully logs into the tutoring system.

Failed End Condition: The author is unable to log into the system because of an incorrect NetID or password or both

Steps:

1. The author enters his NetID in the username textbox

2. The author enters his password in the password textbox
3. The author clicks on the LOGIN button to enter the system

Exceptions:

- If the author does not enter the correct NetID or password the system will not log the student in and a message will appear stating that the NetID or password that they entered is incorrect and to please try again.

4.11 AUTHOR VIEWS THE QUESTION BANK

4.12 AUTHOR ADDS A NEW QUESTION TO QUESTION BANK

Description: Author adds a new question to the question bank.

Primary Actor: Instructor.

Secondary Actor: System

Precondition: Author is logged into the Online Tutor System.

Trigger: The author would like to add a new question to the question bank.

Successful End Condition: A question is successfully added to the question Bank.

Failed End Condition: The question is no added to the question bank.

Steps:

1. Author goes to question bank section.
2. Author clicks on "Add" button to add a question.

3. Author input the question in a textbox.
4. Author provides the appropriate feedback to the question.
5. Author clicks on a "Submit" button.

Exceptions:

- Author submits wrong feedback.
- Internet goes offline while author was writing the question and/or feedback.

4.13 AUTHOR EDITS A QUESTION FROM THE QUESTION BANK

Description: The author wants to edit a question that is already in the question bank by changing any or all of the different parts of the question.

Primary Actor: Author

Secondary Actor: System

Precondition: The author has already created the question that wish to edit.

Trigger: The author is viewing a question that they wish to edit.

Successful End Condition: The question changes have been made and the author is prompted that their changes have been made.

Failed End Condition: The question does not get updated and the author is prompted saying that the question was not changed.

Steps:

1. The author selects the edit button.
2. The author edits the question text.
3. The author edits the question correct answer.
4. The author edits the question feedback.
5. The author saves the changes to the question and answer.

Exceptions:

- The author does not want to edit the question text so they do not edit it and leave it alone.
- The author does not want to edit the question correct answer so they do not edit it and leave it alone.
- The author does not want to edit the question feedback so they do not edit it and leave it alone.
- The author does not save the changes to the question so the changes are not saved.
- The author exits the system without saving the changes to the questions resulting in none of the changes being saved.

4.14 AUTHOR REMOVES A QUESTION FROM THE QUESTION BANK

Description: The author views the questions that have already been created and are in the question bank.

Primary Actor: Author.

Secondary Actor: System.

Precondition: Author is logged in and there are questions in the question bank.

Trigger: The author would like to remove a question from the question bank.

Successful End Condition: The question is removed.

Failed End Condition: The question is unable to be removed.

Steps:

1. The author selects the questions tab to view the question bank.
2. The author selects the specific question that they would like to remove.
3. The author presses remove question.
- 4.
- 5.

Exceptions:

- The question bank is empty and therefore the author is unable to remove any questions.

4.15 AUTHOR VIEWS A QUESTION

Description: The author views questions that have been created.

Primary Actor: Author

Secondary Actor: System

Precondition: The author is logged into the system.

Trigger: The author has created a question and would like

to view the question.

Successful End Condition: The author views the question that they would like to view.

Failed End Condition: The author is unable to view the question that they want to view.

Steps:

1. The author selects the questions tab from their view.
2. The author then scrolls through the list of questions.
3. The author then selects the question they would like to view.
4. The author then views the question.

Exceptions: None

4.16 AUTHOR COPIES A QUESTION

ENVIRONMENTAL REQUIREMENTS

5.1 TOOLBOX FOR DRAWING DIAGRAM

A ToolBox will help the student draw the diagram. The student will first select whether he wants to draw a Chen's Diagram or a Crow's Foot Diagram. The toolbox will then adjust accordingly, displaying the shapes and edges that are common to the chosen diagram. This will include squares, circles, directed edges, and tick marks (for Crow's Foot).

5.2 SAVE PROGRESS OF CURRENT ASSIGNMENT

When a student logs in, he/she should be able to start a quiz. As the student progresses through the quiz, the answers answered by the student should be saved in the student's personal database. In that way, if he/she wants to stop and continue with the quiz other time, he can do so without starting all over again.

