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Кафедра іноземних мов

Англійська мова наукового спілкування

Методичні вказівки

для магістрів
спеціальності «Комп'ютерна інженерія» та
«Комп'ютерні науки та інформаційні технології»

Частина 2

(електронне видання)

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Частина 2

(електронне видання)

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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 Web

Vocabulary list

rank	strong; powerful; capable of acting or being used with great effect; energetic; vigorous; headstrong
query	a set of instructions passed to a database
relevance	the property or state of being relevant or pertinent
provide	to act to prepare for something
cache	a fast temporary storage where recently or frequently used information is stored to avoid having to reload it from a slower storage medium
usability	the state or condition of being usable
Google	a search engine that popularized the company of the same name
index	a data structure that improves the performance of operations on a table
algorithm	a precise step-by-step plan for a computational procedure that possibly begins with an input value and yields an output value in a finite number of steps
robots	machine built to carry out complex tasks, especially one which can be programmed

Lead-in

Exercise 1. *What title will be is suitable for the text about* ***Web Search Engine****?*

Exercise 2. *Read the words and give their definition: algorithm, robots, search engine*

Exercise 3. *Match two columns*

1	Rank	A	The state or condition of being usable
2	Usability	B	To act to prepare for something
3	Provide	C	A set of instructions passed to a database
4	Relevance	D	Strong; powerful; capable of acting or being used with great effect; energetic; vigorous; headstrong
5	Query	E	The property or state of being relevant or pertinent

Reading

Read the text.

WEB SEARCH ENGINE

A web search engine is designed to search for information on the World Wide Web and FTP servers. The search results are generally presented in a list of results often referred to as SERPS, or "search engine results pages". The information may consist of web pages, images, information and other types of files. Some search engines also mine data available in databases or open directories. Unlike web directories, which are maintained only by human editors, search engines also maintain real-time information by running an algorithm on a web crawler.

A search engine operates in the following order:

1. Web Crawling
2. Indexing
3. Searching

Web search engines work by storing information about many web pages, which they retrieve from the html itself. These pages are retrieved by a Web crawler (sometimes also known as a spider) — an automated Web browser which follows every link on the site. Exclusions can be made by the use of robots.txt. The contents of each page are then analyzed to determine how it should be indexed (for example, words are extracted from the titles, headings, or special fields called meta-tags). Data about web pages are stored in an index database for use in later queries. A query can be a single word. The purpose of an index is to allow information to be found as quickly as possible. Some search engines, such as Google, store all or part of the source page (referred to as a cache) as well as information about the web pages, whereas others, such as AltaVista, store every word of every page they find. This cashed page always holds the actual search text since it is the one that was actually indexed, so it can be very useful when the content of the current page has been updated and the search terms are no longer in it. This problem might be considered to be a mild form of link rot, and Google's handling of it increases usability by satisfying user expectations that the search terms will be on the returned webpage. This satisfies the principle of least astonishment since the user normally expects the search terms to be on the returned pages. Increased search relevance makes these cached pages very useful, even beyond the fact that they may contain data that may no longer be available elsewhere.

When a user enters a query into a search engine (typically by using key words), the engine examines its index and provides a listing of best-matching web pages according to its criteria, usually with a short summary containing the document's title and sometimes parts of the text. The index is built from the information stored with the data and the method by which the information is indexed. Unfortunately, there are currently no known public search engines that allow documents to be searched by date. Most search engines support the use of the Boolean operators AND, OR and NOT to further specify the search query. Boolean operators are for literal searches that allow the user to refine and extend the terms of the search. The engine looks for the words or phrases exactly as entered. Some search engines provide an advanced feature called proximity search which allows users to define the distance between keywords. There is also concept-based searching where the research involves using statistical analysis on pages containing the words or phrases you search for. As well, natural language queries allow the user to type a question in the same form one would ask it to a human. A site like this would be ask.com.

