
LINGI2255

Software Development Project

Specifications & Requirements - Team 06

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1 Module's description

For the moment the questions are created manually by the professor. To increase the number of questions available for a given skill, we want to give the possibility for a professor to create/solve a large sample of questions based on typical problems. And for the students to efficiently train given skills by exercising on a large set of different problems.

It means that first the professor has to create a generic question, for example: $ax^2 + bx + c$ for an equation of the second degree. Then from this generic question we will provide an automatic creation of precise question with multiple values for a, b and c belonging to natural, integer or rational. We also want to provide some control the domain of the question and answer either integer, rational, complex ...

We also need to implement a solver for each type of questions. The solver should be able to give the students the solution and eventually the resolution step by step of the problem. So that the students knows if he provide the correct answer and can understand his mistake if he has done some. When he is training a given skills.

For some problems involving geometrical figures, we would like to implement visualization fonctionnalités for the student.

These fonctionnalités would take the randomized parameters and display the related figures on the student test.

For more advanced shapes or 3D shapes, the visualization fonctionnalités would provide multiple points of view of these shapes, enabling the best understanding of the shape by the student.

2 User stories

The number before each use story is the value coming from the planning poker session.

1. 5 :
As a teacher
I want to be able to set the domain of a problem
In order to let the question creation fonctionnalités use this domain for random parameters
2. 13 :
As a teacher
I want to have, for each assignement topic, a fonctionnalité to create a related problem based on random values
In order to not having to type specific values each time.
3. 8 :
As a teacher
I want a fonctionnalité to create multiple 2nd degree equations from random values to be solved by students
In order to not having to manually type the parameters
4. 3 :
As a teacher
I want to be allowed to specify rational, integer or natural answers and parameters for the 2nd degree equations problems
In order to allow the fonctionnalité to use random parameters of different domain types
5. 3 :
As a teacher
I want a fonctionnalité to create random triangle on which the student will have to compute the perimeter
In order to not having to manually create a triangle for the exercice

6. 3 :
As a teacher
I want to be able to choose how the student should resolve a question, if there are multiple ways to find the answer (e.g. find a triangle's perimeter)
In order to evaluate a specific skill
7. 3 :
As a teacher
I want a fonctionnality to create a random triangle on which the student will have to compute the area
In order to not having to manually create a set of triangles
8. 2 :
As a teacher
I want a fonctionnality to create a random circle on which the student will have to compute the area
In order to not having to manually create the circles
9. 2 :
As a teacher
I want a fonctionnality to create a random quadrilateral/rhombus/square/rectangle/parallelogram/trapezium on which the student will have to compute the perimeter
In order to not having to create them manually
10. 2 :
As a teacher
I want a fonctionnality to create a random quadrilateral/rhombus/square/rectangle/parallelogram/trapezium on which the student will have to compute the area
In order to not having to create them manually
11. 3 :
As a teacher
I want a fonctionnality to create a random regular polygon ($n=5$ to 10) on which the student will have to compute the perimeter
In order to not having to create the polygon manually
12. 3 :
As a teacher
I want a fonctionnality to create a random regular polygon ($n=5$ to 10) on which the student will have to compute the area
In order to not having to create the polygon manually
13. 2 :
As a teacher
I want a fonctionnality to create a random problem where the student will have to find the length of the side of a triangle (using Pythagoras theorem)
In order to not having to create multiple questions manually
14. 5 :
As a teacher
I want a fonctionnality to create a random statistical data on which the student will have to compute characteristic values (one characteristic value for one question)
In order to not having to create them manually

15. 2 :
As a teacher
I want a fonctionnality to create a random problem where the student will have to compute the simple interest
In order to not having to manually create that kind of problem
16. 3 :
As a teacher
I want a fonctionnality to create a question about compound interest from random values
In order to not having to manually type the parameters of each compound interest problem.
17. 13 :
As a teacher
I want to have a functionality to select a kind of object (cylinder, cone, prism, pyramid) and create that object from random values to be included in the assignement

3 Scenarios

3.1 Assessment for geometry skills

1. Professor Layton wants to assess his students about basic geometric skills.
2. Layton decides to test his students with perimeter and area calculus of triangles (non right-angled).
3. Layton logs in, reach his class management page and access the assessment creation page.
4. Layton select the skills for area and perimeter calculus of non right-angled triangles.
5. Layton creates the assessment.
6. Questions have been generated with random values (not leading to extreme shapes of triangle).
7. Layton chose to regenerate some of the questions that not fit its tastes.
8. Layton finalize the test creation, his students can now do it online.

