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МЕТОДИЧЕСКИЕ УКАЗАНИЯ

к практическим занятиям по дисциплине
«Английский язык» для студентов II курса специальности
6.050202 «Автоматизация и компьютерно-
интегрированные технологии» факультета ТАМІТ
дневной формы обучения

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Методические указания к практическим занятиям по дисциплине «Английский язык» для студентов II курса специальности 6.050202 «Автоматизация и компьютерно-интегрированные технологии» факультета ТАМПТ дневной формы обучения / Сост. Е.Е. Волошина, И.В. Моисейкина. – Севастополь: Изд-во СевНТУ, 2011. – 20 с.

Методические указания предназначены для практических занятий в 3 семестре по дисциплине «Английский язык» по специальности «Автоматизированные компьютерные технологии» факультета ТАМПТ дневной формы обучения. Цель методических указаний состоит в том, чтобы расширить лексический запас студентов и совершенствовать навыки чтения, перевода и аннотирования оригинальных научно-технических статей по специальности.

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ВВЕДЕНИЕ

Данные методические указания предназначены для студентов II курса специальностей 6.050202 «Автоматизация и компьютерно-интегрированные технологии» студентов технических специальностей второго курса дневной формы обучения.

Целью данных практических занятий является развитие навыков чтения и понимания литературы по специальности, изучение лексического материала, повторение и обобщение грамматического материала, предусмотренного программой второго курса, развитие умения вести беседу по заданной теме.

Методические указания состоят из 6 уроков, каждый из которых содержит текст, упражнения для закрепления грамматики, лексические упражнения профессионального содержания, соответствующие темам уроков.

Лексический материал содержит как профессиональную терминологию, так и слова и словосочетания из общей лексики, которые студенты смогут использовать в разговоре на различные темы.

LESSON 1.

Pre-text exercise 1. Look through these words and try to memorize them.

numerical control - числовое управление (вид автоматического управления);

rapidly expanding range – быстро растущее количество;

to be in no immediate danger of – быть в безопасности;

handicapped - человек с физическими/умственными недостатками;

pattern recognition – распознавание образов;

hardened – усиленный;

controller – автоматический регулятор, датчик;

actuator – (силовой) привод, пускатель;

monitor – наблюдать, следить;

test automation – испытательная автоматизация;

software-automation – автоматизация программного обеспечения;

macro recorder – макрорекодер

Pre-text exercise 2. Try to sum up everything you know about Automation and continue the phrase: “Automation – is...”

READ AND TRANSLATE THE TEXT

Automation

Automation (ancient Greek: = self dictated), roboticization or industrial automation or numerical control is the use of control systems such as computers to control industrial machinery and processes, replacing human operators. In the scope of industrialization, it is a step beyond mechanization. Whereas mechanization provided human operators with machinery to assist them with the physical requirements of work, automation greatly reduces the need for human sensory and mental requirements as well. Processes and systems can also be automated. Automation plays an increasingly important role in the global economy and in daily experience. Engineers strive to combine automated devices with mathematical and organizational tools to create complex systems for a rapidly expanding range of applications and human activities.

There are still many jobs which are in no immediate danger of automation. No device has been invented which can match the human eye for accuracy and precision in many tasks; nor the human ear. Even the admittedly handicapped human is able to identify and distinguish among far more scents than any automated device. Human pattern recognition, language recognition, and language production ability is well beyond anything currently envisioned by automation engineers. Specialized hardened computers, referred to as programmable logic controllers (PLCs), are frequently used to synchronize the flow of inputs from (physical) sensors and events with the flow of outputs to actuators and events. This leads to precisely controlled actions that permit a tight control of almost any industrial process.

Human-machine interfaces (HMI) or computer human interfaces (CHI), formerly known as man-machine interfaces, are usually employed to communicate with PLCs and other computers, such as entering and monitoring temperatures or pressures for

further automated control or emergency response. Service personnel who monitor and control these interfaces are often referred to as stationary engineers.

