sciendo International Conference KNOWLEDGE-BASED ORGANIZATION
Vol. XXVI No 1 2020

CREATING MODELING AND SIMULATION SCENARIOS USING DEDICATED TOOLS

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Abstract: *Simulating military actions has been an important element since ancient times, the fighting ability being intricately connected to training and exercises simulating real combat. The paper describes the steps followed to create a scenario used for online teaching activities during the pandemic, using the facilities of the Centre for Modelling and Simulation of Military Actions. The scenarios were created by using two modelling and simulation software - JCATS (Joint Conflict and Tactical Simulation) for constructive simulation and the VBS (Virtual Battlespace) for virtual simulation.*

Keywords: VBS, JCATS, Matlab, Military Leaders

1. Introduction

In the context of the new measures to prevent the spread of COVID-19, the Military Operations Modelling and Simulation Centre from "Nicolae Bălcescu" Land Forces Academy of Sibiu continues to support virtual teaching activities carried out by faculty staff and students.

2. Methodology

In this paper we highlight that Military research is conducted through experimental campaigns because military actions cannot be experienced unless they are simulated, by using several types of simulations and models simultaneously and by analysing the results obtained.

3. The conceptual framework of an integrated normative system

In order to support specialized training and the development of the didactic activities from the curricular area of the M&S field, possible scenarios are configured using the existing laboratory equipment - the JCATS (Joint Conflict and Tactical Simulation) constructive simulation system and the VBS (Virtual Battlespace) virtual simulation system. The scenarios are uploaded on the Moodle platform (Figure 1), and the military students, under the guidance of their instructors, can analyse courses of action and subsequent implications [1, 2]. At the same time, on the Moodle platform that was installed on its own servers, experimental activities are carried out – information is collected from students and the unfinished training tasks are monitored. The data collected will be the starting point for generating future scenarios. These will be integrated into training activities and will be replicated according to the scenario developed by the planner.

Figure 1: Print Screen, on the Moodle platform

DOI: 10.2478/kbo-2020-0027

The scenarios enable the staff participating in exercises at any level to be introduced in the action situation that each student has to solve. In order to create the scenarios, the starting point was to identify the tasks that the cadets have to perform [3, 4]. The planning hypotheses centred on the modern operational environment were determined based on these scenarios. In addition, lists with the main events and incidents were drawn up in order to generate contexts that require correct decisions to be made by the students (Figure 2).

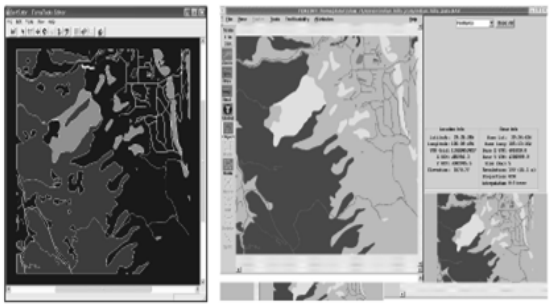

Figure 2: Print Screen, operational environment

In creating the realistic premises for achieving the proposed objectives, the following tools were used: the constructive simulation system Joint Conflict and the Tactical Simulation and virtual simulation system Virtual Battlespace.

JCATS sets the general framework, which, from an action point of view, is defined by a series of events that generate the planned operational situation (Figure 3).

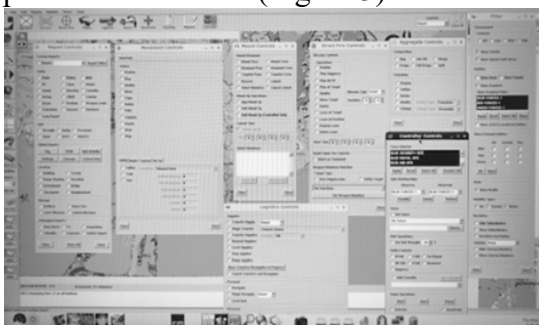

Figure 3: Print Screen Tactical Simulation Tools

Thus the Planning Controls can be used to initially position the system and units, to display or alter a system's LOS(Line of Sight), to set a system's orientation(direction of view) for single entities or all entities, to detonate Improvised Explosive Devices and other explosive munitions, to set system attributes(shoot, breach, sound, direct support, etc.) On/Off, and to surrender and capture systems to arrest entities.(Figure4).

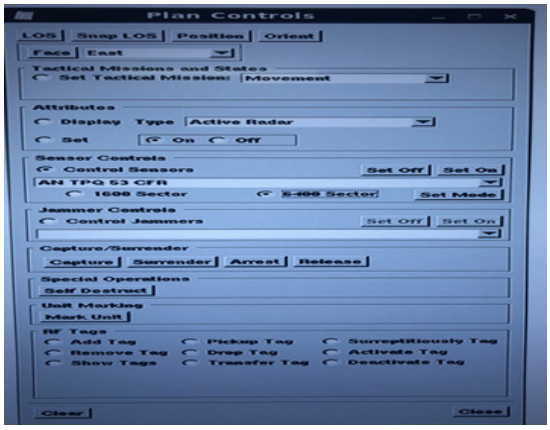

Figure 4: Print Screen, plan controls

In order for the scenario to be as realistic as possible, we can create the positioning of the entities (without actually taking staff to those locations) in the training area because all systems allow to adjust the LOS; an aggregate unit has one LOS to which all entities within the aggregate adhere; any systems within LOS fan are eligible for acquisition; each limit of view (right or left) may extend 0 degrees to 360 degrees from primary direction of view; time to acquire is increased as LOS angle fan increases (acquisition depends on the size and range of target); each system has a direction of view and a direction of movement; LOS direction is independent of movement direction; if system LOS is set to look to the right, the system will always look in that direction regardless of movement direction; LOS may be set to a system's movement direction at any time – see snap LOS; LOS fans may default to East/West or North/South view at game initialization, adjusted LOS is saved during planning (Figure 5).