3.2 Roots of polynomial assessment

1. Professor Oak decides that the time has come to test his students on determining the roots of a polynomial.
2. Oak logs in, reach his class management page and access the assessment creation page.
3. Oak select the said skill in the selection option.
4. Oak creates the assessment.
5. Oak is now on the assessment modification page.
6. Oak chose the type of parameters and answer for the questions related to root calculus.
7. Oak generate a polynomial and an expected answer with those parameters
8. Oak validates the test, students can do the assessment online.

3.3 Assessment for students

1. Student Sasha has to do the assessment given by teacher Oak.
2. Sasha logs in, reach Assessment section.
3. Sasha arrives in a Assessment page.
4. Sasha answers at all the exercices given
5. Sasha has finished and leave the assessement.

3.4 Training for students

1. Student Sasha wants to train her skills in a given subject.
2. Sasha logs in, reach the training section
3. Sasha choose one skills amongst those given by her teacher.
4. Sacha arrives in a Training page.
5. Sasha try to answer the question, after 3 tries the correction is given.
6. Sasha decide she is done training and leave the page.

4 Wireframes

4.1 Question Configuration

The professor can choose subject and assessment type or skills. The right side is the assessment type where he can set the domain radius and parameter.

A Web Page

Navigation icons: back, forward, close, home

Address bar: http://

Form fields:

- Subject:
- Assessment type:
- Skills:
- Shape: (with a circle icon)
- Domain Radius:
- Parameter: ☐ Integer
☐ Fraction
☐ Decimal

Submit button

4.2 Generated Questions Choice

The professor can choose questions in the list of generated questions. There is the possibility to generate 5 new question if some are not suitable.

A Web Page

http://

Question 1

☐ Radius Value Result Value

Question 2

☐ Radius Value Result Value

Back Generate 5 More Questions Create Assessment

4.3 Student Answer

The student has the problem with an illustration and can answer in the input.


A Web Page

http://

Problem :

.....

.....