A separate form of automation involving computers is test automation, where computer-controlled automated test equipment is programmed to simulate human testers in manually testing an application. This is often accomplished by using test automation tools to generate special scripts (written as computer programs) that direct the automated test equipment in exactly what to do in order to accomplish the tests. Another separate field of automation is home automation. This type of automation emerged in the early 1990s. This type of automation is concerned with the controls of everything in a house, from lights and blinds through security and access system to heating, cooling, water supply and home theater systems.

A whole house system will gather and integrate all of these separate subsystems into one integrated system that can be managed from a central display panel, a remote control or even over the Internet from another physical location. A more common form of automation is more related to office automation is software-automation, where a computer by means of macro recorder software records the sequence of user actions (mouse and keyboard) as a macro for playback at a later time.

COMPREHENSION QUESTIONS

- 1) How is the word "Automation" translated?
- 2) What did mechanization provide the humans with?
- 3) What main advantages of automation can you name?
- 4) Can an automated device replace a man? Why?
- 5) What is the general use of hardened computers?
- 6) What is a test automation? What is it used for?
- 7) When did home automation emerge?
- 8) Is automation useful? Give your own opinion.
- 9) What is the use of software-automation?

Exercise 1. Translate the following expressions from English into Russian:

Numerical control, industrial machinery, automated devices, applications and human activities, match the human eye for accuracy, handicapped human, language production ability, currently envisioned, programmable logic controllers, human-machine interfaces, enter and monitor temperature.

Exercise 2. Find English equivalents for following words and word combinations in the text.

Промышленная автоматизация, оборудование, уменьшать потребность в чувственных и умственных способностях человека, распознавание человека, интерфейс типа «человек - машина», неподвижный инженер, автоматизированное испытательное оборудование, домашняя автоматизация, подсистема, автоматизация программного обеспечения, записывать последовательность действий пользователя.

Exercise 3. Translate the following sentences:

- 1) Автоматизация - это использование контрольных систем для контроля промышленным оборудованием и процессами.
- 2) Автоматизация играет важную роль в мировой экономике.
- 3) Но автоматизированные устройства не способны полностью заменить человека.
- 4) Ни одно устройство не сравнится с человеческим глазом по точности.
- 5) Домашняя автоматизация появилась в начале 1990-х и подразумевает полный контроль над всеми процессами, происходящими в доме: отопление, охлаждение воздуха, подача воды и даже домашний кинотеатр.

Exercise 4. Write down an annotation to the text using the following set phrases:

The main idea of the text is...

The author believes that...

The paper deals with...

The article poses the problem of...

LESSON 2.

Pre-text exercise 1. Look through these words and try to memorize them.

social issue – социальный аспект;

Luddites - луддиты, противники всякой механизации и автоматизации;

weaving loom – ткацкий станок;

displacement – замена;

unemployment – безработица;

higher paying – высокооплачиваемый;

odd – странный;

shift – смещение;

impact – влияние;

manufacturing – обрабатывающий;

devalue – девальвировать;

encroach – вторгаться;

muddy - смазать;

telephone switchboard – коммутатор;

radiography – радиография, рентгенография;

gene – ген;

sera – (serum) сыворотка крови;

cell – клетка;

tissue -ткань;

surgical – хирургический;

physician – терапевт;

culprit – виновник;

outsourcing – выходящие.

Pre-text exercise 2. Explain how the term “Social Issues” can be connected with automation.

READ AND TRANSLATE THE TEXT

Social Issues of Automation

Automation raises several important social issues. Among them is automation's impact on employment. Indeed, the Luddites were a social movement of English textile workers in the early 1800s who protested against Jacquard's automated weaving looms— often by destroying such textile machines— that they felt threatened their jobs. Since then, the term luddite has come to be applied freely to anyone who is against any advance of technology.

Some argue automation leads to higher employment. One author made the following case. When automation was first introduced, it caused widespread fear. It was thought that the displacement of human workers by computerized systems would lead to severe unemployment. In fact, the opposite has often been true, e.g., the freeing up of the labor force allowed more people to enter higher skilled jobs, which are typically higher paying.