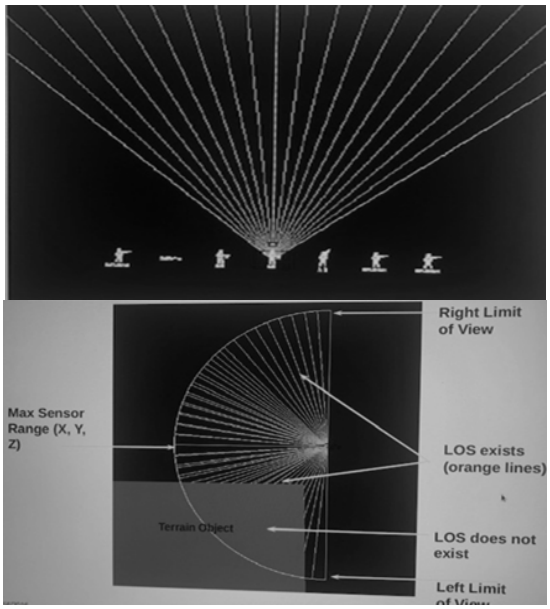

Figure 5: LOS fan characteristics

The scenarios describe events from the moment the action is initiated until the moment when they require the decisional intervention of the students. The system recorded important moments in the evolution of the scenario and the changes that occurred in accordance with the efforts of each participant [5, 6]. Thus, the hypotheses and the possible alternatives led to find solutions for the students (Figure 6).

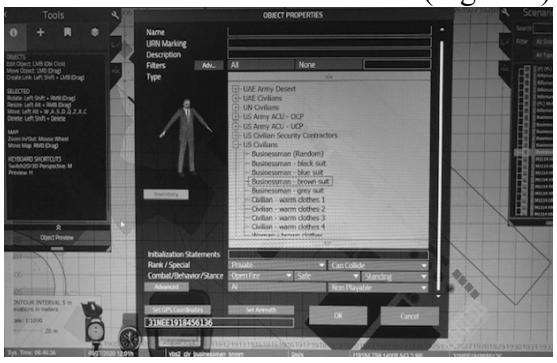

Figure 6: Print Screen, Virtual Battlespace

Virtual Battlespace simulates a realistic scenario with 3D characters that exemplify movements and reactions similar to those of a real soldier (Figure 7).

Figure 7: Print Screen, Virtual Battlespace, 3D characters

It incorporates an intuitive program that allows the teaching staff and the military instructor to configure and manipulate the training system, providing the "after action review" feedback and detailed data (Figure 8).

Figure 8: Print Screen, Virtual Battlespace, "after action review"

Thus, each student can use *ArcGIS* for any signal analysis or model simulation, regardless of the computer characteristics (Figure 9).

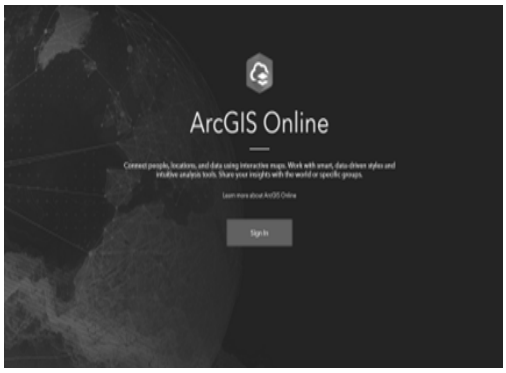

Figure 9: Print Screen, ArcGIS

These licenses are granted for the entire pandemic period, and students and teaching staff use remote software to achieve course objectives [7]. Determining visibility, distances and directions, converting coordinates or adding military symbols to the map are accessible by integrating the free Military Tools into ArcGIS Pro, a tool that has also been used in the traditional space [8].

The combination of M&S software has allowed the implementation of scenarios, be they fictitious, real or synthetic, and eventually turned them into realistic scenarios (Figure 10, 11).

Figure 10: Sample of Virtual Battlespace – realistic scenarios

Figure 11: Virtual Battlespace – realistic scenarios

4. Conclusions

The scenarios were an alternative method of instruction during the pandemic and facilitated:

- planning, organizing and conducting training exercises through simulation;
- conducting experimentation activities related to the field of M&S;
- a positive impact in terms of student involvement.

Under normal circumstances, students are directly involved in creating and generating the scenarios.

Technological progress has amplified the capabilities of military simulations by evolving from an analytical modelling to the one accepted nowadays: real, virtual and constructive. The fidelity of the military simulation reaches maximum levels when the simulation results coincide with the results of the actions in the field, where equipment, personnel, ammunition, food packages, etc. are used.

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