APPLICATION SOFTWARE PLATFORM IN TRAINING OF EXPERTS ON PROTECTION OF THE POPULATION AND INFRASTRUCTURE

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Abstract: *This report presents a software platform that can be used for computer simulation of one of the most dangerous natural disasters. Offers a software product can be used for training by experts on protection of the population and infrastructure.*

Keywords: TRAINING, PROTECTION, DISASTERS, COMPUTER SIMULATION

1. Introduction

In recent years, the swiftly development of computing and the widespread to use of personal computers and their growing capacity, follows a new directions in the development of information-technology so we can be apply for the training of experts in various scientific fields. The computer with appropriate software becomes a virtual toolkit with broad functionality and flexibility as conventional panels, rocks, buttons, etc.

Except in the control and management of real objects, virtual tools enable to simulate the operation of these objects and performing virtual experiments with varying different parameters, which would be difficult to implement real terms. The multimedia tools can be greatly improve and facilitate to learning process and allow for greater autonomy in self-study students.

The purpose of this report is a present a software platform which has a possibility to use by civil protection experts.

Last same years humanity suffered many man-made and natural disasters, accidents and catastrophes which caused damage to the environment, many victims and devastation of settlements worldwide. In the example are Tsunami in the Indian Ocean in 2004, there were approximately 250 thousand people died and 2 million injured. Other one is Hurricane Katrina flooding in New Orleans, earthquakes in India, Iran, China, Indonesia and Chile. Do not forget earthquakes in Japan after that Tsunami and Fukushima nuclear disaster. Last year there a strong earthquake with a magnitude of 6.5 on the Richter in central Italy there were many casualties and considerable losses in the country economy. One of the most frequently occurring natural disasters causing damage is an Earthquake. Earthquakes are all suddenly occurring short-term movements of the Earth's surface caused by natural causes. On Fig. 1 there are Earthquakes for a period of two weeks.
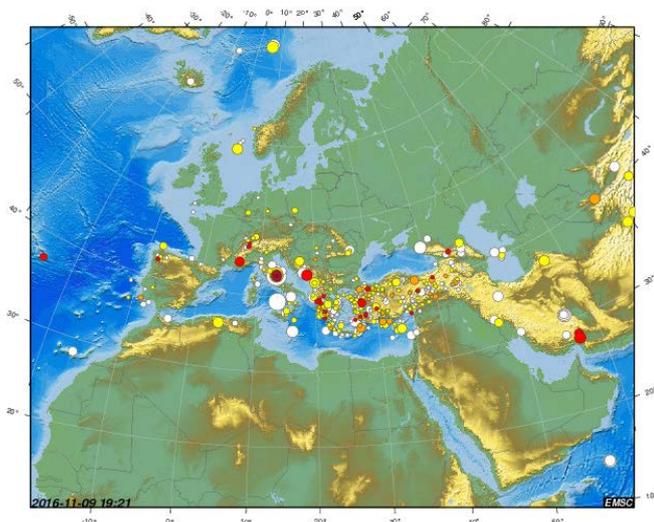

Fig. 1 *Earthquakes in all over the World for two weeks.*

An earthquake is a one of the most dangerous natural disaster on the last century in which had to take the most effective countermeasures. One of the countermeasures is to conduct seismic zoning of seismic risk areas in order to clarify the scope of areas under certain assumed maximum level of seismic hazard. In areas threatened by earthquakes on the Earth is introduced compulsory earthquake resistant construction. Its rules are consistent with the nature and extent of local seismic danger (presumed intensity earthquake hit, a state of rock massif, etc.) and taken into account in the design of appropriate technical facilities.

2. Measurement Methodology and Research Object

Solid Works is 3D CAD software for engineering design in mechanical engineering, industrial equipment, consumer products, automotive, aerospace, robotics, energy and many others. Solid Works offers opportunities for analysis of stress, strain, motion, tolerances, rendering, huge libraries of components, routing of pipes, tubes and wires and productivity tools. This software is suitable for parametric modeling of solids, based on building blocks. (See Fig. 2)
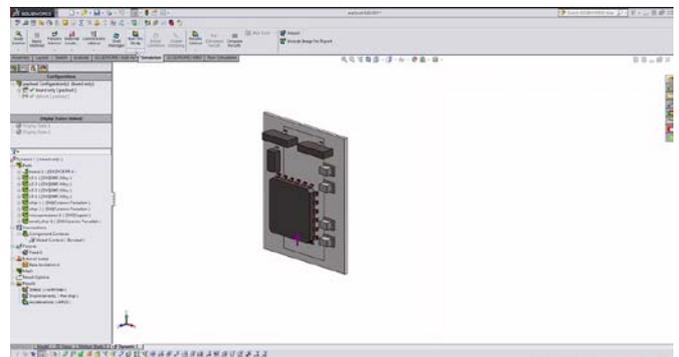

Fig. 2 *Parametric modeling.*

All dimensions and geometric relationships that are created in the model are stored in it. This opportunity allows subsequently making quick and easy adjustments to it. The different tools are show detail for sketching and adding geometric relationships and dimensions in sketches. The program has tools for creating, editing and reproduction of three-dimensional building blocks. The final product consists of a combination of many parts and components.

