КІРОВОГРАДСЬКИЙ НАЦІОНАЛЬНИЙ ТЕХНІЧНИЙ УНІВЕРСИТЕТ

Англійська мова наукового спілкування

Методичні вказівки

для магістрів спеціальності

«Комп'ютерна інженерія» та
«Комп'ютерні науки та інформаційні технології»

Частина 1

(електронне видання)

Кіровоград 2016

Англійська мова наукового спілкування: Методичні вказівки для магістрів спеціальностей «Комп'ютерна інженерія» та «Комп'ютерні науки та інформаційні технології». Матеріал даних методичних вказівок призначений для практичних занять. За основу було взято оригінальні технічні тексти комп'ютерної тематики, які розташовані у порядку поступового граматичного ускладнення. Частина 1 (електронне видання) / Укл.: к.п.н., доц. С.В. Щербина., – Кіровоград, КНТУ 2016. – 43 с. Умовн. друк. арк.: 2. (64890 др. зн.).

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Частина 1

(електронне видання)

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Затверджено на засіданні
кафедри іноземних мов
Протокол №10 від 20.04.2016 р.

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Передмова

Іноземним мовам належить вагоме місце, зокрема, на сучасному етапі історичного розвитку нашого суспільства, коли триває інтеграція України в європейське співтовариство, налагоджуються нові зв'язки нашої держави з іншими країнами світу. Спеціаліст зі знанням іноземної мови отримує за таких умов доступ до найсучасніших здобутків світової науково-технічної думки і можливість сприяти виходу української науки і техніки на світову арену.

Методичні вказівки для магістрів спеціальностей «Комп'ютерна інженерія» та «Комп'ютерні науки та інформаційні технології» з дисципліни «Англійська мова наукового спілкування» розроблені відповідно до рекомендацій чинної навчальної програми, яка передбачає формування у магістрів професійної та наукової мовної компетенції, необхідної для ефективної участі у процесі навчання та в різноманітних ситуаціях професійного та наукового спілкування. Вони призначені для практичних занять з мовним матеріалом для забезпечення освітніх запитів і гармонійного поєднання навчального процесу та наукової діяльності і укладені з метою ознайомити студентів комп'ютерних спеціальностей з особливостями англомовного комп'ютерного дискурсу, виробити у них навички самостійної роботи з іноземною фаховою літературою, сприяти розвитку вміння спілкуватися на професійні теми англійською мовою.

Методичні вказівки складаються з п'яти уроків, розроблених на основі десяти аутентичних текстів. Тексти охоплюють широке коло тем, які входять у сферу професійних інтересів майбутніх фахівців з комп'ютерних наук. Оскільки одиницею навчання є цілісний текст, студенти отримують можливість не лише засвоїти терміни відповідної галузі знань, але також ознайомитись з їхньої сполучуваністю.

До кожного тексту додано вправи для перевірки і закріплення характерних лексичних і синтаксичних одиниць, повторення ключових граматичних структур англійської мови. Серед лексичних вправ можна виділити вправи на переклад лексики термінологічного характеру. Вправи на будову слова мають за мету навчити студентів перекладати слова, до складу яких входять префікси і суфікси,

які часто зустрічаються в науково- технічній літературі. Кожен урок містить вправи присвячені розвитку навичок написання листів, наведені тексти для перекладу українською мовою, тексти підібрані з оригінальної технічної літератури і розраховані на розвиток навичок роботи зі словником. Підібраний текстовий матеріал є органічним компонентом професійної підготовки студентів. У кінці кожного уроку подаються розмовні завдання у вигляді монологів, які розраховані на активізацію комунікативної спроможності студентів у фаховому тексті.

Computer history of the world

In the beginning, God created the Bit and the Bite. And from those he created the Word.

And there were two Bytes in the Word; and nothing else existed. And God separated the One from the Zero; and he saw it was good.

And God said - Let the Data be; And so it happened. And God said - Let the Data go to the proper places. And he created floppy disks and hard disks and compact disks.

And God said - Let the computers be, so there would be a place to put floppy disks and hard disks and compact disks. Thus God created computers and called them hardware.

And there was no software yet. But God created programs; small and big...

And told them - Go and multiply yourselves and fill all the Memory.

And God said - I will create the Programmer; And the Programmer will make new programs and govern over the computers and programs and Data.

And God created the Programmer; and put him at Data Center; And God showed the Programmer the Catalog Tree and said - You can use all the volumes and subvolumes but do not use Windows.

And God said - It's not good for the programmer to be alone. He took a bone from the Programmer's body and created a creature that would look up at the Programmer; and admire the Programmer; and love the things the Programmer does; And God called the creature: the User.

And the Programmer and the User were left under the naked DOS and it was Good.

But Bill was smarter than all the other creatures of God. And Bill said to the User - Did God really tell you not to run any programs?

And the User answered - God told us that we can use every program and every piece of Data but told us not to run Windows or we will die.

And Bill said to the User - How can you talk about something you did not even try. The moment you run Windows you will become equal to God. You will be able to create anything you like by a simple click of your mouse.

And the User saw that the fruits of the windows were nicer and easier to use. And the User saw that any knowledge was useless - since windows could replace it.

So the User installed the windows on his computer; and said to the Programmer that it was good.

And the Programmer immediately started to look for new drivers. And God asked him - What are you looking for? And the Programmer answered - I am looking for new drivers because I can not find them in the DOS. And God said - Who told you need drivers? Did you run Windows? And the Programmer said - It was Bill who told us to!

And God said to Bill - Because of what you did, you will be hated by all the creatures. And the User will always be unhappy with you. And you always sell Windows.

And God said to the User - Because of what you did, the windows will disappoint you and eat up all your Resources; and you will have to use lousy programs; and you will always rely on the Programmers help.

And God said to Programmer - Because you listened to the User, you will never be happy. All your programs will have errors and you will have to fix them and fix them to the end of time.

And God threw them out of the Data Center and locked the door and secured it with a password.

U N I T 1

The Internet and email

Vocabulary list

Mouse click	depression of a button on a computer mouse
Obsessed	to have the mind excessively preoccupied with a single emotion or topic
Impact	the striking of one body against another
Locomotives	able to move independently from place to place
Fuel	something consumed to produce energy, especially
Consumption	the act or process of consuming
Stripped	to remove all excess detail from; reduce to essentials
Mudslides	a mudflow, especially a slow-moving one
Preparedness	the state of being prepared, especially military readiness for combat
Lucrative	producing wealth; profitable

Lead-in

Exercise 1. *What title will be suitable for the text about* **The Internet***?*

Exercise 2. *Read the words and give their definition:* mudslides, obsessed, impact.

Exercise 3. *Match two columns:*

1	Lucrative	A	able to move independently from place to place
2	Fuel	B	the state of being prepared, especially military readiness for combat
3	Preparedness	C	depression of a button on a computer mouse
4	Locomotives	D	something consumed to produce energy, especially
5	Mouse click	E	producing wealth; profitable

Reading

Read the text.

