Institute of Information Systems Engineering
Software Engineering
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Reference:	**QSE:AeWG**
Topic:	**Agile eduLAB Workshop Guidance**
Course Type:	Bakk-/Master Thesis, CS Project
Start:	As soon as possible
End:	To be defined
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Background

The eduLAB[1] at TU Wien Institute of Information Systems Engineering conducts workshops on algorithmic thinking for secondary school pupils. In a workshop, 3 to 4 tutors shall guide groups of 3 to 4 pupils, who shall cooperatively solve tasks on algorithms. A challenge in this setting is to guide the tutors consistently for a set of normal and special cases, and to document the outcome as a foundation for improving the quality of teaching and guidance.

The goal is to provide guidance to conduct coordinated, repeatable processes, adapted to changing environments, such as varying material/data input, technical support systems, and student groups. Figure 1 illustrates a workshop setting.

This project aims to explore in the eduLAB workshop context *Agile Teaching Workshop Guidance* (ATWG). ATWG shall build on Behavior-Driven Development to design and validate method and tool prototypes, supporting an expert eduLAB supervisor to specify actionable tasks for a team of tutors and observers, who may use machine actors, including sensors and software-intensive systems, as a foundation for configuring role-specific expert information systems that guide a tutor/observer during a workshop. A key goal is the improvement of process guidance, e.g., repeatable workshop processes and results, such as feedback to solutions that may contain defects. The project can build on preliminary data and prototypes.

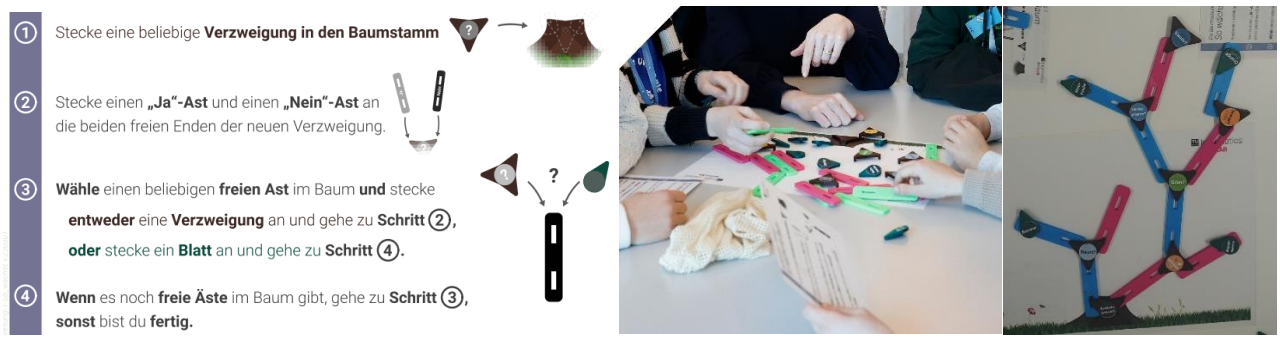

Figure 1: ATWG application context – decision tree explanation, group working on task, and example outcome.

[1] https://edulab.ifs.tuwien.ac.at/

ATWG shall facilitate iterative quality improvement of process guidance in four steps:

(1) Scenario management: The eduLAB supervisor shall specify phases and tasks with measurable pre- and post-conditions based on a domain model, such as tutors, students, and algorithmic problems, with their properties and states.

(2) Guided mission and documentation: Tutors with machine support conduct scenarios with their role-specific views. Observers document data, deviations, and issues in an event and task history. Role-specific expert information systems shall answer the question: What could I do next?

(3) Mission documentation retrospective: Tutors and observers validate collected field data and annotate issues with data, e.g., deviations of time stamps. This retrospective of the event and task history is similar to the agile SE practice. The retrospective expert information system shall answer the question: What happened during the mission?

(4) Mission data analysis: The data analyst shall analyze event and task result data to derive mission performance, as input to determine the quality level and options for improvement of the eduLAB workshop processes.