5.3 LIST OF AVAILABLE QUESTIONS AND THEIR STATUS

While a student is answering questions, there will be a list of all the questions listed horizontally at the top of the page. Next to each question number will be a small image. The image will either be a green check mark if the question is answered correctly, a red x if the question is answered incorrectly or a black question mark if the question has not been answered yet. When the status of the question changes then so will the image next to the question number.

5.4 OPEN SPACE TO DRAW DIAGRAM

After a student selects which question they want to work on a white drawing space will be given to them in which to draw their answer. Off to the side of this space will be the toolbox which they use to do the drawing. There will also be a submit button off to the side somewhere which is what the student is to press when they're finished with their answer.

5.5 COMPATIBILITY WITH MULTIPLE BROWSERS

The program will open and be usable with all major internet browsers. Including Safari, Chrome, Firefox, Internet Explorer.

6

PERFORMANCE REQUIREMENTS

6.1 CORRECTNESS ANALYSIS

The ER diagram drawn by the student generates a database schema that will be compared with schema provided by the professor in the question. If they are equal, then the solution provided by the student is correct, otherwise is wrong. This should be done in a matter of seconds.

6.2 QUESTION LOADING

When the student selects a new question to attempt to answer the question should load within 5 seconds when the server is not busy and should load within 10 seconds when the server is busy.

SAFETY/SECURITY REQUIREMENTS

7.1 STUDENT NAVIGATES TO THE MAIN PAGE

Description: The student reaches the main page of an assignment.

Primary Actor: Student

Secondary Actor: Content author

Steps:

1. The page loads, displaying the correct questions for the assignment selected.
2. All questions load and display properly.
3. The student response areas load and allow for proper student input.

Successful Post Conditions:

- The page displayed is for the correct class and assignment.
- The student gains no access to non-student interfaces.
- The submission of answers writes only to the students record for the assignment.

Exceptional Condition:

- The student attempts to access a page he/she should not have access to - the student is displayed an appropriate warning message and is not given access to any assignment or interface that he/she is not meant to have access to.

7.2 PROFESSOR NAVIGATES TO THE MAIN PAGE

Description: The professor reaches the main page of an assignment.

Primary Actor: Professor

Secondary Actor: Content author

Steps:

1. The page loads, displaying the tools for adding or modifying an assignment and the information corresponding to student-submitted scores.
2. All questions load and display properly.
3. The content-create pallet allows for the full range of content creation.
4. The data corresponding to student submissions accurately reflects the data currently stored for each student.

Successful Post Conditions:

- The page that is displayed shows the correct class and assignment.
- The professor is shown the assignment creation and management page.

- The content changes that are made only apply to the currently selected assignment.

Exceptional Condition:

- The professor attempts to access a page he/she should not have access to - the professor is displayed an appropriate warning message and is not given access to any assignment or interface he/she is not meant to have access to.

7.3 STUDENT CLOSES APPLICATION WITH UNSAVED ANSWERS IN THE WINDOW

Description: The student has entered a response to a question without saving or submitting the assignment.

Primary Actor: Student

Secondary Actor: Professor

Steps:

1. The student enters a full or partial response to an assignment question.
2. The student does not save or submit the assignment.
3. The student closes the assignment page.

Successful Post Condition:

- The student is shown a prompt asking if he/she is sure about wanting to leave the page with unsaved responses.

7.4 STUDENT SUBMITS PAGE WITH BLANK ANSWERS

Description: The student submits an assignment with a response that was left blank.

Primary Actor: Student

Secondary Actor: Professor

Steps:

1. The student accesses the page.
2. The student inputs and saves responses to some questions.
3. The student submits the assignment with some responses that are left entirely blank.

Successful Post Condition:

- The student is presented with a prompt asking he/she is sure about wanting to submit a blank response to a question.

7.5 STUDENT SUBMITS ASSIGNMENT THAT WAS ALREADY SUBMITTED

Description: After a student submits an assignment, he/she tries to submit the same assignment again.

Primary Actor: Student

Secondary Actor: Professor

Steps:

1. The student completes an assignment.
2. The student completes the same assignment with different answers.

3. The student submits the assignment again.

Successful Post Condition:

- The student is presented with a prompt asking if the/she wants to overwrite the submitted assignment - assuming this occurs before the assignment is closed.

Exceptional Condition:

- If the submission comes after the assignment is closed, the student is informed that the assignment is closed and no subsequent submissions are allowed.