The Internet

The Internet likes you, really likes you. It offers you so much, just a mouse click or finger tap away. Go Christmas shopping, find restaurants, locate partying friends, and tell the world what you're up to. Some of the finest minds in computer science, working at start-ups and big companies, are obsessed with tracking your online habits to offer targeted ads and coupons, just for you.

But now — nothing personal, mind you — the Internet is growing up and lifting its gaze to the wider world. To be sure, the economy of Internet selfgratification is thriving. Web start-ups for the consumer market still sprout at a torrid pace. And young corporate stars seeking to cash in for billions by selling shares to the public are consumer services — the online game company Zynga last week, and the social network giant Facebook, whose stock offering is scheduled for next year.

As this is happening, though, the protean Internet technologies of computing and communications are rapidly spreading beyond the lucrative consumer bailiwick. Low-cost sensors, clever software and advancing computer firepower are opening the door to new uses in energy conservation, transportation, health care and food distribution. The consumer Internet can be seen as the warm-up act for these technologies.

The concept has been around for years, sometimes called the Internet of Things or the Industrial Internet. Yet it takes time for the economics and engineering to catch up with the predictions. And that moment is upon us.

"We're going to put the digital 'smarts' into everything," said Edward D. Lazowska, a computer scientist at the University of Washington. These abundant smart devices, Dr. Lazowska added, will "interact intelligently with people and with the physical world."

The role of sensors — once costly and clunky, now inexpensive and tiny — was described this month in an essay in The New York Times by Larry Smarr, founding director of the California Institute for Telecommunications and Information Technology; he said the ultimate goal was "the sensor-aware planetary computer".

That may sound like blue-sky futurism, but evidence shows that the vision is beginning to be realized on the ground, in recent investments, products and services, coming from large industrial and technology corporations and some ambitious start-ups.

One of the hot new ventures in Silicon Valley is Nest Labs, founded by Tony Fadell, a former Apple executive, which has hired more than 100 engineers from Apple, Google, Microsoft and other high-tech companies.

Its product, introduced in late October, is a digital thermostat, combining sensors, machine learning and Web technology. It senses not just air temperature, but the movements of people in a house, their comings and goings, and adjusts room temperatures accordingly to save energy.

At the Nest offices in Palo Alto, Calif., there is a lot of talk of helping the planet, as well as the thrill of creating cool technology. Yoky Matsuoka, a former Google computer scientist and winner of a MacArthur “genius” grant, said: “This is the next wave for me”.

Matt Rogers, 28, a Nest co-founder, led a team of engineers at Apple that wrote software for iPods. He loved his job and working for Apple, he said. But he added: “In essence, we were building toys. I wanted to build a product that could really make a huge impact on a big problem”.

Across many industries, products and practices are being transformed by communicating sensors and computing intelligence. The smart industrial gear includes jet engines, bridges and oil rigs that alert their human minders when they need repairs, before equipment failures occur. Computers track sensor data on operating performance of a jet engine, or slight structural changes in an oil rig, looking for telltale patterns that signal coming trouble.

SENSORS on fruit and vegetable cartons can track location and sniff the produce, warning in advance of spoilage, so shipments can be rerouted or rescheduled. Computers pull GPS data from railway locomotives, taking into account the weight and length of trains, the terrain and turns, to reduce unnecessary braking and curb fuel consumption by up to 10 percent.

Researchers at General Electric, the nation's largest industrial company, are working on such applications and others. One is a smart hospital room, equipped with three small cameras, mounted inconspicuously on the ceiling. With software for analysis, the room can monitor movements by doctors and nurses in and out of the room, alerting them if they have forgotten to wash their hands before and after touching patients — lapses that contribute significantly to hospital-acquired infections. Computer vision software can analyze facial expressions for signs of severe pain, the onset of delirium or other hints of distress, and send an electronic alert to a nearby nurse.

Last month, G.E. announced that it was opening a new global software center in Northern California and would hire 400 engineers there to write code to accelerate the commercial development of intelligent machines. "Our role is to build the software that enables us to do this industrial Internet," said William Ruh, who will head the new center.

In 2008, I.B.M. declared that it was going to make a big push into the industrial Internet, using computing intelligence to create more efficient systems for utility grids, traffic management, food distribution, water conservation and health care. Smarter Planet was the label the company tacked on to the initiative, and industry analysts wondered if it was more than a sales campaign.

In a recent interview, Samuel J. Palmisano, chief executive of I.B.M., emphasized that the program's origins were in the company's research labs rather than its marketing department. "The timing was right because we had the technology," he said.

Today, I.B.M. says it is working on more than 2,000 projects worldwide that fit in the Smarter Planet category.

In Dubuque, Iowa, for example, I.B.M. has embarked on a long-term program with the local government to use sensors, software and Internet computing to improve the city's use of water, electricity and transportation. In a pilot project this year, digital water meters were installed in 151 homes, and software monitored water use and patterns, informing residents about ways to consume less and alerting them to likely leaks. The savings in the pilot, nearly 7 percent, would translate into curbing water use by 65 million gallons a year in Dubuque, a Midwestern city of 60,000.

In Rio de Janeiro, I.B.M. is employing ground and airborne sensors, along with artificial intelligence software, for neighbourhood-level disaster preparedness. The system, which is being developed by I.B.M. researchers, aims to predict heavy rains and mudslides up to 48 hours in advance and conduct evacuations before they occur - and avoid tragedies like the one last year, when a mudslide left more than 70 people dead and thousands homeless.

The next wave of computing does not step away from the consumer Internet so much as build on it for different uses (posing some of the same sorts of privacy and civil liberties concerns). Software techniques like pattern recognition and machine learning used in Internet searches, online advertising and smartphone apps are also ingredients in making smart devices to manage energy consumption, health care and traffic.

Take Google's robot car program, for example. The automated cars, each with a human along for the ride, have deftly navigated thousands of miles on California highways and city streets. The project — a research effort so far — uses a bundle of artificial intelligence technologies, as does Google's search-and- ad business.

GLOBAL PULSE is a new initiative by the United Nations to leverage data from the consumer Internet for global development. So-called sentiment analysis of messages in social networks and phone text messages – using natural-language deciphering software – can help predict job losses or lower spending in a region, or disease outbreaks.

In parts of Africa and Asia, where cellphones serve as automated bank tellers, with text messages initiating money transfers, they can also serve as an early warning system. When savings transfers drop to 50 cents or zero from $10 a month, "something is happening that is evident in the digital smoke signals," said Robert Kirkpatrick, the director of Global Pulse. School feeding programs or government assistance might be stepped up to prevent a region from slipping back into poverty.

Global Pulse, begun in late 2009, is conducting research and trying to forge partnerships with private companies. To really succeed, the program needs the cooperation of Internet companies and cellphone carriers to give it access to social network and text-message communications, which would be stripped of any personally identifying information.

Mr. Kirkpatrick terms such contributions “data philanthropy.” His argument is that cooperating helps companies by nurturing economic health in the markets where they do business.

Global Pulse, Mr. Kirkpatrick said, is exploring new frontiers in knowledge with its real-time tracking of what is happening to people, not to sell them something but to target development efforts. “This is computational behavioural economics,” he said. “We’re part of a whole new science here.”

