****UDC ххх.ххх: (ххх.ххх + ххх.ххх)****

**INTEGRATED INTELLIGENT SYSTEMS FOR INDUSTRIAL AUTOMATION:**

**THE CHALLENGES OF INDUSTRY 4.0, INFORMATION GRANULATION**

**AND UNDERSTANDING AGENTS**

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***Abstract:*** *Consists in considering the**challenges of new automation paradigm Industry 4.0**and reviewing the-state-of-the-art in the field of its enabling information**and communication technologies, including Cyberphysical Systems, Cloud Computing, Internet of Things and Big Data.* *Some ways of multi-dimensional, multi-faceted industrial Big Data representation and analysis are suggested. The fundamentals of Big Data processing with using Granular Computing techniques have been developed. The problem of constructing special cognitive tools to build artificial understanding agents for Integrated Intelligent Enterprises has been faced..........*

***Keywords:*** *Industrial Automation, Agent,* *Intelligent Manufacturing System*, *Industry 4.0, Digitization, Virtual Enterprise, Cyberphysical System*.

**САНОАТ АВТОМАТЛАШТИРИШ УЧУН ИНТЕГРАЛЛАНГАН ИТЕЛЛЕКТУАЛ ТИЗИМЛАР: INDUSTRY 4.0****МУАММОЛАРИ, АХБОРОТЛИ БЎЛИНИШ ВА АГЕНТЛАР ТУШУНЧАСИ**

**Н.Р.Юсупбеков, В.Б.Тарассов**

***Аннотация:*** *Industry 4.0 автоматлаштиришнинг янги парадигмасининг муаммолари кўриб чиқилган ҳамда уни қўзғатадиган ахборот ва коммуникация технологиялари, шу жумладан киберфизик тизимлар, “булут”ли ҳисоблаш, Ашёларнинг интернети ва салмоқли маълумотлар борасида янги технологиялар таҳлил этилган. Салмоқли маълумотларни тақдим этиш ва таҳлил қилишнинг кўп ўлчамли ва кўп қиррали усуллари таклиф этилган. Ҳисобларни грануляциялаш усулларидан фойдаланган холда салмоқли маълумотларга ишлов бериш асослари ишлаб чиқилган. Интеграллашган интеллектуал корхоналар учун тушунишнинг сунъий агентларини қуриш учун маҳсус когниктив инструментларни яратиш муаммоси пайдо бўлгани таъкидланган...............*

***Таянч сўзлар:*** *саноат автоматлаштириш, агент, интеллектуал ишлаб чиқариш тизими, индустрия 4.0, рақамлаш, виртуал корхона, киберфизик тизим.*

**ИНТЕГРИРОВАННЫЕ ИНТЕЛЛЕКТУАЛЬНЫЕ СИСТЕМЫ ДЛЯ ПРОМЫШЛЕННОЙ АВТОМАТИЗАЦИИ: ПРОБЛЕМЫ INDUSTRY 4.0, ИНФОРМАЦИОННОЕ РАЗДЕЛЕНИЕ И ПОЯСННИЕ АГЕНТОВ**

**Н.Р.Юсупбеков, В.Б.Тарассов**

***Аннотация:*** *Рассмотрены проблемы новой парадигмы автоматизации Industry 4.0 и проанализированы новейшие технологии в области стимулирующих ее информационных и коммуникационных технологий, включая киберфизические системы, облачные вычисления, Интернет вещей и большие данные. Предложены некоторые способы многомерного, многогранного промышленного представления и анализа больших данных. Были разработаны основы обработки больших данных с использованием методов гранулярных вычислений. Отмечено возникновение проблемы создания специальных когнитивных инструментов для построения искусственных агентов понимания для интегрированных интеллектуальных предприятий..................*

***Ключевые слова:*** *промышленная автоматизация, агент, интеллектуальная производственная система, индустрия 4.0, оцифровка, виртуальное предприятие, киберфизическая система.*

**Introduction**

The aim of the paper consists in reviewing the-state-of-the-art in modern communication and information technologies, associated with the advent of the 4th Industrial Revolution (Digital Enterprise, Cyberphysical Systems, Internet of Things, Big Data Mining & Analytics, etc.) and specify appropriate new trends in building new generation intelligent systems of industrial automation........

**Research Methods and the Received Results**

Nowadays a main challenge in CIM and industrial automation is the development of integrated intelligent manufacturing systems and technologies enabling the implementation of Industry 4.0 initiative. These innovative approaches and technologies don’t develop from scratch (see [1,2])...............

**Conclusion**

Basic components and technologies of Industry 4.0 – a new paradigm of Industrial Automation, based on NBICS-convergence Basic components and technologies of Industry 4.0 – a new paradigm of Industrial Automation, based on NBICS-convergence concept and new generation integrated intelligent systems have been reviewed. The concept and new generation integrated intelligent systems have been reviewed. ..................

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17. .....
18. ....

**SAMPLE TABLE AND PICTURE**

Table 1.

**Matrix of stoichiometric coefficients**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
|  | -1 | -1 | -1 | 0 | 0 |
|  | -1 | 0 | -1 | 1 | 0 |
|  | -1 | 0 | 0 | -1 | 0 |



*Fig. 7.* ***The Recognition Process.***

#### SAMPLE of MATHEMATICS

 (1)