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## Intelligent System of Distance Education of Engineers, based on Modern Innovative Technologies

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### Abstract

Nowadays, distance education is a promising direction for the training of engineers. There was developed the intellectual system of distance education for the training of qualified specialists of technical specialties on the expensive modern equipment in the laboratories of collective use. Processing of personal data for the purpose of selecting an individual educational plan for each student is based on the biological approach of artificial immune systems.

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### 1. Introduction

Nowadays, there is an acute problem of quality technical education organization to train specialists for modern high technologies. Often, higher and postgraduate education is not available to skilled specialists because full-time training does not allow to improve the skills on the job.

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The problem may be exacerbated because of the geographical remoteness of potential students from higher education institutions. In such cases in the world there are used various mechanisms of the organization of the learning process. There was well proven a distance education (DE), which brings together various forms of education with the use of modern information technology. The world's leading universities with a long history practice a distance learning form, such as: University of South Africa<sup>1</sup> - one of the first university with DE, the British Open University<sup>2</sup> - the largest DE university, Fern University in Hagen<sup>3</sup>, etc.

Distance education centers in Europe are the National Distance Education University<sup>4</sup> in Spain and the Baltic University. Nowadays, there is developed a huge amount of educational platforms that offer their DE courses, such as: Coursera<sup>5</sup>; EDX<sup>6</sup>; Udacity<sup>7</sup>; Open Yale Courses<sup>8</sup>; Teamtreehouse<sup>9</sup>, etc. The DE organization is carried out by the Internet using special software (shells).

The most common shells are: Sharepointlms, JoomlaLMS, OpenNet and MOODLE (Modular Object-Oriented Dynamic Learning Environment). Due to the open source code MOODLE<sup>10</sup> became widely known, the system is translated into more than 75 languages and is used in almost 50 thousand organizations from 200 countries of the world.

There are carried out various researches in the sphere of DE, for instance, analysis of the dynamics and efficiency of distance learning implementation based on different countries (Australia, Saudi Arabia, Russia, Turkey) which are presented in works [1,2]. Approaches based on the use of different simulators in the DE are shown in work [3]. Modern approaches to improve traditional methods of teaching online [4] enhanced by the approaches of artificial intelligence (AI) and cognitive science. In work [5] the authors presented the latest developments in the DE field, such as the use of ontological models, the creation of virtual laboratories, open training systems, the use of artificial intelligence methods, etc. In addition to educational technologies there are carried out distance learning environment development for access to laboratories of a common use, thus the work [6] shows remote experimental system that allows students to have an access for distance researches to the photovoltaic module.

In connection with the above, in order to solve the problem of highly skilled engineering staff training and distance education courses there can be relevant to use approaches of AI, which are used in the processing of students personal data, in the creation of individual education plans, in processing of multidimensional data, in forecasting results and in operational adjustment of process of knowledge acquiring, as well as in the use of laboratories of a common use.

There is proposed the following structure of the article. The second section shows an intelligent system of distance education, which consists of two parts, the first part explains the principle of processing of students personal data on the basis of artificial immune system (AIS), and the second part describes the distance operation in laboratories of a common use. The conclusion is presented in the third section.

## 2. Intellectual system of distance education

### 2.1. Processing of students personal data on the basis of AIS

Due to the fact that the DE system is a large automated self-contained resource it is expedient to use modern intellectual approaches of creating an individual path and rapid adjustment of the educational process. There are

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<sup>1</sup> [<http://www.unisa.ac.za/>]

<sup>2</sup> [<http://www.open.ac.uk/>]

<sup>3</sup> [<https://www.fernuni-hagen.de>]

<sup>4</sup> [<http://portal.uned.es/>]

<sup>5</sup> [<https://www.coursera.org>]

<sup>6</sup> [<https://www.edx.org>]

<sup>7</sup> [<https://www.udacity.com>]

<sup>8</sup> [<http://oyc.yale.edu>]

<sup>9</sup> [<http://teamtreehouse.com>]

<sup>10</sup> [<http://moodle.com>]

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