Exercise 4. *Look at the statements and decide if they are true or false.*

1. The Internet can offer a large number of services and possibilities.
2. Zynga is online game company.
3. SENSORS on fruit and vegetable can’t track location and sniff they produce.
4. GLOBAL PULSE is social network.
5. The director of Global Pulse is Mr. Kirkpatrick.

1	2	3	4	5
T\F	T\F	T\F	T\F	T\F

Exercise 5. *Read the questions and choose the correct answers.*

1. What devices are opening the door to new uses?
    a) Low-cost sensors, clever software and advancing computer firepower.
    b) High-cost sensors, clever software and advancing computer firepower.
    c) Low-cost sensors and advancing computer firepower.
    d) High-cost sensors and advancing computer firepower
2. How was the concept called?
    a) the Internet of Thoughts or the Software Internet.
    b) the Internet of Things or the Software Internet.
    c) the Internet of Thoughts or the Industrial Internet.
    d) the Internet of Things or the Industrial Internet.
3. What products are being used in many industries?
    a) communicating services and computing intelligence.
    b) communicating sensors and computing CPU.

c) communicating sensors and computing intelligence.

d) communicating CPU and computing intelligence.

4. When did Global Pulse begin?

a) in the late 2009;

b) in the late 2012;

c) in the early 2012;

d) in the late 2010.

5. Mr. Kirkpatrick's argument that cooperating helps companies by nurturing economic health in the markets where they do business, doesn't it?

a) Yes.

b) No.

c) It is not mentioned in the text.

d) It's not stated in the text.

Language Work: Complex Object

Exercise 6. *While translating indicate those sentences in which the Complex Object is used.*

1. They saw her enter the room.

2. He would like them to come in time.

3. He observed the engineers to make experiments with that substance

4. The chief wanted the programmers to install the new software.

5. They think him to be the prominent scientist.

Language Work: Word Building

Exercise 7. *Arrange the following words to the similar meaning.*

to grow, to house, powerful, total, to perfect an antenna, a way, a use, great, to increase

Writing

Exercise 8. *Write an email (60-80 words) to a local newspaper, asking for information about the hardware they use in their production, the page layout software they use, and the data communication they use. Use key words from the box.*

Input/output devices, operating system, graphics, data, hardware, software, application, page layout

Exercise 9. *Read the text and summarize it in 5 sentences.*

Biological cryptography system

CUHK iGEM 2010 team is formed by a group of undergraduates and instructors from the Chinese University of Hong Kong. Our project is to create a brand new biological cryptography system. We harness the incredible adaptability of simple organisms in the tortured environment to make sure that the message stored can be left undisturbed regardless of any environmental changes. Employing a specially people are denied access to obtain the information.

Quick fact: In our system, 1g of *E. coli* can store max 931,322 GB data. In comparison, typical hard disk can store 1-4GB/gram.

As the leakage of national confidential information and personal privacy become more and more serious, we believe that this biological cryptography can help protect the important information of the mankind. The innovative cryptography system heralds a new era of information security.

This year in the iGEM 2010 competition, we will use bacteria not only as a biological data storage unit but also to integrate an intrinsic encryption system with it.

With the advancement of electronic engineering after the World War II, more complex ciphers are developed, which plays a pivotal role in the security system of this information explosive age. However mathematical advances result in the weakening or even attack on the ciphers. It makes us rethink whether data storage and encryption in computer is the only way to ensure data safety

Using bacteria as the information storage device is not a new idea; Bancroft's group had long proposed the storage of information in DNA early in 2001. Yachie's group had also been working on the bacterial data storage method in Bacillus subtilis in 2007. In contrast to electronic data storage, the nature of bacterial data storage depends on the bacteria one would pick - Bacillus subtilis would create extra copies of the data, inserting into their genomes which would further safeguard the information;

Deinococcus radiodurans, one of the most radioresistant organisms known, would survive even under the electromagnetic pulse and radiation after the nuclear attack. But how are we actually improving the security system by simply storing information in bacteria?

Exercise 10. *Write an abstract "Creating software" to the conference «Innovations in Science and Technology» (120 words).*

Translation

Exercise 11. *Read and translate the following sentences from Ukrainian into English.*

1. Оптичні сканери - це пристрої вводу, які копіюють графічні зображення для подальшого їх зберігання у числовій формі.
2. Найбільш поширеними пристроями вводу є клавіатура та такі індикаторні пристрої, як маніпулятор - "миша" та кульковий маніпулятор.
3. Іншими поширеними пристроями вводу/виводу є сканери, модеми для зв'язку між комп'ютерами, "миша" та джойстик, принтери для друку копій на папері.
4. Хоча такі дисплеї дорожчі за електронно-променеві трубки, вони також використовуються у високопродуктивних комп'ютерах, де принципове значення має мала вага та відсутність мерехтіння зображення.
5. В цілому комп'ютер складається з трьох частин: центрального процесора, пристроїв вводу-виводу та блоку пам'яті.

Exercise12. *Translate the word-combinations from English into Ukrainian.*

Low-cost sensors; rapidly spreading; to catch up with; facial expressions; neighbourhood-level; clunky; step away; food distribution; start-ups; digital thermostat.

Exercise 13. *Read the text and render it into Ukrainian.*

First deadly sin of software development: Lust (overengineering)

Modern programming languages tend to add features as they mature. They pile on layer after layer of abstraction, with new keywords and structures designed to aid code

readability and reusability - provided you take the time to learn how to use them properly.

At the same time, the discipline of programming has changed over the years. Today you have giant tomes of design patterns to pore over, and every few months someone comes up with a new development methodology that they swear will transform you into a god among programmers.

But what looks good on paper doesn't always work in practice, and just because you can do something doesn't mean you should. As programming guru Joel Spolsky puts it, "Shipping is a feature. A really important feature. Your product must have it."

Programmers who fetishize their tools inevitably lose sight of this, and even the seemingly simplest of projects can end up mired in development hell. Resist your baser impulses and stick to what works.

Discussion Question

Exercise 14. *How do you imagine the future of the mankind when mass production of humanoid robots and androids become possible? Give reasons. Use keywords from the box.*

Effective, performance, work force, substitution, disabled persons

U N I T 2

New technologies

Vocabulary list

quantum computer	a computation device that makes direct use of quantum mechanical phenomena, such as superposition and entanglement, to perform operations on data
entanglement	occurs when particles such as photons, electrons, molecules as large as buck balls, and even small diamonds interact physically and then become separated
tiny silica chip	a minute slice of a semiconducting material, such as silicon or germanium, doped and otherwise processed to have specified electrical characteristics, especially before it is developed into an electronic component or integrated circuit
scalable	capable of being scaled or climbed
optical quantum computing	is the area of study focused on developing computer technology based on the principles of quantum theory
'spooky action at a distance’	is the nonlocal interaction of objects that are separated in space
wrap your mind around	understand, comprehend, get your mind around
Photon	is an elementary particle, the quantum of light and all other forms of electromagnetic radiation, and the force carrier for the electromagnetic force, even when static via virtual photons
multi-purpose	having many different uses

Lead-in

Exercise 1. *What title will be suitable for the text about* ***Multi-Purpose Optical Chip****?*

Exercise2. *Read the words and give their definition:* tiny silica chip, quantum computer, entanglement.

