INTERNATIONAL JOURNAL OF HUMAN COMPUTING STUDIES

https://journals.researchparks.org/index.php/IJHCS e-ISSN: 2615-8159 | p-ISSN: 2615-1898

Volume: 04 Issue: 8 | Aug 2022

Computer Engineering Computer Technology in All Areas of Industry

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Abstract: The article deals with computer engineering, logical design, information technology in engineering, the communication capabilities of computers and computer networks, as well as the complexity of the product of industrial production and computer technology in all areas of industry.

Keywords: Computer, engineering, Computer engineering, IT industry, intellectual conveyor, methodologies, Multi-D design, computer architecture, computer interface.

A computer engineer is a specialist who has fundamental and professional training in three components — three "whales" on which modern information technologies are based – software, programmable (hardware) and network (communication). This allows them to feel free in various sectors of the IT industry: in the development of software systems, multi-core microprocessor systems and programmable systems on chips, wireless and mobile systems, distributed computing, network communications.

Computer engineers research, design, develop, test and control the production and installation of computer equipment, including computer chips, printed circuit boards, computer systems and related equipment such as keyboards, routers and printers. Their work is similar to that of electronics engineers in that they can design and test circuits and other electronic components; however, computer hardware engineers only do this work in relation to computers and computer hardware. They also focus on computer networks for data transmission and multimedia.

Computer engineering

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The work of a computer engineer is based on hardware - from schematics to architecture - but also focuses on operating systems and software. Computer engineers need to understand logic design, microprocessor system design, computer architecture, computer interfaces and constantly focus on system requirements and design.

The use of information technologies in engineering has led to the emergence of several qualitatively new trends in engineering activities that are inextricably linked with the computing and communication capabilities of computers and computer networks, including:

1. The creation of distributed integrated work environments — "intelligent pipelines". This trend originated in large software development projects and was quickly transferred to the field of design research, successfully continues to draw in all new areas of collective human activity. With regard to engineering, the practice of using modern computer means of communication and collaboration allows you to radically increase the productivity of engineering work, ensure the delivery of the necessary competencies to the right place and time anywhere in the world. Such a conveyor for engineering work, equipped with with

RESEARCH PARKS

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powerful automation, modeling, communication and information processing tools, it provides the developer, designer, engineer, technologist, designer with an intelligent collective working environment with the ability to quickly develop products and systems of almost any complexity. It is obvious that in the near future we can expect full integration of "smart" environments from the development stage to the final production and, possibly, the inclusion of the consumer at the stage of forming product requirements.

This kind of integration faces a number of problems, including ontological of a nature that goes beyond engineering and technical activities, and therefore requires the involvement of a wide range of specialists.

2. The transition to total "digitalization". The development of complex digital models of materials, processes, systems is based on the integration of scientific knowledge and the use of statistical methods for processing large amounts of data (Big Data). The transition to operating with digital models at all stages of the life cycle, including the design of materials with specified properties, allows modeling the behavior of products, components and systems in various conditions.

3. Transition to the level of work with sociotechnical systems. The increasing complexity of the systems led to the need to integrate the social component into the processes of designing and managing systems. The capabilities of modern software and computing hardware make it possible to model, analyze and visualize (for example, as in the Multi-D design methodology) all stages of creating the value of manufactured products, as well as to accumulate and process arrays of data related to their subsequent operation and life cycle management (the concept of UCC). Consideration of the interests of numerous stakeholders at all stages of the life cycle of a technical system — a prerequisite both for creating new products for the consumer market and for building complex engineering infrastructure facilities.

The complexity of an industrial production product (technical system8) can be determined through such characteristics as:

- ✓ the number and variety of component parts (parts, components, etc.) of the system;
- ✓ high number and specific properties of connections between components (including irreducibility of the properties of the entire structure as a whole to the sum of the properties of the components — "lack of additivity");
- ✓ the need to describe the properties and behavior of individual components (first of all, materials) at the nano-, micro-, meso—levels, and the entire structure - at the macro level, including, for example, possible phase transitions and progressive accumulation of damage;
- ✓ the need to take into account the mutual influence of fields of different physical nature (mechanical, thermal, aero-, hydro-, gas-dynamic, electromagnetic, acoustic, radiation, etc.);
- ✓ the need to take into account all types of external influences (static /stationary, dynamic / non-stationary, cyclic, vibration, shock, etc.) and operational modes, including violations of normal operating conditions, emergencies, out-of-design accidents, etc.;
- ✓ time spent on system development;
- ✓ complexity of the system management process and others 9

It should be noted that with the penetration of computer technologies into all spheres of industry, the intellectualization of "simple" technical objects10, a trend has formed towards the transition of almost all technical systems into the group of "complex" and "very complex".

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