Assessment of Military Personnel for Complex Environment using Human Performance Modeling

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ABSTRACT

A military candidate´s capability concerning critical and risky tasks does not only depend on military-specific and technical skills, but especially on individual characteristics and so called "soft skills" (i.e. problem-solving abilities). Concerning the existence and specification of these skills, it was the HBR (Human Behaviour Representation)-theory´s aim to create a computer program that simulates typical military or military related scenarios (i.e. in a PRT) and at the same time assess whether a candidate is appropriate to a specific set of tasks or not. The aim was to create a psychological demanding and a realistic military environment to assess a candidate's problem solving skills in complex, risky and uncertain situations. Therefore, the HBR-assessment decision support system consists mainly of two different computer programs:

1) *Assessment-Demonstrator: a 3D-simulation of realistic military environment with agents, objects and realistic scenarios, where candidates have to show their problem solving skills by coping with complexity and uncertainty.*
2) *Demonstrator of an Assessment supporting tool, which consists of several assessment-tools that measure the candidate's behavior with relevant psychological terms to help identifying strengths and weaknesses of a candidate´s soft skills by process analyses..*

1.0 HUMAN BEHAVIOR REPRESENTATION (HBR)

Human behaviour is highly complex in its structure. It is influenced by physical, emotional, cognitive and social factors. Fundamentally, one may distinguish between the different modes of behaviour: Reactive behaviour comprises behaviour that follows fixed rules. This means that no explicit thought processes are required. Deliberative behaviour does not follow fixed rules. Instead a goal is set which has to be achieved. By means of reflection, working with models and trying and testing, a sequence of actions that leads to the goal is established. Reflective behaviour is not only thinking and planning but also of observing, supervising and controlling mental processes. These modes of behaviour have developed gradually over the course of evolution. Current tests for personnel assessment only focus on less complex behaviour. Personnel selection is a demanding and critical task, especially for the armed forces. In the worst case an individual error can lead to a political crisis or the death of personnel. Therefore, it is always better to know that you assign the right person to the right job at the right time. To optimize the selection process for the German MoD two studies have recently been conducted called “Assessment of Military Personnel with Human Behavior Representation (HBR) - Tools” and “Objective Personnel Diagnostic with Human Behavior Representation (HBR) – Tools”. The goals of the studies were two-fold: First goal was to examine the scientific background for the assessment of military personnel that focuses on “soft-skills” (problem solving competencies) and to develop a coherent theoretical framework describing and explaining human behavior and errors in complex and uncertain environments. Second goal was to demonstrate that these scientific fundamentals and findings can be applied in terms of a software product

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A military candidate´s capability concerning critical and risky tasks does not only depend on military-specific and technical skills, but especially on individual characteristics and so called "soft skills" (i.e. problem-solving abilities). Concerning the existence and specification of these skills, it was the HBR (Human Behaviour Representation)-theory´s aim to create a computer program that simulates typical military or military related scenarios (i.e. in a PRT) and at the same time assess whether a candidate is appropriate to a specific set of tasks or not. The aim was to create a psychological demanding and a realistic military environment to assess a candidate's problem solving skills in complex, risky and uncertain situations. Therefore, the HBR-assessment decision support system consists mainly of two different computer programs: 1) Assessment-Demonstrator: a 3D-simulation of realistic military environment with agents, objects and realistic scenarios, where candidates have to show their problem solving skills by coping with complexity and uncertainty. 2) Demonstrator of an Assessment supporting tool, which consists of several assessment-tools that measure the candidate's behavior with relevant psychological terms to help identifying strengths and weaknesses of a candidate´s soft skills by process analyses..

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for the given intention by creating a 3D computer simulation system that can serve as a test tool for the assessment of military personnel for specific tasks such as Peace Supporting Operations (PSO).

2.0 TOOL FOR THE ASSESSMENT OF PROBLEM SOLVING CAPABILITIES OF MILITARY PERSONNEL

One goal was to create a demonstrator in terms of a software product that demonstrates the possibility to implement the psychological basics and to serve as a test tool for the assessment of problem solving capabilities of military personnel. We constructed several scenarios that provoke typical requirements in action organization and that require specific individual characteristics to successfully solve the given task. We implemented a system to automatically measure personal characteristics shown in the scenario and to evaluate the test system in several standard diagnostic processes of the German armed forces. Each scenario was implemented as a 3D virtual environment, peopled with one or more virtual, psychological agents. The counterparts of the probands are virtual human beings with diverse modes of behaviour. They are to be represented in the model with the structure of a psychological system of action regulation.