7.6 STUDENT OR PROFESSOR TRIES TO LOG INTO SOMEONE ELSE'S ACCOUNT

Description: The student or professor tries to log into the system with the NetID of another student or professor.

Primary Actors: Student, Professor

Secondary Actor: System

Steps:

1. The student or professor enters someone else's NetID into the system.
2. The student or professor enters a fake password into the system.
3. The student or professor clicks the "Login" button or the enter key.

Successful Post Conditions:

- The system prohibits the student or professor from logging into the system with a NetID and password that do not match.

- The system sends a reply that says that the login was unsuccessful.
- The system prompts the user to try entering a username and password again.

7.7 USER (STUDENT/INSTRUCTOR/AUTHOR) CORRECTLY LOGS INTO THE ONLINE TUTOR SYSTEM

Description: The user logs into the online tutor system by correctly entering his/her netID and password.

Primary Actor: User

Precondition: User navigates to the online tutor system's login web page

Trigger: User clicks the "Log In" button on the online tutor system's login web page

Successful End Condition: The user is successfully logged into his/her account and can see his/her respective homepage on the screen.

Failed End Condition: The user is brought back to the login web page and is prompted to try logging in again.

Steps:

1. The user correctly enters his/her netID.
2. The user correctly enters his/her password.
3. The user clicks the "Log In" button.

Exception:

- The online tutor system does not recognize that the user's correctly entered netID and password are associated with that user's existing account. The

user is brought back to the login web page and is prompted to try logging in again.

7.8 USER INCORRECTLY LOGS INTO THE ONLINE TUTOR SYSTEM

Description: The user logs into the online tutor system by entering an incorrect netID and/or password.

Primary Actor: User

Precondition: User navigates to the online tutor system's login web page

Trigger: User clicks the "Log In" button on the online tutor system's login web page

Successful End Condition: The user is brought back to the login web page and is prompted to try logging in again.

Failed End Condition: The user is logged into another user's account and can see that user's respective homepage on the screen.

Steps:

1. The user enters an incorrect netID.
(and/or)
2. The user enters an incorrect password.
3. The user clicks the "Log In" button.

Exception: None

7.9 USER CORRECTLY LOGS OUT OF THE ONLINE TUTOR SYSTEM

Description: The user is able to successfully log out of the online tutor system.

Primary Actor: User

Precondition: User is logged into his/her account

Trigger: User clicks the "Log Out" button on one of the online tutor system's web pages

Successful End Condition: The user's screen shows a reply from the online tutor system that says that the log out was successful.

Failed End Condition: The user's screen displays the same page that it displayed before the user clicked the "Log Out" button.

Step:

1. The user clicks the "Log Out" button.

Exception:

- The "Log Out" button does not have the functionality to successfully log the user out of his/her account. The user's screen displays the same page that it displayed before the user clicked the "Log Out" button.

7.10 USER CREATES AN ACCOUNT ON THE ONLINE TUTOR SYSTEM

Description: The user is able to successfully create an account on the online tutor system.

Primary Actor: User

Precondition: User navigates to the online tutor system's login web page

Trigger: User clicks the "Create" button on the online tutor system's create account web page

Successful End Condition: The user's screen shows a reply from the system that says that his/her account was successfully created, and the user's respective homepage is displayed on the screen.

Failed End Condition: The user receives a reply from the online tutor system that says that the account could not be created.

Steps:

1. The user clicks the "Create Account" button on the online tutor system's login web page.
2. The user correctly enters his/her netID.
3. The user correctly enters his/her password.
4. The user clicks the "Create" button.

Exception:

- The user's entered netID and/or password is not recognized by the online tutor system as pertaining to an existing student of the respective university or college. The user receives a reply from the online tutor system that says that the account could not be created.

7.11 USER HAS UNLIMITED AMOUNT OF ATTEMPTS TO LOG IN

Description: Each user is given a certain (preset) amount of failed login attempts in a given (preset) amount of time to

log into the online tutoring system on a particular device. After a user has used up all of his/her failed login attempts on a particular device, that device will be prevented from logging into the system by that user or any other users until a certain (preset) amount of time has passed. This method is act of security to prevent users from hacking into other users's accounts.

ACCURACY REQUIREMENTS

8.1 STUDENT SUBMITS CORRECT DIAGRAM

Description: The student answers a question by submitting the correct diagram.