The usefulness of a search engine depends on the relevance of the result set it gives back. While there may be millions of web pages that include a particular word or phrase, some pages may be more relevant, popular, or authoritative than others. Most search engines employ methods to rank the results to provide the "best" results first. How a search engine decides which pages are the best matches, and what order the results should be shown in, varies widely from one engine to another. The methods also change over time as Internet usage changes and new techniques evolve. There are two main types of search engine that have evolved: one is a system of predefined and hierarchically ordered keywords that humans have programmed extensively. The other is a system that generates an "inverted index" by analyzing texts it locates. This second form relies much more heavily on the computer itself to do the bulk of the work.

Most Web search engines are commercial ventures supported by advertising revenue and, as a result, some employ the practice of allowing advertisers to pay money to have their listings ranked higher in search results. Those search engines which do not accept money for their search engine results make money by running search related ads alongside the regular search engine results. The search engines make money every time someone clicks on one of these ads.

Review Questions

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

1. SERPS means «search engine results pages».
2. AltaVista is a new Windows distributive.
3. When a user enters a query into a search engine examines its index and provides a listing of best-matching web pages according to its criteria.
4. Boolean operators don't allow the user to refine and extend the terms of the search.
5. Most Web search engines are commercial.

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 does a web search engine stand for?
   a) to search for information on the local PC;
   b) to search for forbidden information;
   c) to search for information on the World Wide Web and FTP servers;
   d) to redirect and handle HTTP requests.
2. What is the correct order of search engine operators?
   a) web crawling, indexing, searching;
   b) indexing, web crawling, searching;
   c) web crawling, searching, indexing;
   d) searching, indexing, web crawling.
3. Where is data about web-pages stored?
   a) in clients PC's;
   b) in an index database;
   c) isn't stored;
   d) in social networks.
4. In which case can cashed pages be very useful?
   a) to restore online passwords;
   b) it can be very useful when the content of the current page has been updated and the search terms are no longer in it;
   c) to get forbidden information;
   d) to speed up search result.
5. In which way do search engines make money?
   a) the search engines make money every time someone clicks on one of commercial ads;
   b) for searching information;
   c) for enhanced results;
   d) for permission to access forbidden data.

Language Work: Participle

Exercise 6. *Read the sentences and define the functions of the Participle I in passive, translate the sentences.*

1. Being heated magnetized steel loses its magnetism.
2. The new measuring instrument being developed in this laboratory will be tested by that engineer.
3. The oscillations being produced in the antenna are weak.
4. New data being obtained are necessary for nature investigations.
5. Being perfected the device operated successfully under all conditions.
6. The new receiver being tested will be used in this system.
7. Being equipped with modern instruments the laboratory carried out important experiments.

Language Work: Word Building

Exercise 7. *Translate the following words with the prefixes: semi-, trans-, non-.*

semiconductor n	non-conductor n	transatlantic a
semicircle n	non-essential a	transoceanic a
semimonocoque a	non-standard a	transcontinental a
semiautomatic a	nondurable a	

Writing

Exercise 8. *Last week the company you work for found a virus in the network. You solved the problem. Write an email (60-80 words) to the IT manager. Say what the problem was, say what you think caused it, say what you did to solve it, suggest what the company should do to stop this happening again, recommend new security software. Use key words from the box.*

Security, virus, firewall, hacker, digital certificate, encryption/decryption, filtering program, malware spreading.

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

Intelligent drive solutions for distributed machine and plant concepts

Drive and automation functions are being increasingly distributed in modular machine concepts The available intelligence in drive solutions can take over more and more tasks due to growing processor performance - even up to motion control and control functions with standardized Ethernet-based field buses providing the necessary data exchange and isochronously in real-time.

Intelligent drives are particularly suitable as an automation platform when module machine concepts are to be implemented. In central automation structures, the drive also has the job of turning the machine module into an easy to handle functional unit. Intelligent drives located close to the axis all simple commissioning of local axis assemblies, reduce the wiring effort for the close-to- axis periphery, motor wiring and encoder interfacing and save space in the switch cabinet.

It is therefore necessary to be able to select control module and power units of the drives as separate modules for the independent scaling or functionality and electrical power. The independent dimensioning of the power units allows flexible scaling of the drive solution to various different load situations whilst the engineering of very different applications is based on the same resources with a uniform control module for all applications. This principle is applied consistently in the Sinamics S120 drive system. In distributed automation topologies, for example, a Simotion D module takes over the control of the Sinamics S120 axis group. It is plugged into the drive station instead of the Sinamics control module. Control functions and motion control are then available directly in the drive apart from the regulation.

