

Wargaming Simulator MASA SWORD for Training and Education of Czech Army Officers

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Abstract: The article deals with expanding the capabilities of the University of Defence in the field of training and education of new officers of the Czech Army using newly introduced simulation technology. First, it looks at the beginnings of the use of simulations to support and develop teaching. One of those steps was the establishment of a professional-level computer games group. This gave students the opportunity to gain experience in commanding and managing combat while playing computer games such as Counter-Strike. Currently, students have the opportunity to deepen their command and tactical skills during practical field training or in virtual environments while playing games based on virtual and constructive simulation. Another section explains the importance and role of these simulations in teaching professional soldiers. It is very important for future combat commanders to gain as much experience as possible in commanding and directing combat activity in the conduct of military operations before they occur. Finally, it deals with the newly acquired MASA SWORD simulator, which offers another and much more complex tool for gaining valuable experience. MASA SWORD, unlike the software currently in use, can be controlled by only one user without the need to connect other users or perform control exercises. It includes a scenario building tool, constructive simulation and analytical tools for evaluating created simulations. In addition to its use in teaching and educating students, the simulator can be used for staff training, support for commander planning and decision-making, analysis and, last but not least, operational research. In the last section, the article evaluates the usefulness of simulations for teaching, science and research. It also reports on ongoing qualitative research methods to predict the next direction of development and possible connectivity with other simulators.

Keywords: wargaming, virtual training, MASA SWORD, constructive simulation, military education

1. Introduction

At the beginning of the 21st century, the Center for Simulation and Training Technologies was established in the Czech Armed Forces. The main task and objective was to provide instruction and training of ground troops in tactical and firearms training. With the development of computer technology, students and soldiers had more and more opportunities to play computer fighting games outside of this specialized teaching. The University of Defence understood the potential of tactical games to develop and gain students' experience of commanding and controlling combat in their playing. The response was to set up a group to play computer games at a professional level. The goal was not to promote gaming, but to use students' interest in computer games to practice skills that soldiers could use in real-life situations. As a result, various types of simulators were purchased at the university for wider support for the teaching and education of future Czech army officers. In addition to the MASA SWORD simulator, which is described in the next part of the article, it is worth mentioning the latest version of the Virtual Battlespace 4 (VBS4) war simulator. VBS4 prepares students to conduct various combat operations as weapon system operators or unit commanders.

2. Simulation in military training and education

Students first acquire knowledge through theoretical teaching in classrooms, practical demonstrations of armaments, military equipment, techniques and during observation of training units. Then, students try to apply the lessons learned as part of an exercise in field practical training. Military training is an essential part of training soldiers. In doing so, soldiers acquire and further deepen their experience and skills in commanding and directing combat and non-combat units in various tactical activities.

One of the common methods used to prepare soldiers is called the war game. The NATO Glossary of Terms and Definitions AAP-6 (Edition 2021) defines the war game as: *"A simulation of a military operation in which participants seek to achieve a specified objective, given preestablished resources and constraints."*

Military exercises take a lot of time to prepare and require financial, logistical, but mostly personnel support. All activities must be coordinated and rehearsed before the exercise itself. Unfortunately, there are several other uncontrollable parameters that then enter the exercise. These can easily interrupt or significantly shorten the entire exercise. Another adverse side effect is the risk of injury or damage to equipment when maneuvering troops in the field and in live ammunition training.

Using simulators greatly reduces training costs and preparation time. It allows exercises to be conducted at any tactical level with high variability of all real tactical situations. They serve not only training but also education. With the help of simulators, students can develop basic habits that they do not have to waste time on field training. They will get a comprehensive overview of the tactical situation and, with the help of the After-Action Review (AAR), have the opportunity to learn from mistakes and inaccuracies before personally entering the training ground. That saves fuel and ammunition.

The advantage of modelling and simulation is that it can be used not only in training and education, but also in other areas. This is the field of acquisition (acquisition or research of new weapons), development of new concepts, verification of standard procedures, support for the commander's decision-making process or verification of experiments already conducted. This means that theoretical models may not only be validated by practical experiments (Drozd et al., 2018), but may be represented by simulation. A comprehensive tactical simulator is required to fill all these areas. Tactical simulator means a complex of interconnected: workstation systems; software tools for constructive simulation; virtual simulation tools; communication systems; fire control systems; recording, evaluation and analysis tools. The artillery fire control system is often a neglected part in virtual and constructive simulations. Unlike logistics or other command systems, the fire control system is largely controlled by an artificial intelligence without the possibility of user intervention or full control of the system. Artillery fire control system has been repeatedly described in the past (Blaha et al., 2010; Šilinger et al., 2017) and is applicable in the simulation environment.

To obtain the tactical simulator described above, it needs to be developed or created by combining appropriate simulators. The development of such a simulator is a lengthy and demanding process, therefore only a variant of multi-simulator interconnection is permissible under the conditions of the Czech Army. If the selected simulators have more features, fewer will need to be connected. A smaller amount is desirable in several respects: lower costs for acquisition, maintenance and training, easier connectivity and communication, and more intuitive control. With its capabilities, the newly acquired MASA SWORD simulator can be one of the important pieces of this "puzzle."