Primary Actors: Student, System

Secondary Actor: Professor

Successful Post Condition: The system marks the student's answer to the question as correct.

Steps:

1. The student enters a diagram as an answer to a question.
2. The system compares that diagram to the correct diagram that was uploaded by the professor.
3. The system recognizes that the diagram submitted matches the diagram that was uploaded by the professor.

Exceptional Conditions:

- The student is unable to submit a diagram as an answer to a question.

- The system cannot process the student's submitted diagram so that it can be compared to the professor's uploaded answer.
- The system cannot send the student a response that says if his/her diagram was correct or incorrect.

8.2 STUDENT SUBMITS INCORRECT DIAGRAM

Description: The student answers a question by submitting an incorrect diagram.

Primary Actors: Student, System

Secondary Actor: Professor

Successful Post Condition: The system marks the student's answer to the question as incorrect.

Steps:

1. The student enters a diagram as an answer to a question.
2. The system compares that diagram to the correct diagram that was uploaded by the professor.
3. The system recognizes that the diagram submitted matches the diagram that was uploaded by the professor.

Exceptional Conditions:

- The student is unable to submit a diagram as an answer to a question.
- The system cannot process the student's submitted diagram so that it can be compared to the professor's uploaded answer.

- The system cannot send the student a response that says if his/her diagram was correct or incorrect.

8.3 STUDENT SUBMITS CORRECT ANSWER DIAGRAM

Description: The student answers an assignment question by submitting the correct diagram.

Primary Actor: Student

Precondition: Student is logged into the system and has placed a diagram in a question answer box for an assignment

Trigger: Student submits the assignment

Successful End Condition: The student's question is marked correct.

Failed End Condition: The student's question is marked incorrect.

Steps:

1. The student answers an assignment question by putting a diagram in the answer box for that question.
2. The student submits the assignment.
3. The online tutoring system checks the student's diagram against the author's previously uploaded answer diagram.
4. The online tutoring system recognizes that the two diagrams are a match.

Exceptions:

- The student is unable to submit a diagram as an answer to a question. The student's question is marked incorrect.

- The online tutoring system is unable process the student's submitted diagram so that it can be compared to the author's uploaded answer. The student's question is marked "Incorrect."

8.4 STUDENT SUBMITS INCORRECT ANSWER DIAGRAM

Description: The student answers an assignment question by submitting an incorrect diagram. Primary Actor: Student Precondition: Student is logged into the system and has placed a diagram in a question answer box for an assignment Trigger: Student submits the assignment Successful End Condition: The student's question is marked "Incorrect." Failed End Condition: The student's question is marked "Correct." Steps:

1. The student answers an assignment question by putting a diagram in the answer box for that question.
2. The student submits the assignment.
3. The online tutoring system checks the student's diagram against the author's previously uploaded answer diagram.
4. The online tutoring system recognizes that the two diagrams are not a match.

Exceptions:

- The student is unable to submit a diagram as an answer to a question. The student's question is marked "Incorrect."

- The online tutoring system is unable process the student's submitted diagram so that it can be compared to the author's uploaded answer. The student's question is marked as incorrect.

PROFESSOR UI REQUIREMENTS

9.1 PROFESSOR CLICKS ON SIDE OR TOP NAVIGATION BUTTONS

Description: While on any page containing navigation links in the side or top bars, the professor clicks on a nav link

Primary Actors: Professor

Steps:

1. The professor is logged into any of the main pages containing nav links
2. The professor clicks on any link

Successful Post Conditions:

- The professor is directed to the page intended by the link

Exceptional Condition:

- The professor is already on the page of the link they are clicking - nothing happens and the page does not change.

9.2 PROFESSOR CLICKS ON THE ASSIGNMENT SUBMISSION TICKER

Description: From the main landing page the professor clicks on the assignment submission ticker

Primary Actor: Professor

Steps:

1. The professor is on the main page after login
2. The professor clicks on the Assignment Submission Ticker Pane

Successful Post Condition:

- The professor is redirected to a larger detailed view with a time directed log of student submission stats for assignments the professor has created, or is linked to through class ownership

Exceptional Post Condition:

- The professor has no submissions in his feed - he is directed to the log but is not shown any information

9.3 PROFESSOR CLICKS ON THE CLASS OR STUDENT TICKER

Description: From the main landing page the professor clicks on enrolled student/ class ticker pane

