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Assignment A8 – Model Based Testing

Software Quality, Academic Year 2023-2024, University of Milan – Bicocca

Considering the following specification, represent it with a state machine model and generate test cases to satisfy the transition coverage test criterion. Each test case shall be an execution that starts with the connection to the exam web site and terminates with a log out event.

Upon connecting to the exam web site students are shown a login dialog, where they must input their credentials and then press the "login" button. If the provided credentials are not correct, the system outputs an error message and shows the login dialog again. If the credential are correct, but the system determines that the password is expired, it outputs a message to contact the administrator, and then shows the login dialog again. Otherwise, it shows the student dashboard with the list of the available exams. From the dashboard, students can click "edit profile", which brings them to a page to edit their profile data, from which they can get back to the dashboard when they press "done". Or (from the dashboard) they can click "Available results", which brings them to a report of all results of any exam already taken, from which they can get back to the dashboard when they press "done". Or (from the dashboard) they can click "take exam" for an available exam, which leads them to a page where they can answer the questions of the exam. From there, when they click "finish", they get redirected to the report of the results (same as above) where they will also find the results of the exam just taken. Since exams are associated with a maximum time, if the maximum time expires, they can be redirected to the report as well. Finally, from the dashboard, they can exit the system at any time by clicking "logout", and from any page (but the "take exam" page) they can be automatically logged out if the session expires.

Here is the finite state model which represents the given specification:
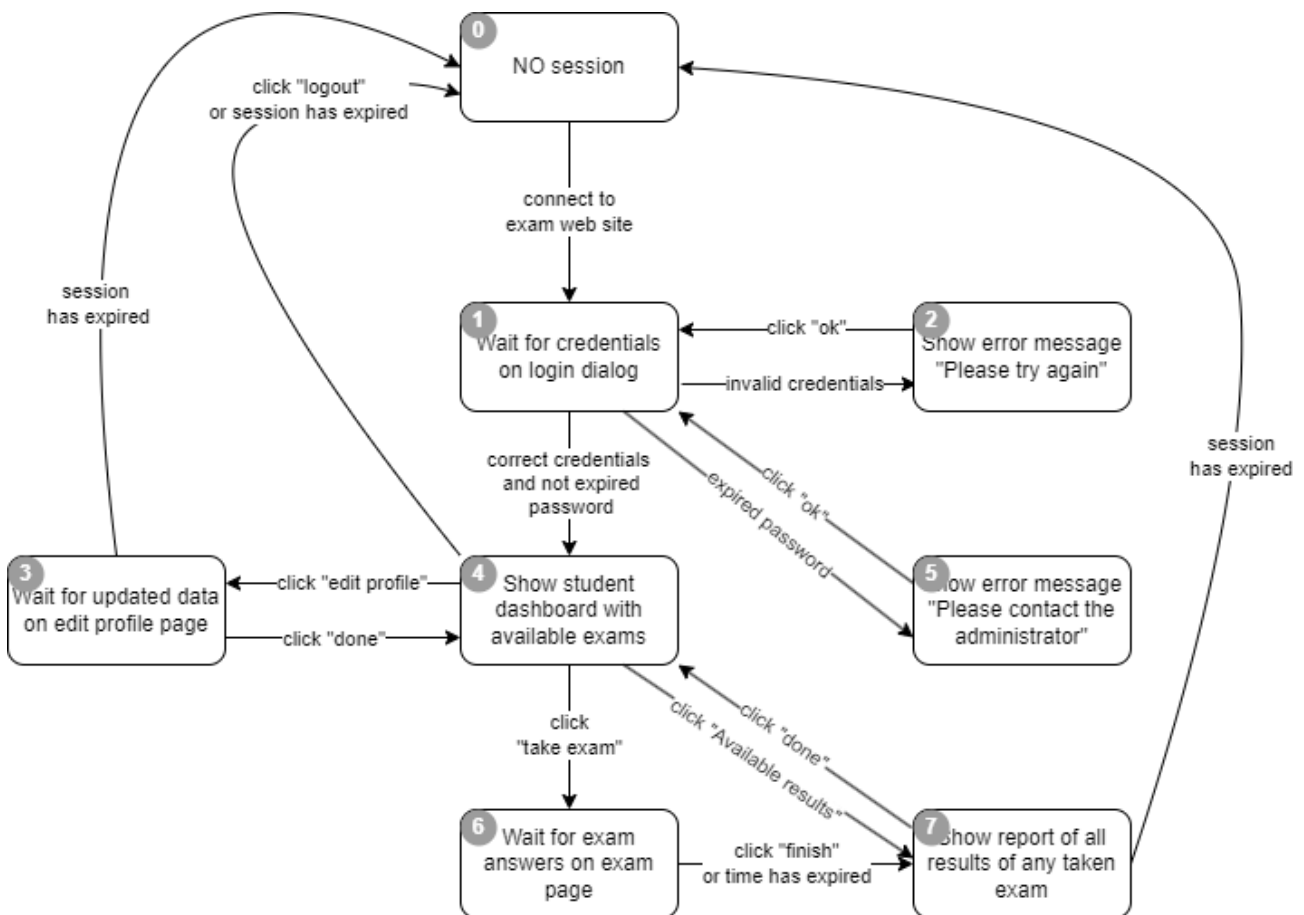
The transition coverage criterion requires **each transition** in the finite state model to be traversed **at least once**. We can generate test cases which satisfy this criterion, from the connection to the web site to a log out event:

