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«Metrological Support of Innovative Technologies» ICMSIT-II 2021

«Animated mixed reality models for teaching solid state physics»

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Problem statement

The trends prevailing over the past year in the educational process of students have exposed a number of difficulties in approaches, technological and software bases. In particular, one of the problems is the slow development of software models and their maintenance.

In this article, we consider one of the mechanisms that make it possible to simplify the development of three-dimensional models in solid state physics, as well as to provide their animation. The need for content development is emphasized in many works devoted to modern virtual learning technologies. This is often a complex process that requires deep specialized knowledge of 3D design and modeling. This, in turn, complicates the development of visual models for specific areas, for example, in physics

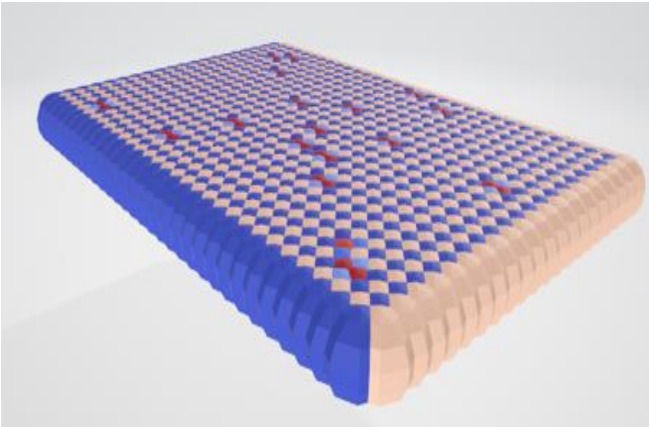


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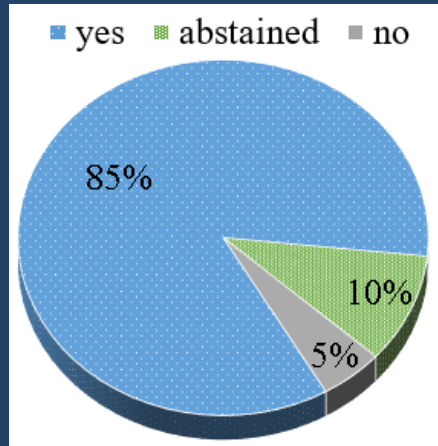
Solution methods

The work uses a number of different methods and technologies. The construction of the models themselves was carried out using the molecular dynamics method in the LAMMPS software package. The next step is to prepare the obtained data using the Paraview analysis and visualization application. Then the resulting model was exported to the Polygonal file format, suitable for further work in the Blender software package. The final stage consisted in downloading the obtained models to devices suitable for demonstration. ClassVR virtual and mixed reality headsets were used as such devices

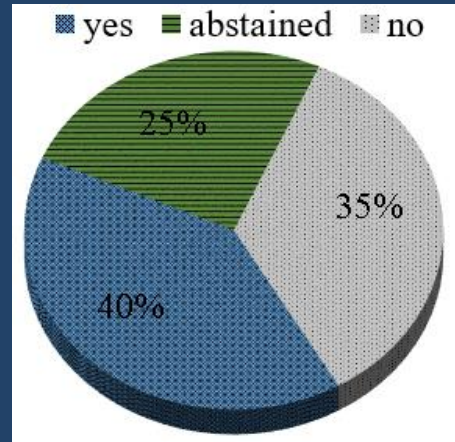


Conclusions

Results, implementation



(a)



(b)

The results of the survey of students: (a) on the use of models in the educational process, (b) on the willingness to independently develop models.

The stages are described and the mechanism of preparing the model for loading on virtual and mixed reality headsets is described in detail. Attention is focused on converting text data into a form suitable for building three-dimensional models and their animation.

Also, a survey of senior students was conducted on the advisability of using such models in the educational process and the complexity of independent development. More than 85 percent are in favor of using such training tools, but only 40 percent are willing to develop such models themselves. The main reason for the difficulties in detailed analysis was the initial stage of building a model in the molecular dynamics software package. The solution to this problem will be considered in subsequent works. The content of this work can be useful for physics teachers, content developers for virtual and mixed reality headsets, as well as undergraduate and graduate students in this field.



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