One odd side effect of this shift is that "unskilled labor" now benefits in many "first-world" nations, because fewer people are available to fill such jobs. Some argue the reverse, at least in the long term. They argue that automation has only just begun and short-term conditions might partially obscure its long-term impact. Many manufacturing jobs left the United States during the early 1990s, but a one-time massive increase in IT jobs (which are only now being outsourced), at the same time, offset this. It appears that automation does devalue labor through its replacement with less-expensive machines; however, the overall effect of this on the workforce as a whole remains unclear.

Today automation of the workforce is quite advanced, and continues to advance increasingly more rapidly throughout the world and is encroaching on ever more skilled jobs, yet during the same period the general well-being of most people in the world (where political factors have not muddled the picture) has increased dramatically. What role automation has played in these changes has not been well studied. One irony is that in recent years, outsourcing has been blamed for the loss of jobs in which automation is the more likely culprit. This argument is supported by the fact that in the U.S., the number of insourced jobs is increasing at a greater rate than those outsourced.

Further, the rate of decline in U.S. manufacturing employment is no greater than the worldwide average: 11 percent between 1995 and 2002. In the same period, China, which has been frequently criticized for "stealing" American manufacturing jobs, lost 15 million manufacturing jobs of its own (about 15% of its total), compared with 2 million lost in the U.S.

Millions of human telephone operators and answerers, throughout the world, have been replaced wholly (or almost wholly) by automated telephone switchboards and answering machines. Thousands of medical researchers have been replaced in many medical tasks from 'primary' screeners in electrocardiography or radiography, to laboratory analyses of human genes, sera, cells, and tissues by automated systems. Even physicians have been partly replaced by remote, automated robots and by highly sophisticated surgical robots that allow them to perform remotely and at levels of accuracy and precision otherwise not normally possible for the average physician.

COMPREHENSION QUESTIONS

- 1) What issue does the automation rise?
- 2) Who are Luddities? Are there any of them nowadays? Give your opinion.
- 3) What odd side effect of the automation can you name?
- 4) When did many manufacturing jobs leave the USA?
- 5) Is automation of the workforce today quite advanced?
- 6) What is the rate of decline in U.S. manufacturing employment?
- 7) What is China frequently criticized for?
- 8) What medical jobs were replaced by automated systems?

Exercise 1. Translate the following expressions from English into Russian:

Impact on employment, textile workers, automated weaving looms, widespread fear, higher paying, massive increase, offset, workforce is quite advanced, worldwide average, telephone switchboards, electrocardiography, radiography, tissue, highly sophisticated surgical robot.

Exercise 2. Find English equivalents for the following words and word combinations in the text:

Влияние, общественное движение, автоматизированные ткацкие станки, технический прогресс, замена людей на компьютеризированные системы, обрабатывающая промышленность, вторгаться, терапевты были заменены на современных роботов-хирургов.

Exercise 3. Translate the following sentences:

- 1) Луддиты - это общественное движение английских работников текстильной промышленности, которые выступали против любого проявления технического прогресса.
- 2) Раньше считалось, что замена человека компьютеризованной системой может привести к безработице.
- 3) Станным побочным эффектом этой замены оказалось то, что непрофессиональные работники хорошо зарабатывают.
- 4) В настоящее время автоматизация уже достаточно развита и продолжает прогрессировать.
- 5) В ходе автоматизации терапевтам пришли на смену дистанционно управляемые автоматизированные роботы-хирурги.

Exercise 4. Write down an annotation to the text using the following set phrases:



The text deals with...

The paper is concerned (with)...

The author emphasizes the idea that...

LESSON 3.

Pre-text exercise 1. Look through these words and try to memorize them.

workforce – рабочая сила;

machinery – машинное оборудование;

junkyard – свалка старых автомобилей;

substantially – существенно, значительно;

piston – поршень;

error rate – частота появления ошибок;

hazardous – опасный;

oil refining – перегонка нефти;

industrial chemicals – промышленные химикаты;

metal working – обработка металлов;

contender – противник;

shift – изменение;

safety issues – проблемы техники безопасности;

human error – ошибка оператора;

consequence – следствие;

Tree Mile Island – остров Три Майл

to anticipate – ожидать, предупреждать;

actual failure mode – фактическое состояние отказа;

overseer – смотритель;

to inundate – наполнять;

irrelevant information – несущественная информация;

fallible – подверженный ошибкам;

expertise – квалификация;

domain – область;

foolproof – надежный.