Primary Actor: Professor

Steps:

1. The professor is on the main page after login
2. The professor clicks on the enrolled student/ class ticker pane

Successful Post Condition:

- The professor is redirected to a larger detailed view with the option to sort by class or student name to display stats pertaining to course enrollment and individual student assignment histories

9.4 PROFESSOR CLICKS TO EXPAND THE ASSIGNMENT CREATION SANDBOX

Primary Actor: Professor

Steps:

1. The professor is on the main page after login
2. The professor clicks to expand the assignment creation sandbox

Successful Post Condition:

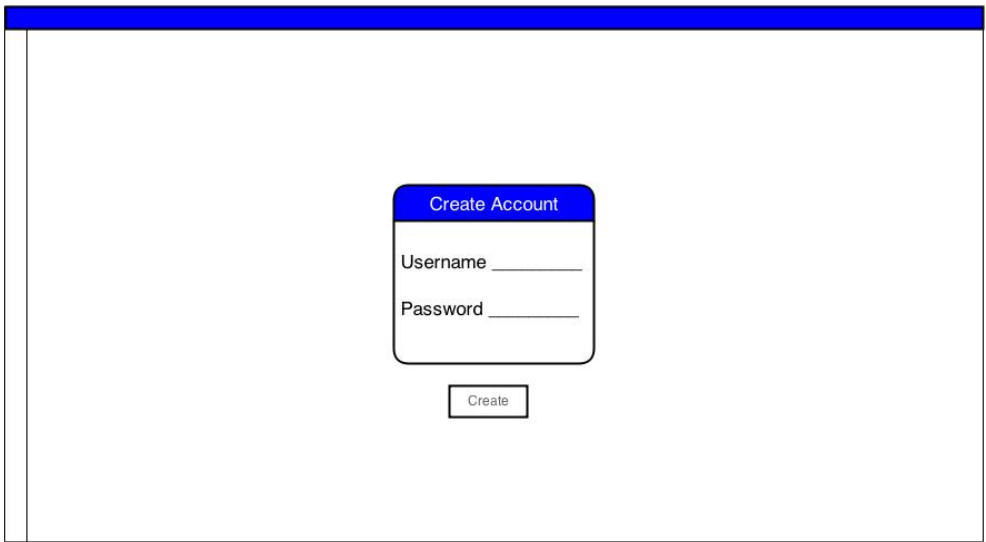
- The professor is taken to the assignment creation page and any potential diagrams or questions created in the sandbox are stored and transferred to the assignment creation window

9.5 PROFESSOR VIEW

| | | | | | | |
|------------------------|------------------------------|------------|-------------------------|------------|--------------|------------|
| | Navigation | Navigation | Navigation | Navigation | Navigation | Navigation |
| Account Administration | Assignment Submission Ticker | | | | | |
| Class Listing | | | | | | |
| Assignment Listing | Assignment Creation Pallet | | Enrolled Student Ticker | | Class Ticker | |
| Student Directory | | | | | | |
| Create New Assignment | | | | | | |
| Modify Assignment | | | | | | |
| Logout | | | | | | |