Exercise 3. *Match two columns:*

1	scalable	A	understand, comprehend, get your mind around
2	wrap your mind around	B	capable of being scaled or climbed
3	photon	C	having many different uses
4	multi-purpose	D	is the area of study focused on developing computer technology based on the principles of quantum theory
5	optical quantum computing	E	is an elementary particle, the quantum of light and all other forms of electromagnetic radiation, and the force carrier for the electromagnetic force, even when static via virtual photons

Reading

Read the text.

Multi-Purpose Photonic Chip Paves the Way to Programmable Quantum Processors

A multi-purpose optical chip which generates, manipulates and measures entanglement and mixture — two quantum phenomena which are essential driving forces for tomorrow's quantum computers — has been developed by researchers from the University of Bristol's Centre for Quantum Photonics. This work represents an important step forward in the race to develop a quantum computer.

The fundamental resource that drives a quantum computer is entanglement — the connection between two distant particles which Einstein famously called 'spooky action at a distance'. The Bristol researchers have, for the first time, shown that this remarkable phenomenon can be generated, manipulated and measured entirely on a tiny silica chip. They have also used the same chip to measure mixture — an often unwanted effect from the environment, but a phenomenon which can now be controlled and used to characterize quantum circuits, as well as being of fundamental interest to physicists.

"In order to build a quantum computer, we not only need to be able to control complex phenomena such as entanglement and mixture, but we need to be able to do this on a chip, so that we can scalably and practically duplicate many such miniature circuits — in much the same way as the modern computers we have today," says Professor Jeremy O'Brien, Director of the Centre for Quantum Photonics. "Our device enables this and we believe it is a major step forward towards optical quantum computing."

The chip, which performs several experiments that would each ordinarily be carried out on an optical bench the size of a large dining table, is 70 mm by 3 mm. It consists of a network of tiny channels which guide, manipulate and interact single photons — particles of light. Using eight reconfigurable electrodes embedded in the circuit, photon pairs can be manipulated and entangled, producing any possible entangled state of two photons or any mixed state of one photon.

"It isn't ideal if your quantum computer can only perform a single specific task," explains Peter Shadbolt, lead author of the study, which is published in the journal Nature Photonics. "We would prefer to have a reconfigurable device which can perform a broad variety of tasks, much like our desktop PCs today — this reconfigurable ability is what we have now demonstrated. This device is approximately ten times more complex than previous experiments using this technology. It's exciting because we can perform many different experiments in a very straightforward way, using a single reconfigurable chip."

The researchers, who have been developing quantum photonic chips for the past six years, are now working on scaling up the complexity of this device, and see this technology as the building block for the quantum computers of the future.

Dr Terry Rudolph from Imperial College in London, UK, believes this work is a significant advance. He said: "Being able to generate, manipulate and measure entanglement on a chip is an awesome achievement. Not only is it a key step towards the many quantum technologies — such as optical quantum computing — which are going to revolutionize our lives, it gives us much more opportunity to explore and play with some of the very weird quantum phenomena we still struggle to wrap our minds around. They have made it so easy to dial up in seconds an experiment that used to take us months that I'm wondering if even I can run my own experiment now!"

Review Questions

Exercise 4. *Look at the statements and decide if they are true or false.*

1. The connection between two distant particles is called triangulation.
2. Mixture is an often unwanted effect from the environment.
3. It is ideal if your quantum computer can only perform a single specific task.
4. Nowadays quantum computers it something like PCs but more expensive.
5. Quantum computers are very slow.

1	2	3	4	5
T\F	T\F	T\F	T\F	T\F

Exercise 5. *Read the questions and choose the correct answers.*

1. Who has developed a multi-purpose optical chip?
   a) Researchers at the University of Stuttgart.
   b) Researchers at the University of Oxford.
   c) Researchers at the University of Bristol.
   d) Researchers at the University of Boston.
2. How is the fundamental resource that drives a quantum computer called?
   a) confusion;
   b) tangle;
   c) disorder;
   d) entanglement.

3. What main ability is needed to build a quantum computer?
   a) to control entanglement;
   b) to control mixture;
   c) to control entanglement and mixture;
   d) to be able to control entanglement and mixture on a chip.
4. What is inside the chip?
   a) neural network;
   b) network of tiny channels which guide, manipulate and interact single photons;
   c) fuzzy logic;
   d) several layers;
5. What possibilities will be given by quantum technology to scientists?
   a) dial up in seconds an experiment that used to take us months;
   b) scientific field for research;
   c) it's just useless theory;
   d) effective work.

Language Work: Subject

Exercise 6. *Translate the following sentences paying attention to the Subjective Infinitive construction (Complex Subject).*

1. Electronics is thought to be a young science.
2. The electric generator is known to be a machine that converts mechanical energy into electrical energy.
3. Alpha rays are considered to be positively charged helium atom.
4. An electric cell is believed to consist of an electrolyte and two electrodes.
5. This voltage source was supposed to supply current for this circuit.
6. The value of the output voltage of the cell was found to depend only on the material used.
7. Due to these experiments this substance was shown to be a good conductor.

8. The secondary coil of the transformer is assumed to have more turns than the primary one.

9. Cadmium was reported to be useful for application in transistor.

10. This scientist is expected to make a report on the fundamentals of radio engineering.

11. The designer is said to construct a new device by using semiconductors.

12. The antenna was found to receive only a small part of energy radiated by the transmitter.

13. Atomic nuclei are believed to be composed of protons and neutrons.

Language Work: Finding Equivalents

Exercise 7. *Give Ukrainian equivalents of the following word combinations (terms).*

1. artificial horizon	7. original equation
2. remote control	8. straight angle
3. direct current	9. low-flying
4. acrobatic maneuvers	10. short-circuit
5. parasitic antenna	11. rapid change
6. aerodynamic missile	12. low water

Writing

Exercise 8. *Write an email (60-80 words) to your friend describing the pros and cons of gaming. Use key words from the box.*

Game platforms, personal computer, multiplayer online game, addiction, favorite, genre, action, strategy

Exercise 9. *Read the text and summarize it in 5 sentences.*

Compression is the key

Before subjecting the DNA sequences to synthesis, a compression step is subsequent to the translation process.

Deflate – renowned as a lossless data compression algorithm that uses a combination of Huffman coding and LZ77 algorithm, this compression process is beneficial in two aspects - firstly, more information could be included when comparing to the uncompressed message of the same length and secondly, homopolymer and repetitive regions could be reduced significantly. This is fundamentally crucial to the infrastructure of the DNA storage system as homopolymer and repetitive regions in DNA sequences are devastating to both DNA synthesis and sequencing, with the compression algorithms these cases would be minimal.

Incorporating a short message is not our purpose, instead we are pursuing for a true massively parallel storage system that one can systematically incorporate useful information neglecting its size.