The homogeneity of the Siemens automation systems guarantees a transparent data storage in a uniform project structure. The division of the machine tasks into functional units also structures the machine-internal communication relations. In the configuration of the components, the configuring tool Sizer supports the selection of the matching components. Then the whole automation solution is programmed and started with the Scout engineering system. The Starter commissioning tool integrated in Scout supports the user with efficient, convenient trace and diagnosis functions in the commissioning. This consistent engineering speed up the development and implementation of new machines considerably and represents a significant competitive advantage with a much shorter time-to-market.

The uniform project structure, from the HMI to the drives without system transitions, import or export interfaces, becomes particularly important when machines are equipped with different hardware platforms.

The advantages of Totally Integrated Automation (TIA) come into effect here. In TIA, the communication is a system service so that the machine manufacturers do not need to concern themselves with communication engineering details. At the same time, the standardized interfaces give them additional freedom in the choice of hardware platform because new or additional modules can easily be integrated in the overall solution.

The striving for simple, flat automation structures and cost-effective exploitation of available resources automatically demands the flexible position ability of intelligence and functionality. The Sinamics S120 drive system is tailor- made for this development. It interacts smoothly with the automation topology preferred by the machine manufacturer. e.g. industrial PC, controller or drive- integrated. Resources going to waste at the drive level are a thing of the past.

This flexibility must also of course be supported by the automation system. The Simotion motion control system covers all three important hardware platforms in a very wide performance range, namely controller, PC and drive. In every one of these constellations, the machine manufacturer is supported by a homogeneous tool landscape from the development work through to telediagnosis and telemaintenance for the whole life cycle of the machine. The Sinamics and Simotion products totally integrated in TIA therefore stand for a new generation of modular drive and automation technology.

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

Translation

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

1. Типовий сучасний струменевий принтер має подвійний картридж (кольоровий і чорно-білий друк), і здатний друкувати на звичайному папері, а також на прозорому і спеціальному фотопаперу, яка значно покращує якість зображення.
2. До того ж струменеві принтери можна адаптувати до складного повно-кольорового друку.
3. Оптичні сканери - це пристрої вводу, які копіюють графічні зображення для подальшого їх зберігання у числовій формі.
4. Первинна пам’ять - це блок пам’яті з безпосереднім для центрального процесора; сучасні процесори здатні працювати з обсягом первинної пам’яті до 4 гігабайт.
5. Дискети мають значно меншу ємність, але їх можна виймати та зберігати окремо; нові типи змінних дисків зовні нагадують дискети, але їх ємність понад 100 мегабайт, що наближається до ємності малих жорстких дисків.

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

a) world wide web
b) real-time
c) meta-tags
d) Boolean
e) search
f) web crawler
g) linkrot
h) web browser
i) current
j) principle of least astonishment

A	1. internet resources that are retrieved by hypertext transfer protocol
B	2. of a system that responds to events or signals within a predictable time after their occurrence; specifically the response time must be within the maximum allowed, but is typically synchronous
C	3. text inserted into the source code of a web page that includes keywords in order to provide information to a search engine about the contents of the page for search engine optimization
D	4. pertaining to data items that can have “true” and “false” (or, equivalently, 1 and 0 respectively) as their only possible values and to operations on such values
E	5. to look in (a place) for something
F	6. software that gathers specific information in an automated and orderly way from the internet
G	7. the steady increase in number of broken hyperlinks as web pages are moved or removed
H	8. a computer program used to navigate the world wide web, chiefly by viewing webpages and following hyperlinks
I	9. the part of a fluid that moves continuously in a certain direction
J	10. a principle that the design should match the user's experience, expectations, and mental models

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

History of object-oriented programming

The Smalltalk language, which was developed at Xerox PARC (by Alan Kay and others) in the 1970s, introduced the term object-oriented programming to represent the pervasive use of objects and messages as the basis for computation. Smalltalk creators were influenced by the ideas introduced in Simula 67, but Smalltalk was designed to be a fully dynamic system in which classes could be created and modified dynamically rather than statically as in Simula 67. Smalltalk and with it OOP were introduced to a wider audience by the August 1981 issue of magazine. Batch spreadsheet report generators.