The construction of the tasks leads to a scenario-framework that includes typical military situations and non-military situations that requires relevant military skills.

We use stories to describe these scenarios. Each part of the story is linked to a psychological category.

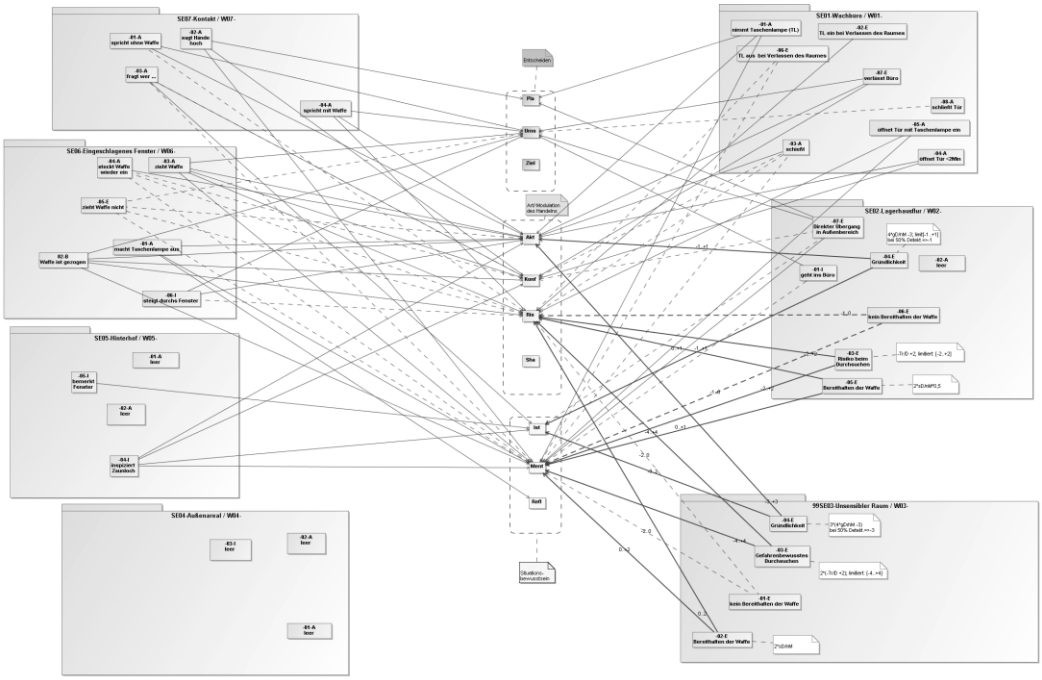

Figure 1: Each part of the story is linked to a psychological category.

In this framework specific tasks had been built. They represent single tasks that have to be managed and that ensure a coherent “story-board”. The scenarios are constructed in a way that especially the performance according to the phases of human action organization can be assessed.

Figure 2: Watchman and burglar.

Recently two scenarios have been implemented, a scenario where the subject has to fulfill tasks of a watchman and a scenario, where the subject has to fulfill tasks of an informal group leader. Both scenario trigger certain military relevant ability (dealing with risk, with uncertainty, with goals, with unclear information, with teaming aspects) and in both scenarios the subject has to interact with simulated, virtual opponents (ex. a burglar) and with peers (ex member of a group).

Figure 3: Peer group.

In strong association with the construction of the scenario framework the operationalization of requirements for the acting persons had to be developed. These requirements were mapped to measures for the assessment of the performance considering processes of action organization and action regulation.