- 0 – 1 – 2 – 1 – 5 – 1 – 4 – 6 – 7 – 4 – 7 - 0
- 0 – 1 – 4 - 0
- 0 – 1 – 4 – 3 – 4 – 3 - 0

We can now provide an explanation of the states and of the transitions, to understand how the model works.

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State NO session (0)

At the beginning, there is no active session: the student must connect to the exam web site (transition **connect to exam web site**).

State Wait for credentials on login dialog (1)

After connecting to the web site, the student is shown a login dialog which requires him/her to input his/her credentials. From this state we have 3 possible scenarios, after pressing the "login" button:

- The credentials are invalid (transition **invalid credentials**): we go to the state **Show error message "Please try again"**
- The credentials are correct but the provided password is expired (transition **expired password**): we go to the state **Show error message "Please contact the administrator"**
- The credentials are correct and a not expired password is provided (transition **correct credentials and not expired password**): we go to the state **Show student dashboard with available exams**

State Show error message "Please try again" (2)

The provided credentials are not correct: the system shows an error message saying to try again, then the student presses "ok" (transition **click "ok"**, not explicitly written in the specification) and is shown the login dialog again.

State Show error message "Please contact the administrator" (5)

The provided credentials are correct, but the system determined that the password is expired: it shows an error message saying the contact the administrator, then the student presses "ok" (transition **click "ok"**, not explicitly written in the specification) and is shown the login dialog again.

State Show student dashboard with available exams (4)

The provided credentials are correct and the password is not expired: the system shows the student dashboard with the list of the available exams. From this state we have 4 possible scenarios:

- The student clicks "edit profile" (transition **click "edit profile"**): we go to the state **Wait for updated data on edit profile page**
- The student clicks "Available results" (transition **click "Available results"**): we go to the state **Show report of all results of any taken exam**
- The student clicks "take exam" for an available exam (transition **click "take exam"**): we go to the state **Wait for exam answers on exam page**
- The student clicks "logout" or the session expires (transition **click "logout" or session has expired**): we go back to the state **NO session**

State Wait for updated data on edit profile page (3)

The student is brought to a page where he/she can edit his/her profile data, then he/she can press "done" when finished, to go back to the dashboard (transition **click "done"**).
We also have another possible scenario: in case the session expires, the student is automatically logged out (transition **session has expired**).

State Show report of all results of any taken exam (7)

The student is brought to a page where he/she can view a report of all results of any exam (already taken), then he/she can press "done" when finished, to go back to the dashboard (transition **click "done"**).
We also have another possible scenario: in case the session expires, the student is automatically logged out (transition **session has expired**).

State Wait for exam answers on exam page (6)

The student is brought to a page where he/she can answer the questions of the exam, then, when he/she presses "finish" or the exam's associated maximum time expires (transition **click "finish" or time has expired**), he/she gets redirected to the report of the results where he/she will also find the results of the exam just taken.