워게임 모형의 동적 Lanchester 소모계수 산출방안 연구

Dynamic Adjustments of Lanchester Attrition Coefficients with Qualitative Parameters using Expert System

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Abstract

This thesis presents a new method of calculating Lanchester attrition coefficients which have been widely used for estimating the damages from closes combat in wargame simulations. Normally, these coefficients are derived from quantifiable factors through analytical models or statistics Due to this limitation, the existing ways of determining Lanchester attrition coefficients do not reflect the various battlefield factors, which would be changed continuously during actual battle situations, thereby degrading the credibility of its simulation results. Furthermore, the associated complex mathematical equations and many assumptions make the combat process too difficult for the user to understand the model.

To remedy such problems, this thesis takes an approach that regards the quantifiable factors derived from the standardized combat situation as the nominal values, then adjust them with the qualitative factors, which are time variant. This approach may result in more realistic attrition coefficients appropriate for the various environments.

There are many factors influencing attrition from close combat. But, key factors are target posture and its activities, and shooters ability and type. Instead of mathematical approach to assess their influences on the battles, this study applied the expert system to account for the tactics and military doctrine. The amount of combat damage from the wargame applied this study fell within

the acceptable range of the expected value from the viewpoint of the military experts.

The expert system in this study may be applied primarily for the training simulation model, but it may also be applied to the analytical model with calibrating parameters by considering the historic war data. Three advantages for applying this study to a training model are :

Firstly, attrition is assessed more accurately by taking into account the tactical judgements of military experts. These factors have been normally ignored or at best partially considered in the assessment of attrition in the existing model. The experts system in this study deals with METT-T(Mission, Enemy, Terrain, Troops and Time) and other important tactical factors for the realistic assessment of attrition.

Secondly, training audiences can better achieve the training goal because they can understand the model. They had a tendency in the past to regard the model as black box. Consequently they were apt to focus on the quantitative result in their analysis and discarded the qualitative war principles.

Therefore, the result of th war simulation can be easily understood.

Thirdly, it reduces the efforts required for the model development. this study incorporates most of the factors influencing attrition into the expert system. Hence, a model developer can save the unnecessary efforts required in quantifying these factors. There are cases that update the change in some factors. There are cases that update the change in some factors or addition of new factors; for example the availability of a new weapon system or doctrine change. If needed, it can be easily reflected in the system by modifying or adding rules to the expert system. This characteristic contributes to better maintainability and expandability of the system.

The expert system in this study considers only those factors that can automatically be obtained through war simulation. Therefore, some qualitative factors like the proficiency, discipline, and tenacity of the combatants are not considered. Further study on expanding the model through quantifying them may make it more realistic model. Fraction to fire and enemy vulnerability factors mentioned in the study have discontinuous values. It may be tackled by converting the attrition assessments into a fuzzy set and deriving a fuzzy function. this guarantees more accurate attrition assessment.