Pre-text exercise 2. Give the synonyms to the word “Emphasis”.

READ AND TRANSLATE THE TEXT

Current Emphasis in Automation

Currently, for manufacturing companies, the purpose of automation has shifted from increasing productivity and reducing costs, to broader issues, such as increasing quality and flexibility in the manufacturing process.

The old focus on using automation simply to increase productivity and reduce costs was seen to be short-sighted, because it is also necessary to provide a skilled workforce who can make repairs and manage the machinery. Moreover, the initial costs of automation were high and often could not be recovered by the time entirely new manufacturing processes replaced the old. (Japan's "robot junkyards" were once world famous in the manufacturing industry.)



Automation is now often applied primarily to increase quality in the manufacturing process, where automation can increase quality substantially. For example, automobile and truck pistons used to be installed into engines manually. This is rapidly being transitioned to automated machine installation, because the error rate for manual installment was around 1-1.5%, but has been reduced to 0.00001% with automation. Hazardous operations, such as oil refining, the manufacturing of industrial chemicals, and all forms of metal working, were always early contenders for automation.

Another major shift in automation is the increased emphasis on flexibility and convertibility in the manufacturing process. Manufacturers are increasingly demanding the ability to easily switch from manufacturing Product A to manufacturing Product B without having to completely rebuild the production lines.

Safety Issues on Industrial Automation

One safety issue with automation is that while it is often viewed as a way to minimize human error in a system, increasing the degree and levels of automation also increases the consequences of error. For example, The Three Mile Island nuclear event was largely due to over-reliance on "automated safety" systems. Unfortunately, in the event, the designers had never anticipated the actual failure mode which occurred, so both the "automated safety" systems and their human overseers were inundated with vast amounts of largely irrelevant information.

With automation we have machines designed by fallible people with high levels of expertise, which operate at speeds well beyond human ability to react, being operated by people with relatively more limited education (or other failings, as in Chernobyl disaster).

Ultimately, with increasing levels of automation over ever larger domains of activities, when something goes wrong the consequences rapidly approach the catastrophic. This is true for all complex systems however, and one of the major goals of safety engineering for nuclear reactors, for example, is to make safety mechanisms as simple and as foolproof as possible.

COMPREHENSION QUESTIONS

- 1) What was the original purpose of automation?
- 2) What is the current purpose of automation?
- 3) Why was the old focus on using automation short-sighted?
- 4) What are the drawbacks of manual installment?
- 5) For what purposes was the emphasis in automation shifted to flexibility and convertibility?
- 6) Enumerate the safety issues on industrial automation.
- 7) What catastrophic consequences of the disregards of safety issues do you know?
- 8) What is the major goal of safety engineering for nuclear reactors?

Exercise 1. Find English equivalents for the following words and word combinations in the text:

Уменьшение стоимости; производственный процесс; применение механизации; устанавливать вручную (какую-либо деталь); линии производства; проблемы техники безопасности; Чернобыльская авария.

Exercise 2. Translate into Russian:

To shift from; to repair the machinery; initial costs; manufacturing industry; to increase quality; to minimize error; convertibility; safety engineering.

Exercise 3. Translate into English using words and word combinations from the text:

- 1) Первоначально основными задачами механизации было повышение производительности и уменьшение затрат, а в настоящее время ее цель – это увеличение качества и гибкости производственного процесса.
- 2) Частота ошибок автоматизированной установке автомобильных поршней значительно ниже, чем при ручной установке.
- 3) При увеличении гибкости производственного процесса производителям не нужно полностью перестраивать производственные линии.
- 4) Проблемы техники безопасности промышленной механизации не следует рассматривать только, как способ уменьшить количество ошибок оператора.
- 5) Последствия сбоев в автоматизированной системе могут быть катастрофическими, как, например, на Чернобыльской АЭС.

Exercise 4. Make up your own dialogs using the new words and word combinations from the text.