With powerful tools for validation and analysis "Solid Works Simulation" can be easily placed designed article under real operating conditions, to optimize and improve their quality without putting any means for real prototype and tests. That program has opportunity for set static and dynamic loads, different materials and conditions contact details which can be obtained their results of that evaluation. It can also create models of existing mechanisms and to check for errors in their movements, to assess all the variables of interest - forces the reactions, speed, acceleration, etc.

For dynamic analysis can include the frequency and locations of impact. A study of the effects of earthquakes is accomplished by spectral analysis (RS-analysis) as a linear dynamic method of statistical analysis. By measuring the pseudo-spectral acceleration provides insight into the dynamic behavior, velocity or displacement as a function of time and the degree of attenuation.

Spectral analysis measures the contribution of each natural mode of vibration to reflect the expected maximum seismic response of an essentially elastic structure. After creating a 3D model, we move on to the simulation by choosing the menu "Motion Study", and the menu type simulation chooses "Motion Analysis". We have an opportunity to ask different forces.
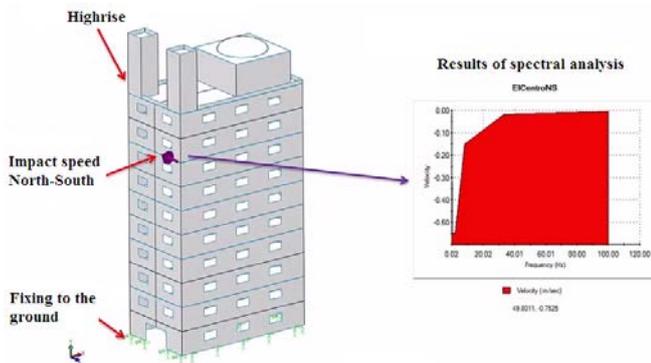

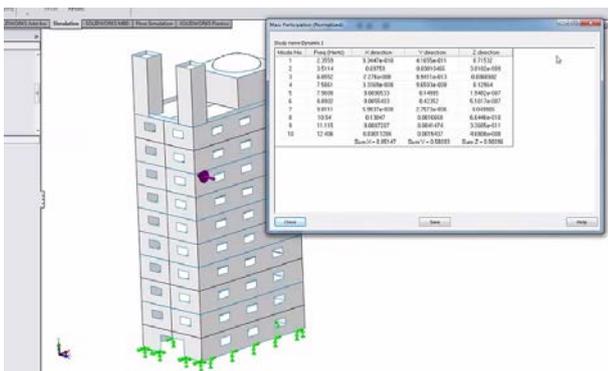**Fig. 3** *Spectral analysis of an impact earthquake on the building.*

Fig. 4 *Earthquake simulation.*

We may choose an earthquake start by menu „Trigger", „Condition" menu we would check a „Task End". Solid Works Simulation is able to assign the effects of gravitational forces (Gravity). It can also be set to the contact forces acting between the components using the menu "Contact". In the same menu and note the material of the contact elements.
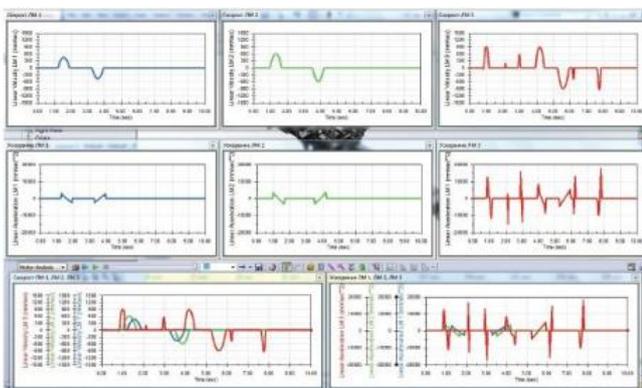

Fig. 5 *Simulation results.*

The results can be exported to Excel, for further analysis, which defines the maximum speeds and accelerations of linear manipulators.

3. Conclusion

Solid Works Simulation provides useful tools for every engineer that can be used for making the right decisions in the design of products. The interface is easy to use and has a rich set of tools which are undeniable advantages. Fully integrated into the operating environment of Solid Works, the simulations are available from the very beginning of the design process to final completion of the projects. The operating environment of Solid Works is a fully integrated into the simulations. They are available from the very beginning of the design process to final completion of projects.

The young audience refuses to play of passive role and prefers to play a leading role in the selection of communication channels in terms of customizing virtual content to exercise control over the design, creation of information and its dissemination. It acquired skills "digital juggling" and that the ability to perform multiple tasks at the same time must be adapted to the learning process.

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