 Radius : Value

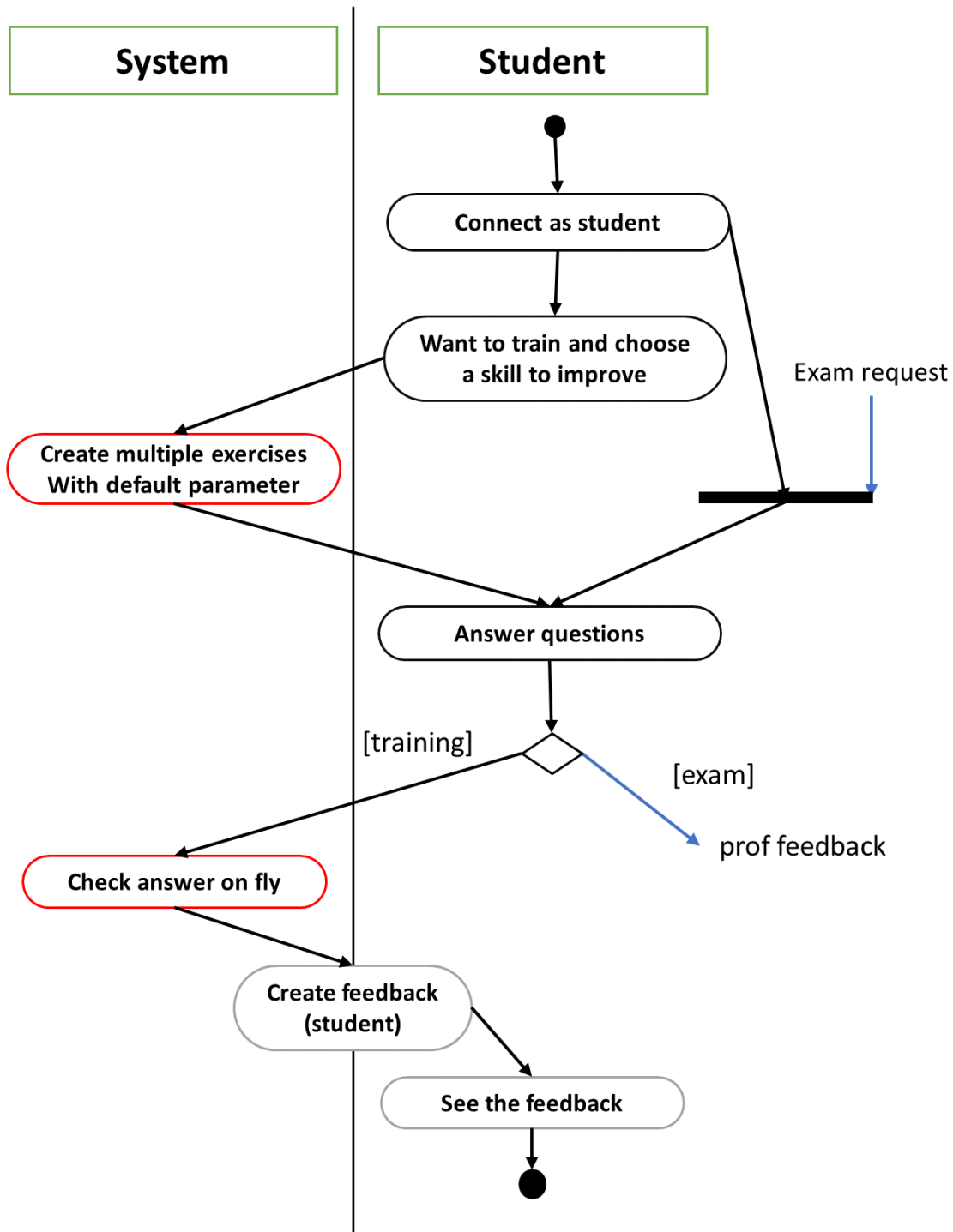
Your Answer :

