Background

In a wide range of application areas, from drone field testing, over coordinated cooking, solving puzzles, experimentation in research labs, to training for reconfiguring or repairing technical systems, expert supervisors want to guide operators, such as testers, cooks, experimenters, or technicians, to conduct coordinated, repeatable processes, adapted to changing environments, such as varying material/data input, available tools and systems, or weather conditions. Figure 1 illustrates ATG application areas.

This project aims to explore in at least one application area Agile Task Guidance (ATG) that shall build on Behavior-Driven Development to design and validate method and tool prototypes, supporting an expert supervisor to specify actionable tasks, typically for a team of 3 to 6 human actors and machine actors, including sensors and software-intensive systems, as a foundation for configuring role-specific expert information systems that guide a role during a mission. A key goal is the improvement of process guidance, e.g., traceable field testing, repeatable cooking results, efficient experimentation, or low-risk repair. The project can build on preliminary data and prototypes.

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

1. **Scenario management:** The supervisor shall specify phases and tasks with measurable pre- and post-conditions based on a domain model, such as drones with their properties and states.

2. **Guided mission and documentation:** Human and machine actors conduct scenarios with their role-specific views. Mission 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:** Human actors and observers validate collected field data and annotate issues with data, e.g., deviations of time stamps. This
A 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 calculate mission performance, as input to determine the quality level and options for improvement of the application 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.

![Figure 2: Behavior-driven task specification for cooking soft-boiled eggs with human/computer actors.](image)

![Figure 2: Cook’s view on relevant next tasks (in red box), based on pre-conditions and situational priority.](image)
Figure 3 illustrates a role-specific user interface to inform a cook during ATG step (2) on the tasks that are ready to start, on the detail description of the current task, and on the event and task history, including observations similar to a log or social media history. The cook can start a task, finish a task successfully, report observations, issues, or task failures.

Goal of this project is to develop a web-based application for facilitating agile task guidance and documentation.
Tasks

- Depending on the application area 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
- 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 a practical application domain, e.g., puzzle solving, pair programming, field testing, repair, cooking, or lab experimentation.

References

