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REVIEW

by Professor DSc. Atanas Ivanov Nachev, home address:
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Regarding: Dissertation work for awarding the educational and scientific degree "doctor" on the **topic**: "Visualization of an electronic battlefield with elements of augmented reality", **authored** by eng. Lili Tsvetanova Pavlova

Sofia
2024

I. Documents

As a reviewer, I have been presented with the following documents:

1.1. Dissertation manuscript on the topic: "Visualization of an electronic battlefield with elements of augmented reality".

2.2. Abstract of the dissertation work.

II. A brief assessment of the submitted documentation

The documents presented to me are sufficient, in terms of volume and content, to clarify the scientific, scientific-applied and applied results obtained as a result of the dissertation research.

The abstract of the dissertation work adequately reflects the structure and content of the dissertation manuscript.

III. Actuality of the dissertation

The PhD student formulated his main goal as: "To propose an efficient model for augmented representation of electronic battlefield objects with the application of augmented reality."

The objective thus defined is achieved through:

1. Analysis and evaluation of known applications of augmented reality information technology in the civil and military fields.

2 Determining the scope of applicability of augmented reality for application in training and combat conditions, when identifying an object and when integrating additional graphic and/or textual information to support the performance of certain tactical tasks.

3. Analysis of the problems accompanying the military application of augmented reality (within the scope of the dissertation research topic).

4. Proposed approaches and algorithms for accessing data for objects from the electronic battlefield.

5. A developed mathematical model of a sensor system and a proposed algorithm for field object identification.

6. Made an assessment of the effectiveness of the proposed algorithm, in the conditions of the implementation of field tasks.

As can be seen from the above, the results of research related to the creation of a uniform visual environment on the battlefield are presented in the dissertation work. This is a modern, up-to-date and necessary direction for scientific research. It communicates directly with current trends in applied science and has direct relevance to specific needs of the military.

IV. Description of the dissertation work

My manuscript submitted for review is structured in an introduction, three chapters, a conclusion and a list of references.

The **introduction** is structured and executed in a way that allows one to get an adequate idea of the nature and content of the dissertation research.

Chapter one in known stepan is introductory. In it, the author develops his view of the state, development and problems dictated by the topic of the dissertation research.

In the **second chapter**, problems related to the command and control system of the battlefield are discussed, highlighted in accordance with the topic of the dissertation work.

The **third chapter** examines current issues related to the use of augmented reality for the augmented battlefield.

V. Analytical characteristics of the dissertation work

The dissertation has a theoretical-applied character. This is determined both by the formulation of the scientific research task and by the ways of formalization and search for solutions.

Proposing new solutions to achieve the goal of the dissertation research reinforces the notion of its completion.

VI. Scientific contributions

As a scientific contribution of a methodological nature, the reviewer adopts the approach in the dissertation manuscript to solve the problems arising from the topic of the dissertation research.

VII. Scientific and applied contributions

1. The obtained results of the dissertation research, in the full volume of the manuscript, which show their applicability and content, including:

2. The main points of the theory and practice of augmented reality information technology, in the context of the topic of the dissertation research, are studied. The general principles of building applications with augmented reality in the process of information processing are defined.

3. The scope of application of augmented reality in the performance of tasks in the military sphere has been determined. A model of an advanced electronic battlefield is proposed.

4. Algorithms are proposed for accessing databases for the purposes of subsequent visualization in augmented reality systems.

5. A model of an embedded sensor subsystem for inertial navigation is presented. The sources of errors in sensor data processing have been studied and analyzed through a methodology developed for the purpose.

6. An architecture of a software application for augmented reality is proposed, accompanied by a developed algorithm for markerless identification of an object from the electronic battlefield.

VIII. About the PhD student's publications

Taking into account the content of the doctoral student's publications, I consider his publication activity to be good and corresponding in its content to obtaining the educational and scientific degree "doctor".

IX. Dissertation Manuscript Notes

The main requirement for obtaining an educational and scientific degree "doctor" is the availability of original scientific and scientific-applied results. They must be set out in the dissertation manuscript. The PhD student's drive in this regard is there, but the style of the presentation often makes it difficult to identify and define the contributing points in the dissertation manuscript.

X. Conclusions from the notes

The mentioned remarks are omissions and are of a decidedly non-essential nature from the point of view of revealing the topic of the dissertation research. They refer to the transparency and rigor of the presentation and in no way question the approach to organizing and conducting the research, the tools used for the purpose, its application and the interpretation of the results obtained.

CONCLUSION:

Based on the requirements of the "Law on the Development of the Academic Staff in the Republic of Bulgaria" and the Rules for its Implementation and taking into account what was said in the full volume of this review, I positively evaluate the dissertation work on the topic: "Visualization of an electronic battlefield with elements of augmented reality". This gives me the reason to propose that its author, eng. Lili Tsvetanova Pavlova, **be awarded** the educational and scientific degree: "Doctor".

REVIEWER:

**PROFESSOR   ATANAS NACHEV
DOCTOR OF TECHNICAL SCIENCES**