Exit Submit

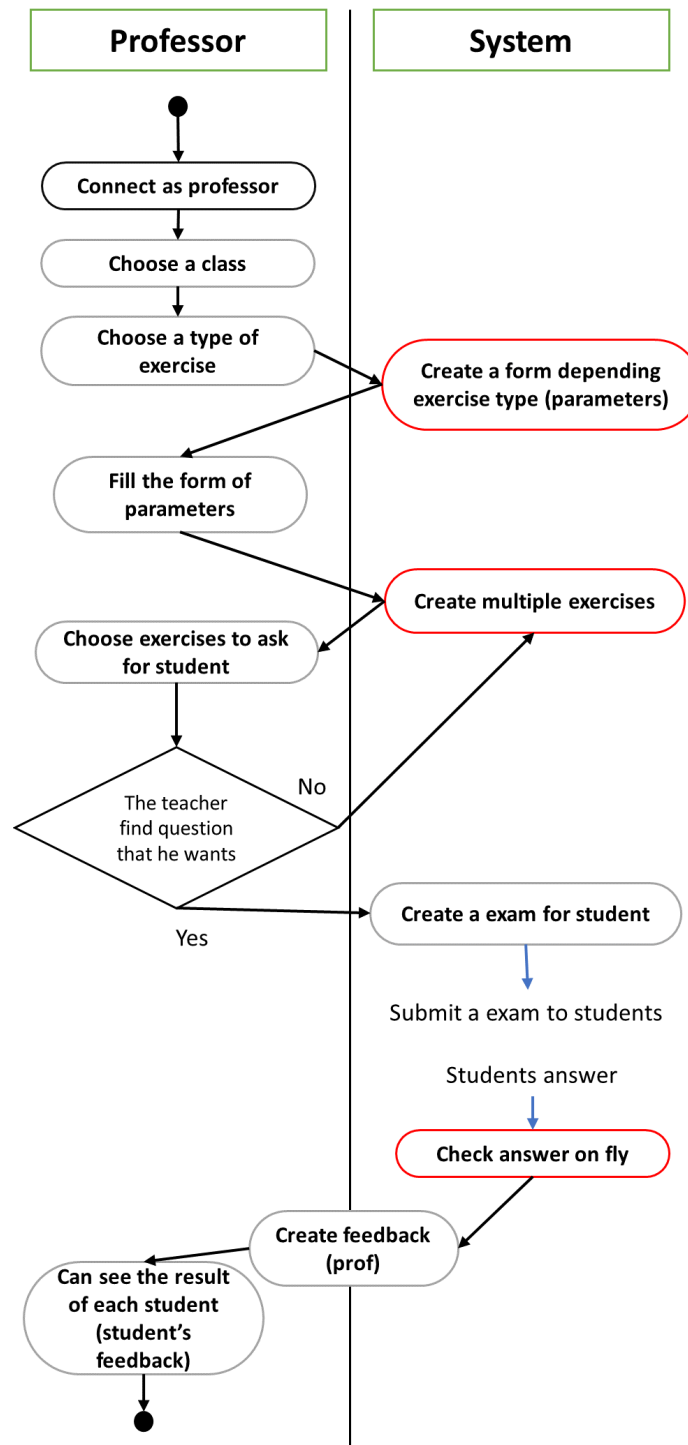
5 Activity diagram

Red bubbles in the Activity Diagram highlight the main activities we will be working on. Blue arrows represent interaction between student and professor diagrams.