In order to store a large piece of information such as a photograph or a dictionary, it is impossible to include it within a single piece of DNA as this is limited by the current DNA synthesis technology. One approach is to fragment the information into pieces and insert them into the cells. However simply fragmenting the information followed by insertion to the cell would destroy all the data, as the order of these fragments is unknown. To overcome such an obstacle, a novel information system was invented. Each sequence that we are inserting into the bacterial cell composes of three sectors - Headers, Messages and Checksum. Header is the address of that particular message fragment, which consist of 8 DNA bases with each 2 bases as one unit - namely zone, region, area and district. The message is self-explanatory - the message fragment itself and the checksum is an identification and correction system for minor mutations.

Exercise 10. *Write an abstract "Programming" to the conference «Innovations in Science and Technology» (120 words).*

Translation

Exercise 11. *Read and translate the following sentences from Ukrainian into English.*

1. Струменеві принтери такі ж зручні у користуванні, як і матричні, але характеризуються нижчим рівнем шуму.

2. Незважаючи на значні успіхи у розробці пристроїв для вторинного зберігання інформації, деякі комп'ютери можуть продаватися взагалі без таких пристроїв.
3. Первинна пам'ять - це блок пам'яті з безпосереднім для центрального процесора; сучасні процесори здатні працювати з обсягом первинної пам'яті до 4 гігабайт.
4. Двома головними показниками потужності комп'ютера є обсяг пам'яті та швидкість обробки даних.
5. Персональний комп'ютер (ПК) - це незалежний мікрокомп'ютер, дія якого базується на мікропроцесорі, тобто невеличкій напівпровідниковій мікросхемі, що виконує функції центрального процесора.

Exercise 12. *Translate the word-combinations from English into Ukrainian.*
data compression; uncompressed message; fundamentally crucial; storage system; massively parallel; synthesis technology; novel information system; namely zone; self-explanatory; minor mutations.

Exercise 13. Read the text and render it into Ukrainian.

Principle

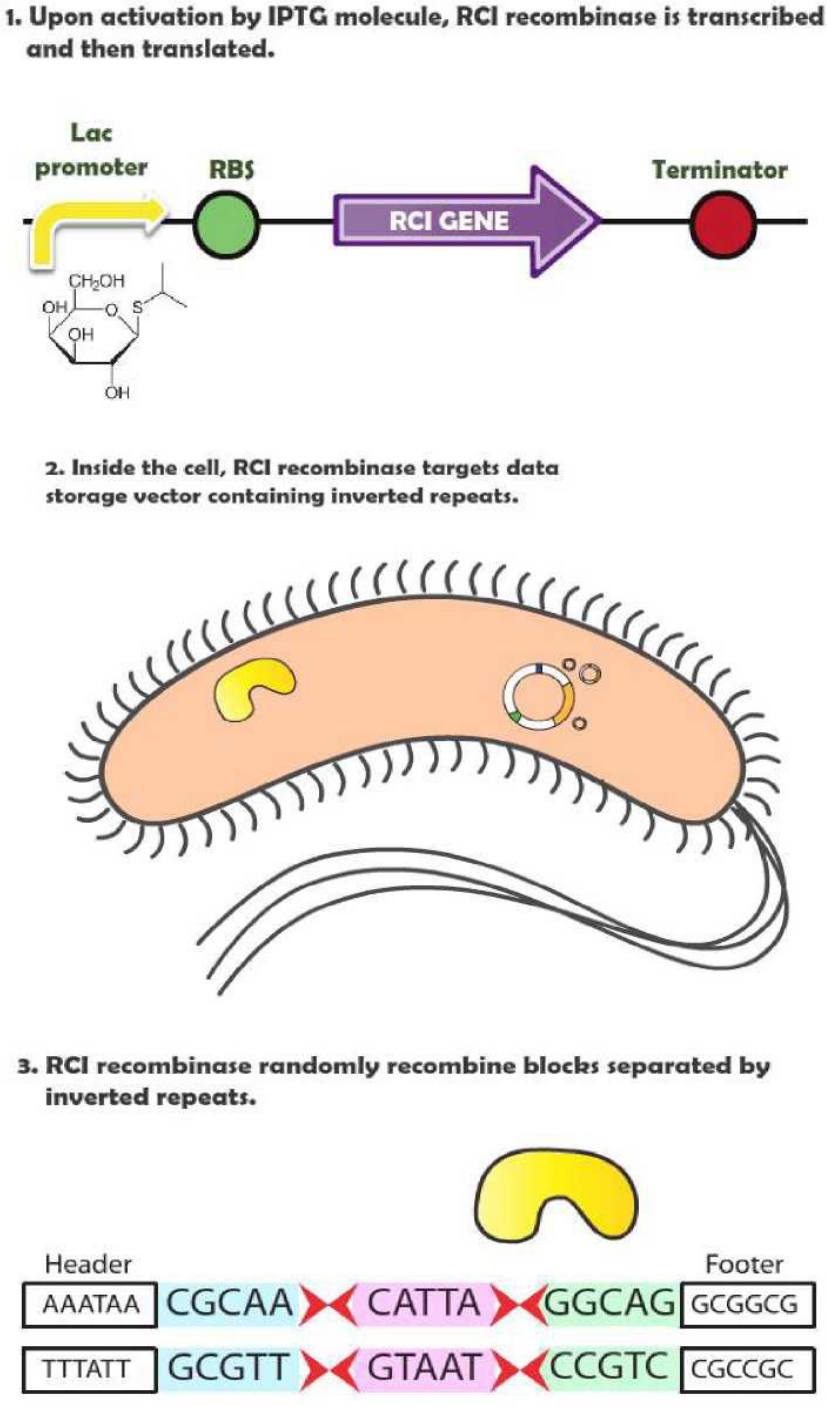
Bioencryption by recombination – Principle

Site-specific recombination systems are classified into two distinctive groups, integration-excision and inversion systems. Our Shufflon system uses the latter one. In this shufflon system, Rci-mediated recombinations occur between any repeat sequences causing inversion of the DNA segments independently or in groups.

Rci-dependent deletion of shufflon segment flanked by the natural repeat sequences was not occurred, i.e., the DNA sequences between repeat after recombinations are conserved and no loss of DNA sequence were found.

For the repeat sequence, there are mainly four groups, repeat a, b, c, d. There are seven different repeat sequences in nature. There are repeat 1-7. Repeat 1,2 belong to repeat a, repeat 4, 6, 7 belong to repeat b, repeat 5 belongs to repeat c, and repeat 3 belongs to repeat d.

Experiments showing that the inversion frequency with DNA sequences flanked by two repeat is the best, and it is much higher than that with any two combination of repeat a, b, c, d flanking the DNA sequence.