In the 1970s, Kay's Smalltalk work had influenced the Lisp community to incorporate object-based techniques which were introduced to developers via the Lisp machine. In the 1980s, there were a few attempts to design processor architectures which included hardware support for objects in memory but these were not successful. Examples include the Intel iAPX 432 and the Linn Smart Rekursiv.

Object-oriented programming developed as the dominant programming methodology during the mid-1990s, largely due to the influence of C++. Its dominance was further enhanced by the rising popularity of graphical user interfaces, for which object-oriented programming seems to be well-suited. OOP toolkits also enhanced the popularity of event-driven programming (although this concept is not limited to OOP).

Discussion Question

Exercise 14. *What object-oriented programming was designed for and where does it work? Give reasons and examples. Use keywords from the box.*

Programming languages, machine languages, code, computer, convenient, advantages/disadvantages, create, develop

U N I T 2

Particle Detector

Vocabulary list

nanosecond	a measure of time equal to one billionth of a second
proton	an elementary particle with a positive electric charge and a mass that is given the value 1 on the scale of atomic weights
gps receiver	an audiovisual device, fitted to a civilian road vehicle, that uses the military global positioning system as an aid to navigation
neutron	an elementary particle slightly heavier than a proton, with no electric charge
target	a butt or mark to shoot at, as for practice, or to test the accuracy of a firearm, or the force of a projectile
mistake	to understand wrongly, taking one thing for another, or someone for someone else
Pulse	a beat or throb
Physicist	a person whose occupation specializes in the science of physics, especially at a professional level
Record	a set of data relating to a single individual or item
Distance	the amount of space between two points, usually geographical points, usually measured along a straight line

Lead-in

Exercise 1. *What title will be is suitable for the text about* ***Opera particle detector****?*

Exercise 2. *Read the words and give their definition:* record, GPS receiver, distance.

Exercise 3. *Match two columns:*

1	nanosecond	A	a butt or mark to shoot at, as for practice, or to test the accuracy of a firearm, or the force of a projectile
2	proton	B	an elementary particle slightly heavier than a proton, with no electric charge
3	neutron	C	a measure of time equal to one billionth of a second
4	target	D	to understand wrongly, taking one thing for another, or someone for someone else
5	mistake	E	an elementary particle with a positive electric charge and a mass that is given the value 1 on the scale of atomic weights

Reading

Read the text.

Where Does the Time Go&

One experiment sees traveling faster than light. If the result can't be replicated, it may never be explained away.

It's got to be wrong. That's the gut reaction of most physicists to the report in September that subatomic particles called neutrinos appear to travel faster than light, a clear violation of Einstein's theory of relativity (Science, 30 September, p. 1809). In fact, the results have spawned a cottage industry as scientists, many of whom are in other fields; try to guess how the 160 physicists working with the OPERA particle detector goofed as they timed the particles zinging 730 kilometers from the European particle physics laboratory, CERN, near Geneva, Switzerland, to OPERA's spot in Italy's Gran Sasso National Laboratory.

Perhaps the OPERA team overlooked some basic effect of relativity itself? Or neglected the fact that Earth turns? Or got the distance the neutrinos travel wrong because they forgot that the accelerator that generates them is 140 meters underground? Not likely, other particle physicists say. "I don't believe there's some sort of gotcha! in the experiment", says Robert Plunkett of Fermi National Accelerator Laboratory (Fermilab) in Batavia, Illinois, who works on an experiment called MINOS, which measured the speed of neutrinos less precisely in 2007. "These are not dumb folks".