3. MASA SWORD

SWORD (Simulated Wargaming for Operational Readiness and Doctrine) is a software package that can simulate operations from the company level to the division level. It includes a scenario generation tool and aggregated tools for constructive simulation and analysis. It is designed for education, training, planning support, analysis, operations research, staff training and stimulation of the command-and-control system. The software can be installed on any number of computers that can run together or separately.

The simulator allows to edit and create terrain and equipment database. It is possible to create any environment for which they are available the necessary elevation, vector and raster data. This data is important for the correct rendering of terrain and especially roads. Movements issues are related to various research activities at the University (Vlkovský et al., 2021). In the database it is possible to create units up to the company level and set its detailed parameters (ammunition, weapons, soldiers, vehicles / equipment, sensors, accessories, unit composition, unit type). For combat units can be set up the firing mode, which is especially important for artillery units before and during fire for effect. Perspective method for determination of fire for effect has been described (Blaha et al., 2016). As outlined above, artillery fire is calculated automatically, so it is not clear how linear and angular issues (Blaha et al., 2018) are solved. Positive ability is a possibility to influence the doctrinal model of the unit's behavior and the level of training, fatigue and stress. These parameters develop during the simulation with respect to the tactical situation and affect the units in terms of their speed and accuracy, as in real combat.

Creating scenarios is simple and consists of inserting prepared units into the selected environment, setting tasks according to the selected tactical situation and setting the required scores. Monitoring and evaluation of the

development of the entire simulation is done by scores (ammunition consumption, number of wounded, number of dead, combat capability of units, etc.). The resulting scores can be plotted in graphs and tables.

In the simulation, it does not represent individual entities (such as one soldier or tank), but aggregates of entities (teams, platoons, companies). Integrated Artificial Intelligence automates the behavior of simulated entities, reducing the number of system operators needed to control the simulation. Only one user is able to control the simulation in the Supervisor mode, with the right to interfere with the settings and the course of the simulation.

This capability is key to operational research capabilities. Using the analytical tool, it is possible to run the prepared scenario multiple times and obtain results in graphs or tables. Another advantage is that you can easily make a copy of a scenario, change certain parameters, and track changes between those scenarios. The analytical tool is very useful in the acquisition area.

4. Conclusion

Simulators will never replace field training and combat experience, but they help educate future officers, expedite the process of adaptation during practical exercises, and increase their interest not only in daily study but also in scientific activities.

MASA SWORD simulator with advanced analytical tools opens up new possibilities for use in teaching, science and research. Based on brainstorming and narrative interviews with experts, important data will be collected for further directions of development and interconnection of individual simulators to create a comprehensive tactical simulator.

To justify the acquisition of the tactical simulator, it is first important to evaluate the results of the implementation of individual simulators in the education of future officers. The core methods of obtaining the necessary data will be a comparison of study results with previous years and a questionnaire survey. Semi-structured talks with alumni commanders in the future.

References

- Blaha, M., Brabcová, K. (2010) *Communication environment in the perspective Automated Artillery Fire Support Control System*. In: *The 10th WSEAS International Conference on APPLIED INFORMATICS AND COMMUNICATIONS (AIC '10)*. Taipei: WSEAS Press, p. 236-239. ISSN 1792-4634. ISBN 978-960-474-216-5.
- Blaha, M., Potužák, L. and Šilinger, K. (2018) *Linear and Angular Issues in Perspective Artillery Fire Control System*. In: *22nd International Conference on Circuits, Systems, Communications and Computers (CSCC 2018)*. Majorca, Spain: EDP Sciences. ISSN 2261-236X.
- Blaha, M., Šilinger, K., Potužák, L., Příklad, B. (2016) *Perspective method for determination of fire for effect in tactical and technical control of artillery units*. In: *ICINCO 2016 Proceedings of the 13th International Conference on Informatics in Control, Automation and Robotics*. Portugal: SCITEPRESS, p. 249-254. ISBN 978-989-758-198-4.
- Drozd, J., Stodola, P., Křišťálová, D., Kozůbek, J. (2018) *Experiments with the UAS Reconnaissance Model in the Real Environment*. In: *Modelling and Simulation for Autonomous Systems*. Cham: Springer International Publishing, p. 340-349. ISSN 0302-9743. ISBN 978-3-319-76071-1.
- Šilinger, K., Blaha, M. (2017) *The new automated fire control system for artillery units based on interoperability and standards*. In: *ICINCO 2017 - Proceedings of the 14th International Conference on Informatics in Control, Automation and Robotics*. Setúbal, Portugal: SciTePress, p. 332-337. ISBN 978-989758263-9.
- STANAG 3680 - NATO glossary of terms and definitions (english and french) - AAP-06 (2021)
- Vlkovský, M., Neubauer, J., Malíšek, J. and Michálek, J. (2021) *Improvement of Road Safety through Appropriate Cargo Securing Using Outliers*. *SUSTAINABILITY*, 13(5), 2688. ISSN 2071-1050.