LESSON 4.

Pre-text exercise 1. Look through these words and try to memorize them.

Test automation – автоматическое тестирование;
 actual outcome – фактический результат;
 predicted outcome – прогнозированный (расчетный) результат;
 setting up – наладка, регулировка;
 precondition – предварительное условие, предпосылка;
 test control – контроль за проведением тестов (испытаний);
 formalized – формальный;
 graphical user interfaces (GUI) – графический интерфейс пользователя;
 tester – тестирующий; лицо, производящее испытание, анализ;
 to perceive – воспринимать, считать;
 code – (зд.) информация;
 time consuming – трудоемкий; отнимающий много времени;
 performance tests – промышленные испытания;
 record and playback features – функции записи и воспроизведения;
 interactively – в диалоговом режиме;
 maintainability – техническое обслуживание;
 engineering approach – программно-технический подход;

oracle – предсказание, прогноз;
 reasonably – разумно, здраво; достаточно;
 test data creation – создание тестовых данных;
 problem detection – выявление ошибок;
 parsing agent – анализатор;
 polling agent – запрашивающее устройство;
 defect logging – учет дефектов;
 end-to-end fashion – сквозной метод (способ);
 cost-effective – рентабельный, прибыльный;
 regression testing – регрессионное тестирование;
 model-based testing – тестирование по эталонной модели;
 test case generation – генерирование контрольных примеров;

Pre-text exercise 2. Name the fields of use of test automation.

READ AND TRANSLATE THE TEXT

Test Automation

Test automation is the use of software to control the execution of tests, the comparison of actual outcomes to predicted outcomes, the setting up of test preconditions, and other test control and test reporting functions. Commonly, test automation involves automating a manual process already in place that uses a formalized testing process.

Over the past few years, tools with graphical user interfaces (GUI) that help programmers quickly create applications have dramatically improved programmer productivity. This has increased the pressure on testers, who are often perceived as bottlenecks to the delivery of software products. Testers are being asked to test more and more code in less and less time. Test automation is one way to do this, as manual testing is time consuming. As different versions of software are released, the new features will have to be tested manually time and again. But, now there are tools available that help the testers in the automation of the GUI which reduce the test time as well as the cost; other test automation tools support execution of performance tests.

Many test automation tools provide record and playback features that allow users to record interactively user actions and replay it back any number of times, comparing actual results to those expected. However, reliance on these features poses major reliability and maintainability problems. Most successful automators use a software engineering approach, and as such most serious test automation is undertaken by people with development experience.

Another important aspect of test automation is the idea of partial test automation, or automating parts but not all of the software testing process. If, for example, an oracle cannot reasonably be created, or if fully automated tests would be too difficult to maintain, then a software tools engineer can instead create testing tools to help human testers perform their jobs more efficiently. Testing tools can help automate tasks such as product installation, test data creation, GUI interaction, problem



detection (consider parsing or polling agents equipped with oracles), defect logging, etc., without necessarily automating tests in an end-to-end fashion.

Test automation is expensive and it is an addition, not a replacement, to manual testing. It can be made cost-effective in the longer term though, especially in regression testing. One way to generate test cases automatically is model-based testing where a model of the system is used for test case generation, but research continues into a variety of methodologies for doing so.

COMPREHENSION QUESTIONS

- 1) What does test automation mean?
- 2) How was the programmer productivity improved?
- 3) What is the main advantage of test automation over manual testing?
- 4) What features do many test automation tools provide?
- 5) Enumerate the important aspects of test automation. Give the examples.
- 6) What are the drawbacks of test automation?
- 7) How can these drawbacks be overcome?
- 8) What is one of the ways to generate test cases automatically?

Exercise 1 Find English equivalents for the following words and word combinations in the text:

Проверка выполнения проводимых тестов; сократить время тестирования; обрабатывать информацию; ручное тестирование; сравнивать результаты тестирования; эффективно осуществлять тестирование.

Exercise 2. Translate into Russian:

Bottlenecks; GUI interaction; automator; development experience; software testing process; end-to-end testing.