5.1 Student-System

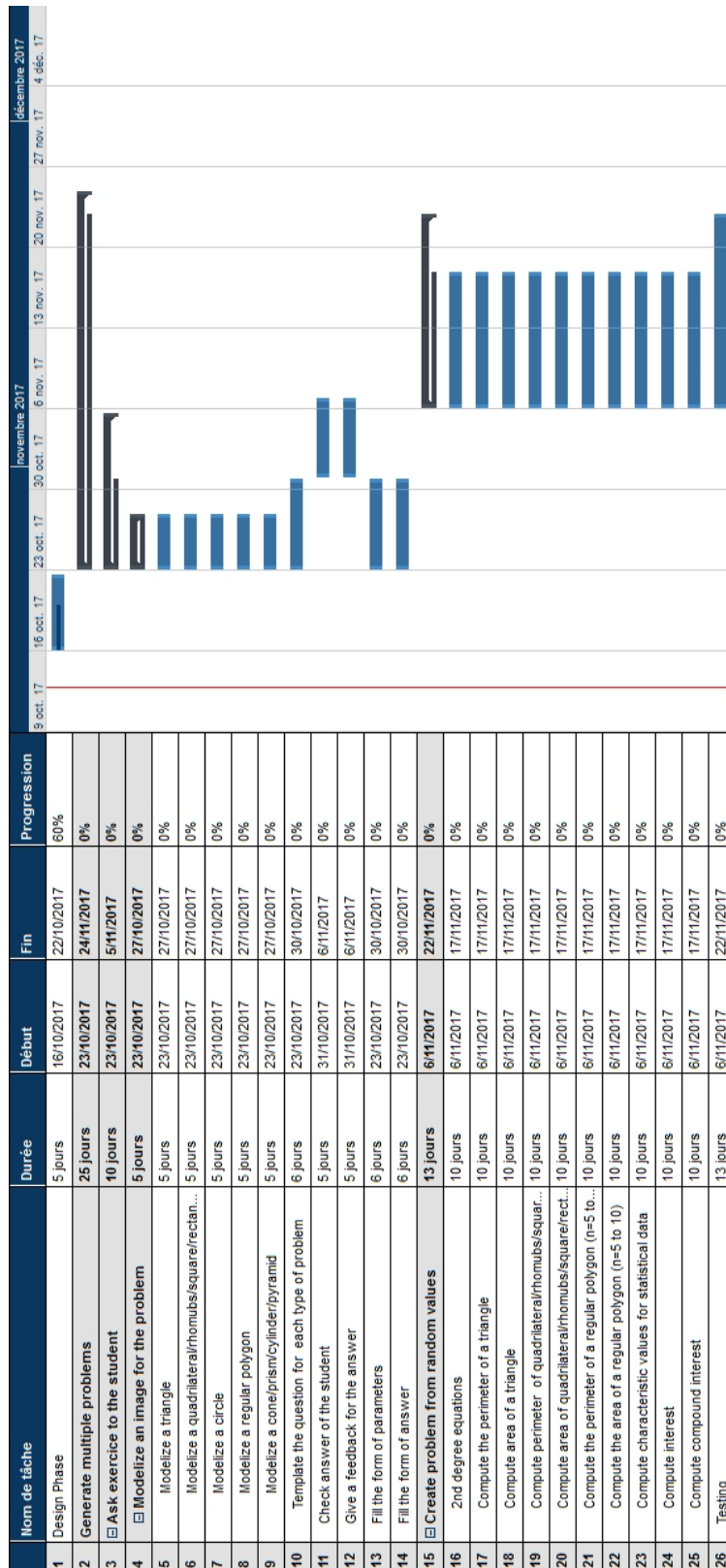


5.2 Professor-System



6 Planning

6.1 Tasks planning



6.2 Deliverables planning

- FRI 29.09 Module to be developed chosen A detailed ORM or ER model of the structure of the initial database.
- FRI 06.10 16:00 First draft of requirements document ready: usage scenarios, user stories and time estimate of user stories. Final requirements document (10 pages) : usage scenarios, uses cases, mock-up, planning, activity diagram.
- FRI 20.10 First draft of design diagrams ready: class and sequence diagrams.
- FRI 27.10 Updated requirements document to be delivered by all teams for which the client requested modifications. Completed version of design document with improved version of class and sequence diagrams + a detailed description of how the module to be developed will integrate with the existing application. First rough implementation of initial prototype, with corresponding tests.
- FRI 03.11 1st prototype ready and working. Test suites + document explaining the tests. Document detailing what existing code or parts of the database the 1st prototype has used or touched.
- FRI 10.11 1st prototype integrated and merged with main application and prototypes of other teams.
- FRI 17.11 Design document with class and sequence diagrams for 2nd prototype + detailed description of how the module to be developed will integrate with the existing application. First rough implementation of second prototype with corresponding tests.
- FRI 24.11 2nd prototype ready and working. Test suites + document explaining the tests. Document detailing precisely what existing code or parts of the database the 2nd prototype touched.
- FRI 08.12 2nd prototype integrated and merged with the main application and prototypes of other teams Final technical report Report on the team organisation
- FRI 15.12 Fully documented code. Final overall version of the tests (unit tests and Selenium), updated according to the two feedbacks. Final user manual in OpenOffice format, to be handed over to the client (production quality).
- MON 18.12 Short video (YouTube link) with a demo of the working prototype.
- WED 20.12 Final project defence including a demonstration “in vivo” on the “production” site.

7 Development methodology

We will be using SCRUM as the Agile methodology.

SCRUM suits the best our needs for this project for these reasons :

- The official planning of the course allows us to organize ourselves in multiple sprints, with personal sub-goals to reach the official deadline.
- Managing a team of eight people might be really difficult using Waterfall. With SCRUM, everybody is responsible of his own piece of work but also of all the other part of the project.
Nobody's never done with his work and everybody's working towards the same goal, which leads to a stronger "team-spirit".
- Frequent stand-up meetings are a good source of motivation, a useful way to keep everybody's knowledge of the project up-to-date.
- The team-leader we elected has already responsibilities about communications with the clients and team organization, him being the SCRUM-Master won't be an overload of work and will perfectly suits the whole organization.

8 Organisation and distribution of work in the team

- **Rémy Voet** : Team-Leader, SCRUM Master
- **Sophie Madessis** : Database Engineer
- **Nicola Romano** : Developer, Test Assistant
- **Youri Mouton** : Lead Developer, Git Master
- **Tristan Moers** : Developer, Team-Leader Assistant
- **Ilias Boutchichi** : Front-End Developer
- **Antoine Rime** : Developer
- **Samuel Monroe** : Behaviour Driven Development, Testing, Front-End Developer

9 Conclusion

The course of this first part went well, the scrum methodology is apprehended by everyone. But we encountered difficulties in planning poker our estimates were not close so it took us a long time to discuss. The meeting with the client allowed us to better understand their expectations of the project because it was not well understood.

Now with all these points and the client feedback we are ready to start the implementation. We have an idea of what the interface will look like thanks to Wireframes and available features for user.