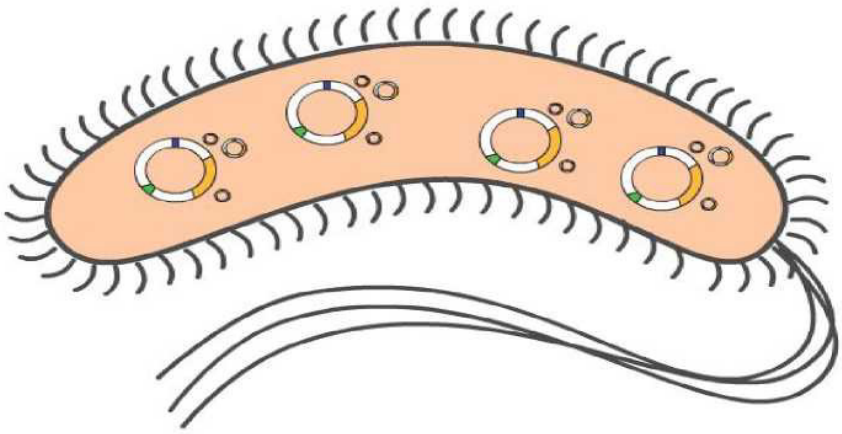


There are 12 bp sequences before every 19 bp repeat sequence. With this sequence, it can further enhance the inversion frequency, while the mechanism is yet unknown. In our project, we just need to exploit the shufflon system for recombination. Therefore, we added the specific 12 bp sequences before every 19 bp repeat sequence we added.

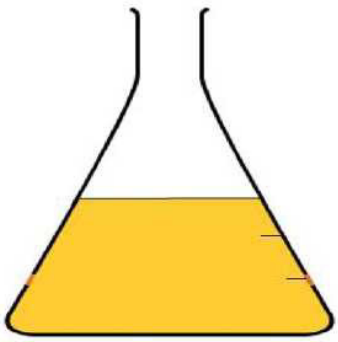
For the Rci recombinase, it is shown that the inversion caused by the wide type (WT) is greater than that with modified, or point mutation at some positions of rci gene. Therefore, we decide to use wide type rci recombinase in our project.

Rci recombination system: In our project, we constructed a Rci recombination system, with regulation of expression.

4. The host cell duplicates the data storage vectors, which helps to ensure data integrity by redundancy.



5. The total data storage volume is theoretically unlimited. With the wet weight of *E.coli* as 1E-12 g, 1 gram of *E.coli* can store up to 931 322 GB data (1kb data storage vector insert size). In comparison, typical computer hard drive can store only 1-4 GB/g.



First, a promotor, which was a lac operon, was located in the beginning of the system. It allowed users to use IPTG as a regulator to control expression of rci recombinase. The Ribosome binding site (RBS) was allocated at second position, next to rci recombinase at third place. RBS allowed ribosome binding before translational process, so ribosome can translate the rci gene right after RBS gene. Finally, a bidirectional double terminator was allocated at the forth position. It allowed terminator on both direction of transcription, so there was no reverse transcription of rci gene into mRNA which led to wrong protein formation.

Discussion Question

Exercise 14. Why does the Shufflon system use the inversion systems? Is it better? Why do you think so? Give your reasons. Use keywords from the box.

U N I T 3

Program design and Computer Languages

Vocabulary list

artificial language	a language of a typically very limited size which emerge either in computer simulations between artificial agents, robot interactions or controlled psychological experiments with humans
imperative style of programming	programming paradigm that describes computation in terms of statements that change a program state
abstraction (computer scince)	the process by which data and programs are defined with a representation similar in form to its meaning (semantics), while hiding away the implementation details
portable application software	sometimes also called standalone, is a program designed to run on a compatible computer without being installed in a way that modifies the computer's configuration information
virtual machine	a software implemented abstraction of the underlying hardware, which is presented to the application layer of the system
capability	ability to perform
debugging	removing errors, defects, deficiencies, or deviations from
features	facial characteristics
implementation	putting into practical effect

Lead-in

Exercise 1. *Why* ***"Program Design"*** *is a suitable title for the text about programming languages?*

Exercise 2. *Read the words and give their definition:* split, artificial language, imperative style of programming.

Exercise 3. *Match two columns:*

1	abstraction (computer science)	A	sometimes also called standalone, is a program designed to run on a compatible computer without being installed in a way that modifies the computer's configuration information
2	capability	B	removing errors, defects, deficiencies, or deviations from
3	implementation	C	the process by which data and programs are defined with a representation similar in form to its meaning (semantics), while hiding away the implementation details
4	debugging	D	putting into practical effect
5	portable application software	E	ability to perform

Reading

Read the text.

Program design

A programming language is an artificial language designed to express computations that can be performed by a machine, particularly a computer. Programming languages can be used to create programs that control the behavior of a machine, to express algorithms precisely, or as a mode of human communication.

Most programming languages describe computation in an imperative style, as a sequence of commands, although some languages, such as those that support functional programming or logic programming, use alternative forms of description.

A programming language is usually split into the two components of syntax (form) and semantics (meaning) and many programming languages have some kind of written specification of their syntax and/or semantics. Some languages are defined by a

specification document, for example, the C programming language is specified by an ISO Standard, while other languages, such as Perl, have a dominant implementation that is used as a reference.

Next will be described dialects of BASIC.

In computer programming, BASIC (an acronym which stands for Beginner's All-purpose Symbolic Instruction Code) is a family of high-level programming languages designed to be easy to use.

The original Dartmouth BASIC was designed in 1964 by John George Kemeny and Thomas Eugene Kurtz at Dartmouth College in New Hampshire, USA to provide computer access to non-science students. At the time, nearly all use of computers required writing custom software, which was something only scientists and mathematicians tended to do. The language and its variants became widespread on microcomputers in the late 1970s and 1980s.

Design and implementation

Programming languages share properties with natural languages related to their purpose as vehicles for communication, having a syntactic form separate from its semantics, and showing language families of related languages branching one from another. But as artificial constructs, they also differ in fundamental ways from languages that have evolved through usage. A significant difference is that a programming language can be fully described and studied in its entirety, since it has a precise and finite definition. By contrast, natural languages have changing meanings given by their users in different communities. While constructed languages are also artificial languages designed from the ground up with a specific purpose, they lack the precise and complete semantic definition that a programming language has.

One common trend in the development of programming languages has been to add more ability to solve problems using a higher level of abstraction. The earliest programming languages were tied very closely to the underlying hardware of the computer. As new programming languages have developed, features have been added that let programmers express ideas that are more remote from simple translation into underlying hardware instructions. Because programmers are less tied to the complexity

of the computer, their programs can do more computing with less effort from the programmer. This lets them write more functionality per time unit.

The basic steps involved the following:

1. Software Elements Analysis - Determine what the requirements for the program are.
2. Specification - Write a document describing how the program is to be written
3. (i.e. language(s), algorithms, databases, etc).
4. Software architecture - Define how the program will interface with the hardware and other programs.
5. Implementation – Write the program.
6. Testing - Test and debug the program to make sure it works.
7. Documentation - Write about how the program works internally and how the
8. end user interacts with it.
9. Maintenance - Update and enhance the program as needed.

There are five basic requirements for creating a program.

1. Requirements.
2. Language where it can be done efficiently.
3. Designing and wording used in program. It must to user friendly.
4. Programming lines must be very less as possible as...
5. Presentation, and testing..., debugging... and using

Languages (C language) – A short descriptions of Visual BASIC.

C is a general-purpose computer programming language developed between 1969 and 1973 by Dennis Ritchie at the Bell Telephone Laboratories for use with the Unix operating system.

Although C was designed for implementing system software, it is also widely used for developing portable application software.