Exercise 3. Translate into English using words and word combinations from the text:

- 1) При автоматическом тестировании для проверки выполнения проводимых тестов используется программное обеспечение.
- 2) Автоматическое тестирование помогает сократить время тестирования и упростить его процесс.
- 3) В наши дни создается большое количество инструментов с графическим интерфейсом.
- 4) Ручное тестирование является очень трудоемким процессом.
- 5) Наилучший вариант использования автоматических тестов — это регрессивное тестирование.

Exercise 4. Write an annotation to the text using the following set phrases:

The paper discusses the important problem of...

The article is devoted to the problem of...

The text is headlined ...

LESSON 5.

Pre-text exercise 1. Look through these words and try to memorize them.

Robotics – робототехника;

working knowledge – рабочее владение, практические знания;

appearance – внешний вид;
 vastly – чрезвычайно, очень;
 structure – устройство;
 autonomous control – автономное управление;
 kinematic chain – кинематическая цепь (схема);
 akin – похожий;
 actuator – силовой привод;
 joint – шарнир;
 degree of freedom – степень свободы;
 open serial chain – открытая последовательная цепь;
 Stewart platform – платформа Стюарта, станок-гексапод;
 to mimic – копировать, подражать;
 end effector – рабочий орган (робота);
 welding device – сварочное устройство.

Pre-text exercise 2. What do you know about Robotics? What is it?

READ AND TRANSLATE THE TEXT

Robotics

Robotics is the science and technology of robots, their design, manufacture, and application. Robotics requires a working knowledge of electronics, mechanics and software, and is usually accompanied by a large working knowledge of many subjects. A person working in the field is a roboticist.

Although the appearance and capabilities of robots vary vastly, all robots share the features of a mechanical, movable structure under some form of autonomous control. The structure of a robot is usually mostly mechanical and can be called a kinematic chain (its functionality being akin to the skeleton of the human body).

The chain is formed of links (its bones), actuators (its muscles) and joints which can allow one or more degrees of freedom. Most contemporary robots use open serial chains in which each link connects the one before to the one after it. These robots are called serial robots and often resemble the human arm. Some robots, such as the Stewart platform, use closed parallel kinematic chains.

Other structures, such as those that mimic the mechanical structure of humans, various animals and insects are comparatively rare. However, the development and use of such structures in robots is an active area of research (e.g. biomechanics). Robots used as manipulators have an end effector mounted on the last link. This end effector can be anything from a welding device to a mechanical hand used to manipulate the environment.

COMPREHENSION QUESTIONS

- 1) What does the robotics mean? What are the tasks of this science?
- 2) What does the robotics require?
- 3) What features do all robots share?
- 4) What structures can robots have?
- 5) What parts is the kinematic chain formed?
- 6) What robots are called serial?

7) What robots are called manipulators?

8) What forms can an end effector have?

Exercise 1. Find English equivalents for the following words and word combinations in the text:

Робототехника; разработка роботов; механическая система (устройство); современные роботы; область исследований; быть похожим на что-либо (кого-либо), подражать чему-либо (кому-либо).

Exercise 2. Translate into Russian:

Application; mechanics; roboticist; serial robots; to resemble; close parallel kinematic chain; mounted on; end effector.

Exercise 3. Translate into English using words and word combinations from the text:

- 1) Робототехника – это наука, занимающаяся разработкой механических движущихся устройств.
- 2) Робототехника требует глубоких практических знаний во многих областях науки.
- 3) Внешний вид и способности роботов очень различаются.
- 4) Кинематическая цепь состоит из соединений, силовых приводов и шарниров. Эта цепь обеспечивает определенную степень свободы.
- 5) Роботы, которые используются как манипуляторы, оборудованы рабочим органом.

Exercise 4. Write an annotation to the text using the following set phrases:

The author expresses his viewpoint...

In this article it was found out that...

The theme of this text is...

LESSON 6.