Figure 3: Professor’s User Interface

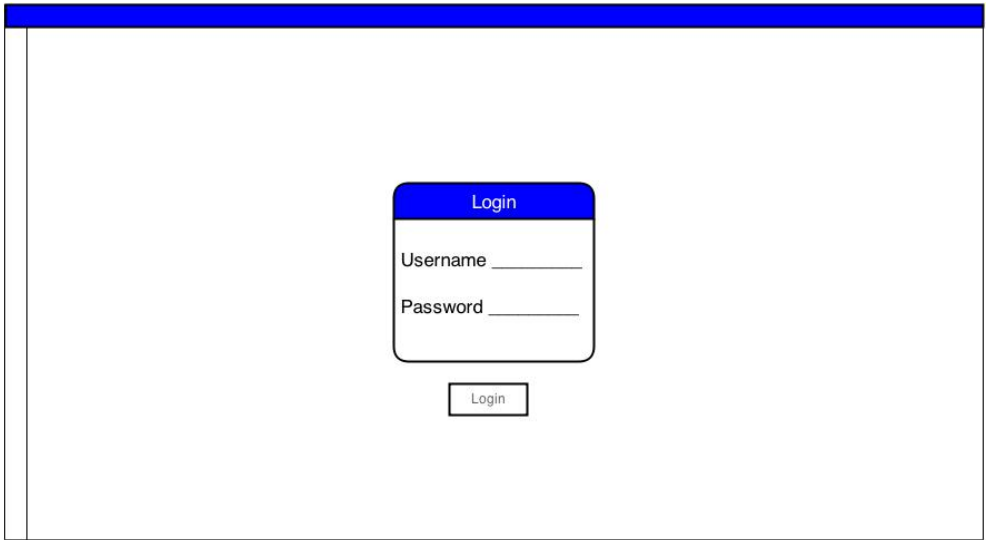
9.6 CREATE



The image shows a web browser window with a blue header bar. In the center of the page is a 'Create Account' form. The form has a blue title bar with the text 'Create Account'. Below the title bar are two input fields: 'Username' and 'Password', each followed by a horizontal line for text entry. Below the input fields is a rectangular button labeled 'Create'.

Figure 4: User Interface to create question

9.7 LOGIN



The diagram illustrates a login user interface within a browser window. The window has a blue title bar at the top. Inside, a central login form is displayed. The form has a blue header with the text "Login". Below the header, there are two input fields: "Username" and "Password", each followed by a horizontal line for text entry. At the bottom of the form is a rectangular button labeled "Login".

Figure 5: Login User Interface

9.8 STUDENT

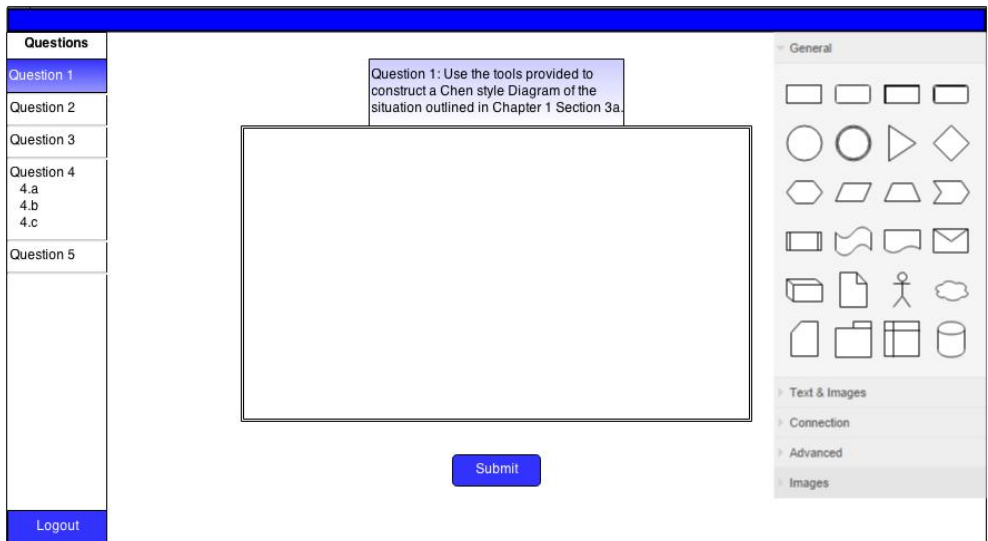


Figure 6: User Interface for the student

Part III

USE CASES

ROBUSTNESS USE CASES

10.1 STUDENT ENTERS DIAGRAM

Description: The student submits a diagram in either Chen or CF that is correct but is not the same as the instructor's.

Primary Actors: Student, System

Secondary Actor: Professor

Successful Post Condition: The system marks the student correct.

Steps:

1. The student enters a diagram into the system.
2. The system checks the diagram against the professor-submitted diagram(s).

Exceptional Conditions:

- The student is unable to submit a diagram as an answer to a question.
- The system cannot process the student's submitted diagram so that it can be compared to the professor's uploaded answer.
- The system cannot send the student a response that says if his/her diagram was correct or incorrect.

10.2 STUDENT ENTERS VARIANT OF INCORRECT DIAGRAM

Description: The student submits a diagram in either Chen or CF that is incorrect.

Primary Actors: Student, System

Secondary Actor: Professor

Successful Post Condition: The system marks the student incorrect.

Steps:

1. The student enters a diagram into the system.
2. The system checks the diagram against the professor-submitted diagram(s).