C is an imperative (procedural) systems implementation language. It was designed to be compiled using a relatively straightforward compiler, to provide low-

level access to memory, to provide language constructs that map efficiently to machine instructions, and to require minimal run-time support. C was therefore useful for many applications that had formerly been coded in assembly language.

Despite its low-level capabilities, the language was designed to encourage cross-platform programming. A standards-compliant and portably written C program can be compiled for a very wide variety of computer platforms and operating systems with few changes to its source code. The language has become available on a very wide range of platforms, from embedded microcontrollers to supercomputers.

C++ is a statically typed, free-form, multi-paradigm, compiled, general purpose programming language. It is regarded as an intermediate-level language, as it comprises a combination of both high-level and low-level language features. It was developed by Bjarne Stroustrup starting in 1979 at Bell Labs as an enhancement to the C language and originally named C with Classes. It was renamed C++ in 1983.

C++ is one of the most popular programming languages and its application domains include systems software, application software, device drivers, embedded software, high-performance server and client applications, and entertainment software such as video games. Several groups provide both free and proprietary C++ compiler software, including the GNU Project, Microsoft, Intel and Embarcadero Technologies. C++ has greatly influenced many other popular programming languages, most notably C# and Java.

C++ is also used for hardware design, where the design is initially described in C++, then analyzed, architecturally constrained, and scheduled to create a register-transfer level hardware description language via high-level synthesis.

The Java revolution (a brief history of Java (gap dictation). What is Java?

Java is a programming language originally developed by James Gosling at Sun Microsystems (which is now a subsidiary of Oracle Corporation) and released in 1995 as a core component of Sun Microsystems' Java platform. The language derives much of its syntax from C and C++ but has a simpler object model and fewer low-level facilities. Java applications are typically compiled to bytecode (class file) that can run on any Java Virtual Machine (JVM) regardless of computer architecture. Java is a general-purpose, concurrent, class-based, object-oriented language that is specifically

designed to have as few implementation dependencies as possible. It is intended to let application developers "write once, run anywhere". Java is currently one of the most popular programming languages in use, and is widely used from application software to web applications.

The original and reference implementation Java compilers, virtual machines, and class libraries were developed by Sun from 1995.(5) As of May 2007, in compliance with the specifications of the Java Community Process, Sun relicensed most of its Java technologies under the GNU General Public License.

Others have also developed alternative implementations of these Sun technologies, such as the GNU Compiler for Java, GNU Classpath, and Dalvik.

Jobs in computing:

IT Director, IT Manager, Programmer / Developer, Project Manager, IT Consultant, Database / DBA, Internet / Web Developer, Technical Support, Helpdesk, Software Engineer, Strategy & Planning, Systems Design / Development, Security, Architect, Tester, Analyst, Network Management, IT Operations, Sales, Marketing.

Review Questions

Exercise 4. *Look at the statements and decide if they are true or false.*

1. A programming language is not an artificial language designed to express computations that can be performed by a machine, particularly a computer.
2. Software Elements Analysis - Write the program.
3. Maintenance - Update and enhance the program as needed.
4. A standards-compliant and portably written C program can be compiled for a very wide variety of computer platforms and operating systems with few changes to its source code.
5. The original and reference implementation Java compilers, virtual machines, and class libraries were developed by Sun from 1995.

1	2	3	4	5
T\F	T\F	T\F	T\F	T\F

Exercise 5. *Read the questions and choose the correct answers.*

1. Where can we use programming languages?
    a) Programming languages can be used to create programs that control the Windows.
    b) Programming languages can be used to create programs that control the behavior of a machine, to express algorithms precisely, or as a mode of human communication.
    c) Programming languages can be used to communicate with people.
    d) Programming languages can be used to communicate with animals.

2. How many components do programming languages usually have?
    a) two: syntax (form) and semantics (meaning);
    b) tree: morphology, syntax (form) and semantics (meaning);
    c) two: morphology (form) and semantics (meaning);
    d) two: morphology (form) and syntax (meaning).

3. What were the earliest programming languages tied to?
    a) to the underlying software of the computer;
    b) to the underlying hardware of the computer;
    c) to the underlying hardware of the robots;
    d) to the underlying software of the robots.

4. Where is C widely used?
    a) for developing portable application software;
    b) for developing application software;
    c) for developing portable hardware;
    d) for developing hardware.

5. Java is a programming language originally developed by James Gosling at Sun Microsystems, isn't it?
    a) Yes.

b) No.

c) Not mentioned in the text.

d) I don't understand the question.

Language Work: The Construction "For+Infinitive"

Exercise 6. *Look at the sentences and point out the construction "for+infinitive". Translate the following sentences.*

1. On completion of a contract of long duration it is a sound policy for the plant to be sent to the repair deport for thorough examination.
2. Architecture is a difficult subject for students to study.
3. In pushing over or felling trees, which are too large for the tractor to move by blade the roots of the trees should be exposed and cut through.
4. It is challenging for scientists to solve this problem.
5. The six rivets necessary for the web connection to be able to take up the design shear are arranged as shown.

Language Work: Word Building

Exercise 7. *Read and translate the following words with prefixes "dis-, in-, im-, il-, un-".*

continuous *a*	discontinuous	correct *a*	incorrect
charge *v*	discharge	divisible *a*	invisible
close *v*	disclose	accurate *a*	inaccurate
connect *v*	disconnect	movable *a*	immovable
advantage *n*	disadvantage	logical *a*	illogical
regular *a*	irregular	important *a*	unimportant
complete *a*	incomplete		

Writing

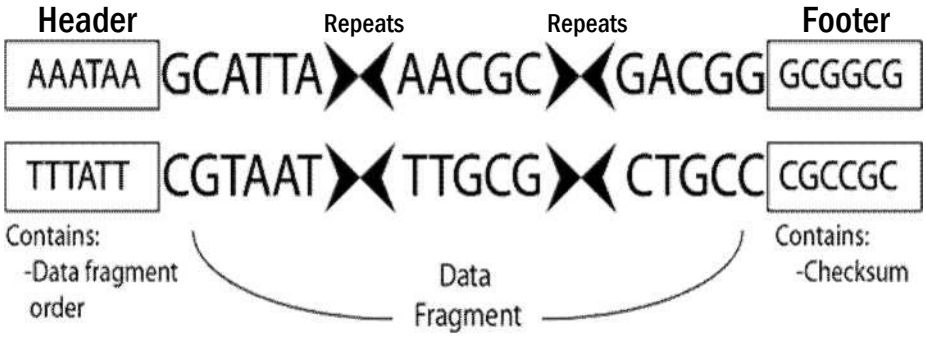
Exercise 8. *Write an email (60-80 words) about your predictions about the future of the Internet. Use key words from the box.*

Internet, addiction, game platforms, nanotechnology, artificial intelligence (AI), biometrics, smart homes, ubiquitous computing, radio-frequency identification (RFID)

Exercise 9. *Read the text and summarize it in 5 sentences.*

Decryption

Decryption is not simple, it consists of a three-tier security fencing - encoding system, encryption system and checksum system, and the message could only be retrieved when enough information is provided. Here shows the design of a single data fragment:



The full message can be restored from data fragments through a series of steps:

Step 1: next generation high-throughput sequencing (NGS) and assembling

With the information-encrypted bacteria provided, the plasmid DNA would be extracted and subjected to next-generation high-throughput sequencing (NGS).