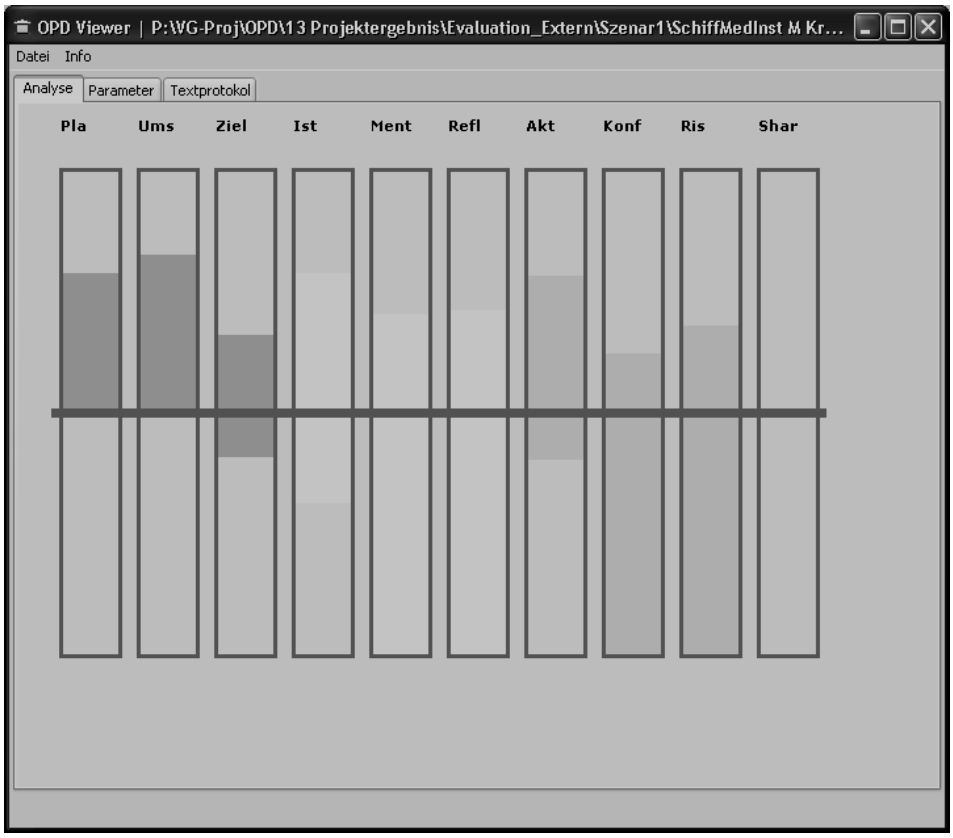

Figure 4: Graph of the Personality Categories.

The resulting test system for the assessment of military personnel includes different sub systems. First, we have a 3D simulation of different complex and realistic military-related environment where persons have to show that they are able to perform adequately in terms of military and psychological requirements. Second, we have am automatically working testing system which reports, analyses and displays the behavior shown by a subject in different ways, translating this behavior into a theory-driven psychological notion.

The evaluation of this system was conducted incrementally. We tested the military and psychological validity of both computer programs continually and from a very early stage on with novice military candidates and with subjects from German Special Forces.

The general idea of cognitive modeling and human behavior representation has been included into this tool in several ways:

- Construction of military-related scenarios (characteristics of the situations and requirements for the subjects)
- Theory-driven (psychological) assessment tool, test system
- Cognitive Agents to interact with the given scenarios.

This work is on the stage for nearly fully applicable test tool for the assessment of military personnel; there is still a need to conduct further empirical data.

RELATED REFERENCES

- Schaub, H. (2007). The Importance of the Characteristics of the Task to Understand Team Mental Models. Codesign - International Journal of Cocreation in Desgin and the Arts, 3, 1, 37-42
- Schaub, H., Detje, F. & Brüggemann, U. (Eds.) (2004). The Logic of Artificial Life. Abstracting and Synthesizing the Principles of Living Systems. Berlin: Akademische Verlagsgesellschaft, AKA
- Detje, F., Dörner, D. & Schaub, H. (2003). The Logic of Cognitive Systems – Proceedings of the Fifth International Conference on Cognitive Modeling. Bamberg: Universitätsverlag
- Schaub, H. (1997). Modelling Action Regulation. In: J. Brezinski, B. Krause & T. Maruszewski (Eds.), Idealization VIII: Modelling in Psychology. Amsterdam: Rodopi, 97-136.

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