Exceptional Conditions:

- The student is unable to submit a diagram as an answer to a question.
- The system cannot process the student's submitted diagram so that it can be compared to the professor's uploaded answer.
- The system cannot send the student a response that says if his/her diagram was correct or incorrect.

10.3 PROFESSOR OR CONTENT

Author enters unspecified answer format

Description: The professor or content author enters an answer into the system without specifying a format.

Primary Actor: Professor (or Content Author)

Secondary Actor: System

Successful Post Condition: The system sends a prompt to the professor specifying that the answer was not recorded in the system and that he/she must submit an answer format.

Steps:

1. The professor submits an answer into the system.
2. The system recognizes that the professor did not submit an answer format.

10.4 ONLINE TUTOR SYSTEM SHOULD NEVER CRASH

Description: Nothing any user does should crash the web browser. The online tutor system may reach an exception when performing a specific task, but it will never crash the user's browser or machine. Each online tutor system task exception should be handled.

10.5 UI SHOULD REACT CORRECTLY TO USER ACTIONS

Description: The UI should correctly react to what the user's actions command. If a specific user action was not accounted for when the UI was created (the UI does not have the ability to make a response to that action) the online tutor system will reach an exception and that exception should be handled by the UI remaining in its current state.

10.6 STUDENT SUBMITS VARIANT OF CORRECT ANSWER DIAGRAM

Description: The student answers an assignment question with a diagram that is correct, but is not exactly the same

as the author's answer diagram.

Primary Actor: Student

Precondition: Student is logged into the system and has placed a diagram in a question answer box for an assignment

Trigger: Student submits the assignment

Successful End Condition: The student's question is marked "Correct."

Failed End Condition: The student's question is marked "Incorrect."

Steps:

1. The student answers an assignment question by putting a diagram in the answer box for that question.
2. The student submits the assignment.
3. The online tutoring system checks the student's diagram against the author's previously uploaded answer diagram.
4. The online tutoring system recognizes that the two diagrams are alike, but are not exactly the same.

Exceptions:

- The student is unable to submit a diagram as an answer to a question. The student's question is marked "Incorrect."
- The online tutoring system is unable to process the student's submitted diagram so that it can be compared to the author's uploaded answer. The student's question is marked "Incorrect."

10.7 AUTHOR MUST COMPLETELY FILL OUT THE QUESTION CREATION FORM

Description: When an author is in the process of creating a question, he/she must completely fill out a question creation form for that question. This question creation form includes the question, which specifies the format that the answer diagram should have, and the answer diagram(s) for that question. If the author presses the form's "Submit" button before it is complete, the online tutoring system will continue to display the question creation form and highlight the fields that have not yet been completed.

LOGIN/LOGOUT SYSTEM USE CASES

11.1 STUDENT OR PROFESSOR CORRECTLY LOGS INTO THE SYSTEM

Description: The student or professor logs into the system with the correct username and password.

Primary Actors: Student, Professor

Secondary Actor: System

Steps:

1. The student or professor enters his/her correct NetID as a username.
2. The student or professor enters his/her correct password.
3. The student or professor clicks the "Login" button or the enter key.

Successful Post Condition:

- The student or professor is successfully logged into his/her account on the system and can see his/her homepage on the screen.

Exceptional Condition:

- The system does not recognize that the correctly entered username and password are associated with an existing account.

11.2 STUDENT OR PROFESSOR INCORRECTLY LOGS INTO THE SYSTEM

Description: The student or professor logs into the system with an incorrect username and/or password.

Primary Actors: Student, Professor

Secondary Actor: System

Steps:

1. The student or professor enters an incorrect NetID as a username. and/or
2. The student or professor enters an incorrect password.
3. The student or professor clicks the "Login" button or the enter key.

Successful Post Conditions:

- The system prohibits the student or professor from logging into the system with a NetID and password that do not match.
- The system sends a reply that says that the login was unsuccessful.
- The system prompts the user to try entering a username and password again.

11.3 STUDENT OR PROFESSOR CORRECTLY LOGS OUT OF THE SYSTEM

Description: The student or professor is able to successfully log out of the system.

Primary Actors: Student, Professor

Secondary Actor: System

Steps:

- The student or professor clicks the “Log Out” button.
- Successful Post Condition:
- The student or professor receives a reply from the system that says that the log out was successful.

Exceptional Condition:

- The “Logout” button does not have the functionality to successfully log out the student or professor.