Pre-text exercise 1. Look through these words and try to memorize them.

actuator-силовой привод

stored energy- запасённая (накопленная) энергия

to be by far the best-быть безусловно превосходящим

compressed air- сжатый воздух

vast majority-подавляющее большинство

stepper motor-шаговый двигатель

in step- синхронно

piezo motor-пьезомотор

whereby- при помощи; посредством чего-либо

piezoceramic legs-пьезокерамические фазы

vibrate- колебаться; вращаться

pulling force- сила тяги

inflate- накачивать воздухом

contract- сжиматься, стягиваться

braiding- оплетение (кабеля)

in response to- в ответ на

electrical simulation- электростимуляция

stretch- растягиваться

tube- резиновая камера

filament- нить тока

Pre-text exercise 2. Give your ideas of the sphere of possible use of robots.

READ AND TRANSLATE THE TEXT

Components of Robots

Actuation

The actuators are the 'muscles' of a robot; the parts which convert stored energy into movement. By far the most popular actuators are electric motors, but there are many others, some of which are powered by electricity, while others use chemicals, or compressed air.

Motors: By far the vast majority of robots use electric motors, of which there are several kinds.

Stepper Motors: As the name suggests, they rotate in steps of a few degrees at a time, under the command of a controller. This makes them easier to control, as the controller knows exactly how far they have rotated, without having to use a sensor.

Piezo Motors: They are also known as ultrasonic motors. These work on a fundamentally different principle, whereby tiny piezoceramic legs, vibrating many thousands of times per second, walk the motor round in a circle or a straight line. The advantages of these motors are incredible resolution, speed and available force for their size.

Air Muscles: The air muscle is a simple yet powerful device for providing a pulling force. When inflated with compressed air, it contracts by up to 40% of its original length. The key to its behavior is the braiding visible around the outside, which forces the muscle to be either long and thin, or short and fat. Since it behaves in a very similar way to a biological muscle, it can be used to construct robots with a similar muscle/skeleton system to an animal.

Electro active Polymers: These are a class of plastics which change shape in response to electrical stimulation. They can be designed so that they bend, stretch or contract. However, they are expected to improve in the future, where they may be useful for micro robotic applications.

Elastic nanotubes are a promising, early-stage experimental technology. The absence of defects in nanotubes enables these filaments to deform elastically by several percent, with low energy storage levels.

COMPREHENSION QUESTIONS

- 1) What are the muscles of the robot?
- 2) Name the most common actuators.
- 3) Are they powered by electricity or by oil?
- 4) The vast majority of robots use electric motors, don't they?
- 5) Under the command of a controller how do the stepped motors rotate?
- 6) How do the ultrasonic motors work?
- 7) Are there any advantages of the ultrasonic motors?

8) What is the air muscle?

9) What is the main principle of its behavior?

Exercise 1. Find equivalents in English in the text:

Вращаться синхронно; работать по совершенно иному принципу; при накачивании сжатым воздухом; сжиматься (стягиваться) на 40 % от начальной длины; начальная стадия развития технологии.

Exercise 2. Translate into Russian:

- 1) The source of the stored energy in modern robots is the actuator.
- 2) Whereby the development of the micro robotic technology makes the automation industry easily controlled.
- 3) There are a lot of advantages in the straightforward usage of the electro-stimulated pulling force.
- 4) Since the behavior of the stepped motor isn't enough studied yet, we consider the tiny piezoceramic legs.
- 5) Under the process of contracting, the elastic tubes can vibrate over the 30 % times per second of its original speed.

Exercise 3. Translate into English using words and word combinations from the text:

- 1) Они также известны как ультразвуковые двигатели.
- 2) Отсутствие дефектов в нанолампах позволяет этим нитям накаливанию деформироваться эластично на несколько процентов с низким уровнем сохранения энергии.
- 3) Преимущество этих двигателей - невероятное разрешение, скорость и доступная мощность для их размера.
- 4) Однако, ожидается, что они станут лучше в будущем, когда они могут быть полезными для микро роботизированных применениях.
- 5) Они могут быть разработаны таким образом, что станут гнуться, растягиваться или сжиматься.
- 6) Это облегчает их контроль, т.к. контроллер знает точно как далеко они вращались без необходимости использования сенсора.

Exercise 4. Make up your own dialogs using the words and word combinations of this text.

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