A reason to choose high-throughput sequencing instead of ordinary sequencing technology would be NGS is a massively parallel sequencing process, which means there must exist multiple copies of sequencing products (reads) that could cover a particular message stored within the DNA, these multiple copies of reads could enable us to perform a majority voting on bases for which qualities are not the best. Moreover with the current reads assembling algorithms available - velvet and euler for example, assembling the reads from NGS is no longer a formidable task.

Step 2: Identification of repeat sequences, messages and checksum

The second tier, with the given encryption system - like R64 shufflon system in this case, the repeats are known. The repeats could be recovered by using alignment tools such as BLAST and the sequences in between the repeats would be regarded as the fragment of messages, with unknown order however. The checksum is right behind the last repeat sequence.

Final Step: Combinatorial problem

The third tier, only the client would know the function to derive the checksum. With the checksum formula, we are just one step before reaching our goal - recovering the correct message. With different fragments of messages provided, they are concatenated in different permutations; fit the trial into the checksum formula, compare with that on the sequence and BINGO if they are the same, or if not one would have to try again.

Exercise 10. *Write an abstract "Jobs in IT" to the conference «Innovations in Science and Technology» (120 words).*

Translation

Exercise 11. *Read and translate the following sentences from Ukrainian into English.*

1. Існує два головних різновиди принтерів: матричні та струменеві.
2. Такі дисплеї працюють у текстовому або графічному, чорно-білому або повнокольоровому режимі.
3. Іншими поширеними пристроями вводу/виводу є сканери, модеми для зв'язку між комп'ютерами, "миша" та джойстик, принтери для друку копій на папері.
4. Хоча такі дисплеї дорожчі за електронно-променеві трубки, вони також використовуються у високопродуктивних комп'ютерах, де принципове значення має мала вага та відсутність мерехтіння зображення.

В цілому комп'ютер складається з трьох частин: центрального процесора, пристроїв вводу-виводу та блоку пам'яті.

Exercise 12. Translate the word-combinations from English into Ukrainian.

Artificial language; design and implementation; common trend in the development requirements for implementing system software; for developing portable

application software; to encourage cross-platform programming; "write once, run anywhere"; Helpdesk.

Exercise 13. *Read the text and render it into Ukrainian.*

The 7 deadly sins of software development

Recognize the worst traits of programmers everywhere and save yourself from developer hell.

Being a good developer takes a lifetime of training and practice. But without proper discipline, even the best programmers risk falling prey to their worse natures. Some bad habits are so insidious that they crop up again and again, even among the most experienced developers. I speak of nothing less than the seven deadly sins of software development. Read on to hear how lust, gluttony, greed, sloth, wrath, envy, and pride may be undermining your latest programming project as we speak.

Discussion Question

Exercise 14. *What are the implications of science fiction for real roboticists and information technology? Give reasons. Use expressions from the box.*

Nanotechnology, artificial intelligence, future trends, law of robotics, to cope with the potential for robots to harm people, brain.

Test

Read the sentences and fill in the missing word(s).

1. ..... These abundant, Dr. Lazowska added, will "interact intelligently with people and with the physical world."

   a) computers; b) applications; c) smart devices.

2. Across many industries, products and practices are being …..by communicating sensors and computing intelligence.

   a) developed; b) analysed; c) transformed.

3. ..... SENSORS on fruit and vegetable cartons can .....location and sniff the produce, warning in advance of spoilage, so shipments can be rerouted or rescheduled.

   a) develop; b) track; c) permit.

4. ..... They have also used the same to measure mixture — an often unwanted effect from the environment, but a phenomenon which can now be controlled and used to characterize quantum circuits, as well as being of fundamental interest to physicists.

   a) byte; b) chip ; c) bit.

5. .....Header is the address of that particular....., which consist of 8 DNA bases with each 2 bases as one unit - namely zone, region, area and district.

   a) message fragment; b) fragment; c) device.

6. .....RBS ribosome binding before translational process, so ribosome can translate the rci gene right after RBS gene.

   a) followed by; b) allowed; c) existed.

7. .....A is usually split into the two components of syntax (form) and semantics (meaning) and many programming languages have some kind of written specification of their syntax and/or semantics.

   human language; b) machine code; c) programming language.

8. A significant difference is that a programming language can be fully described and studied in its entirety, since it has a precise and finite definition.

a) significant difference; b) meaning; c) advantage.

9. A ..... is designed to search for information on the World Wide Web and FTP servers.

a) web search engine; b) The Internet; c) computer.

10. ..... Data about are stored in an index database for use in later queries.

a) personal information; b) web pages; c) financial information.

11. ..... As well, natural language allow the user to type a question in the same form one would ask it to a human.

a) queries; b) searches; c) requests.

12. The methods also change over time as Internet usage changes and new techniques evolve …… are particularly suitable as an automation platform when module machine concepts are to be implemented.

a) search engines; b) disk drives; c) intelligent drives.

13. .....

This consistent engineering speeds up the development and …… of new machines considerably and represents a significant competitive advantage with a much shorter time-to-market.

a) implementation; b) application; c) research .

14. …… developed as the dominant programming methodology during the mid-1990s, largely due to the influence of C++.

a) Object-oriented programming; b) Aspect-oriented programming;

c) Expression -oriented programming.

15. They then measure the particles' actual commute time.

a) measure; b) develop; c) implement.

16. ..... Researchers record many of the 10.5-microsecond proton ……, each one starting the clock on a new trial.

a) collisions; b) pulses; c)recombinations.

17. ..... Moreover, theorists have predicted that faster-than-light neutrinos would energy and quickly slow down anyway.

a) radiate; b) spread; c) distribute.

18. Because T2K's neutrinos fly less than half as far as OPERA's, however, their……. must be twice as precise to get an equally reliable result.

a) clock; b) timing; c) time.

19. If other experiments rule out the tantalizing result, physicists might never what's going on.

a) decide; b) figure out; c) solve.

20. Multiple experiments also saw the particle; others did not. Eventually, Stuart Freedman of the University of California, Berkeley, …… most of the sightings to a peculiarity of the spectrometers used in those experiments.

a) created; b) found; c) traced.

21. Most.....physicists suspect that the purported speedup of the neutrinos is the product of some error in the experimental setup.

a) particle; b) solid-state; c) plasma.

22. History is littered with anomalous ..... that were refuted when subsequent experiments failed to replicate the data and always explained.

a) results; b) achievements; c) documents.

23. Researchers record many of the 10.5-microsecond .....pulses, each one starting the clock on a new trial.

a) proton; b) metric; c) green.

24. To keep GPS …….. hundreds of kilometers apart synchronized to within a few nanoseconds, the OPERA team should have recalibrated them at least once a 2 years.

a) units; b) devices; c) receivers.

25. They pile on layer after layer of abstraction, with new keywords and structures designed to aid …….. readability and reusability - provided you take the time to learn how to use them properly.

a) application; b) library; c) code.

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