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Teamwork in air traffic management

Teamwork is becoming increasingly important in future air traffic management (ATM)

Air traffic controllers must be able to coordinate their actions throughout the European sky and collaboratively decide on flight trajectories. A shared mental model among team members is essential to fulfil these requirements and ensure a safe and efficient traffic flow. NLR participates in the "Human Factors in Future ATM" research program of the Knowledge & Development Centre (KDC) of Schiphol Airport. The program investigates the effects of the future ATM system as regards the task of air traffic controllers. Specifically, a four year PhD research project looked into the concept of shared mental models in relation to team performance.

Member of **AT-One**

Studying shared mental models in air traffic control

The role of teamwork in current and future air traffic control (ATC) was investigated in the described research. Specifically, the shared mental model (SMM) concept was addressed to understand performance differences in ATC teams. SMMs represent organized and structured knowledge about team- and task-related key elements of ATC that are shared among team members.

An initial analysis of the individual mental models necessary for successful task execution and smooth cooperation contributed to the development of a SMM framework and constituted the research background for the project.

In several experimental studies the role of task and team SMMs on team effectiveness was examined under various circumstances and in controlled environments. A specific focus of the project regarded the facilitation of SMM development through team training strategies.

While using normal situations as the baseline, the experimental variations considered the role of SMM during datalink communication and in reaction to system failure (i.e. team adaptation). An abstract team environment called TeamTris was developed to study ATC relevant team behaviours, while enabling experimental control.

IMPORTANT RESULTS

- Air traffic controllers share mental models of the equipment, task, team and situation.
- Team members with more similar and accurate SMMs communicate more relevant knowledge and outperform teams with less similar and accurate SMMs.
- In purely textual communication environments the development of a SMM is facilitated by team training strategies.
- The role of SMM during system failure is ambiguous. While SMMs may lead to better coordination, similiar evaluation of the situation may hamper flexible adaptation.
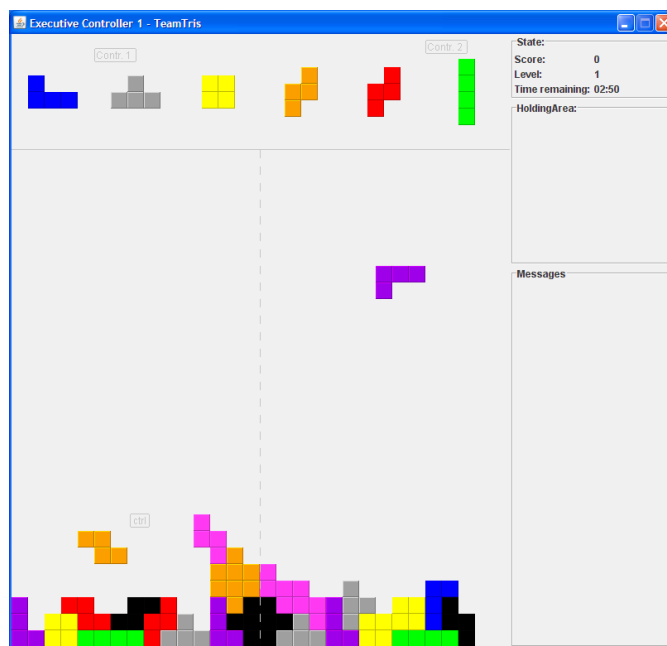
The TeamTris interface

IMPLICATIONS

SMM can be informative predictors of air traffic controllers' team effectiveness and may help diagnosing difficulties in teamwork. Therefore, strategies designed to improve SMM development need to be part of human factors training in future ATM. The effects of SMM should be taken into account when implementing future operational concepts and with regards to system resilience.

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