Figure 2 illustrates ATG step (1) phases and tasks for cooking soft-boiled eggs with a human/computer cook actor. Computer functions can estimate the time for boiling the egg, based on the automated measurement of an egg's size, weight, and temperature. In a phase during ATG step (2), the cook can choose which tasks to start, depending on their fulfilled pre-conditions. The supervisor can specify tasks for the supervisor role to improve the guidance process.

Phase - Given	Given	When	Then	Priority
P01: Plan		Cooking manager shall specify the cooking order: size, delivery time, target consistency (soft-boiled), and number of eggs.	C10: Cooking order is specified; start P11, start P12	50
P12: Load		Cook shall fill a pot with cold water.	Pot filled with water	10
P12: Load		Cook shall fill a bowl with ice water (water and ice cubes).	Bowl filled with ice water	10
P11: Plan	C10	Cook shall input the egg parameters (egg size, egg temperature).	Egg parameters specified	20
P11: Plan		Cook shall estimate and record the time for boiling the egg (egg size/temperature, air pressure).	Boiling time specified	50
P11: Plan		Cook shall estimate and record the time for cooling the egg (egg size).	Cooling time specified	20
P12: Load		Cook shall put the batch of eggs into the pot.	Eggs in pot	40
P12: Load		Cook shall cover the eggs with cold water (fully submerged eggs).	C121: Eggs in pot covered with water; start P13	30
P13: Heat		Cook shall put the pot on high heat.	Water heating started	50
P13: Heat		Cook shall observe the pot until the water shows rolling boil.	Water in rolling boil	40
P13: Heat		Cook shall set the heating source to keep water simmering.	Water simmering	30
P13: Heat		Cook shall wait for the estimated boiling time (4 to 12 minutes).	C134: Boiling time finished	10
P14: Cool	C134	Cook shall drain the eggs.	Eggs boiled; start P14	10
P14: Cool		Cook shall put the eggs into a bowl filled with water and ice cubes	Egg in cooling bowl	40
P14: Cool		Cook shall wait for the estimated cooling time (1 to 2 minutes).	C143: Eggs cooled	30
P14: Cool	C143	Cook shall remove the eggs from the bowl and dry the eggs.	Soft-boiled eggs cooked, start P21	30
P21: Check		Cook shall check the cooked eggs for cracks, egg running out of the	Boiled eggs checked for cracks	30
P21: Check		Cook shall check the cooking state of the batch of eggs.	Soft-boiled eggs checked, start P22	30
P22: Delivery		Cook shall deliver the batch of soft-boiled eggs.	Soft-boiled eggs delivered	20

Figure 2: Behavior-driven task specification for cooking soft-boiled eggs with human/computer actors.

Goal of this project is to develop a web-based application for facilitating *agile teaching workshop guidance and documentation*.

Tasks

- Depending on the workshop setting and preliminary results, plan the project considering the following task candidates.
- Requirements engineering for a selected application.
- User experience design, workflow analysis and design.
- Design of a web-based application, typically mobile (tablet, mobile) application
    - UID for Samsung Galaxy Tab A8, Android 12.
- Viability analysis: identify challenges in practice.
- A field study in the application area to identify requirements and task types
    - Levels: expert, novice, automation
    - Task conditions, task descriptions
- Identify and address typical special cases in the application area.
- Prototype design and evaluation of guidance and documentation functions.
- Design task templates for similar application cases.
- Integration of process documentation with semi-automated data analysis.

Expertise

For this topic, a set of skills is recommended (at least two are mandatory).

- Web application design, implementation, and validation.
- Programming skills, e.g., Java.
- Graph database skills, e.g., Neo4J/Cypher.
- Data modeling.
- Empirical evaluation, e.g., case study, pre/post comparison.
- Interest in puzzle solving, algorithm debugging, teaching (in German).

References

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