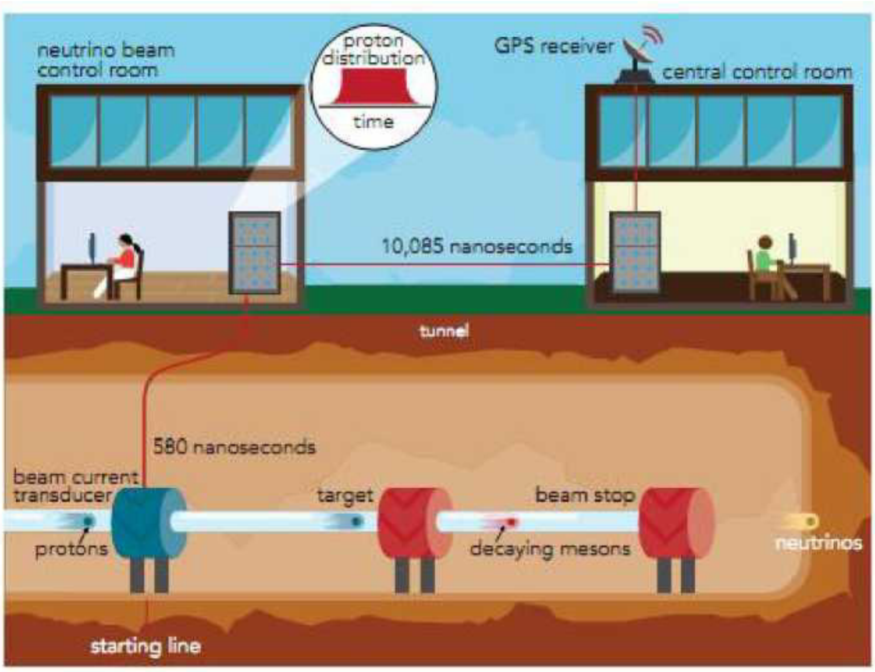
Most particle physicists suspect that the purported speedup of the neutrinos is the product of some error in the experimental setup. But that error is likely subtle and hidden in the details of the measurement, they say. Many suspect the problem may lie in the use of the Global Positioning System (GPS) to synchronize the timing between CERN and Gran Sasso to within nanoseconds. "We may learn something subtle about GPS", says Robert McKeown of Thomas Jefferson National Accelerator Facility in Newport News, Virginia, who has used the system to synchronize separated cosmic ray detectors. In fact, some GPS experts question whether the OPERA team has done enough to ensure the reliability of their timing system.

If there is a mistake, it may remain forever hidden, physicists warn. History is littered with anomalous results that were refuted when subsequent experiments failed to replicate the data, but never explained. Two existing experiments may be able to test the OPERA result. But "if the experiments that are trying to confirm it don't, then it will just linger", says Burton Richter, a Nobel Prize-winning physicist at SLAC National Accelerator Laboratory in Menlo Park, California. "I don't think that the guys who reported it will track [its origin] down".

From start ... At CERN, physicists use GPS to time the passage of a proton pulse, correcting for the time it takes the GPS signal and the data to reach their computer.

Measure a distance, measure a time

In principle, the OPERA measurement is simple. Physicists measure the distance from where the neutrinos emerge at CERN to the OPERA detector. They divide the distance by the speed of light 299,792,458 meters per second to predict how long it should take neutrinos to make the trip.



They then measure the particles' actual commute time. In practice, the experiment is tricky. Physicists cannot time an individual neutrino, as it's impossible to detect a neutrino starting its journey without consuming it. So OPERA researchers do something more complicated. To generate neutrinos, CERN blasts protons into a target to produce particles called pions that decay into neutrinos (see figure below). OPERA researchers measure the protons as they pass through a beam current transducer and take the transducer's position as the neutrinos' starting line. That's not quite right, as the protons won't spawn the neutrinos for a kilometer. But because the protons and pions move at near-light speed, the assumption introduces minimal error.

Researchers record many of the 10.5-microsecond proton pulses, each one starting the clock on a new trial. They add them up to get an average distribution in time of the protons in a pulse. They then measure the time at which they detect each neutrino in Gran Sasso and graph the neutrinos' time distribution. The distribution of the protons in the starting pulse and the distribution of the arrival times of the neutrinos should look alike, only separated by the roughly 2.43 microseconds it takes for the neutrinos to make the trip. To calculate the exact transit time, experimenters mathematically search for the time shift that makes the two distributions coincide. That shift was 60 nanoseconds shorter than it should have been if the neutrinos traveled at light speed.

To synchronize the timing system for CERN's neutrino beam with that of the OPERA detector, the researchers rely on high-quality GPS receivers, stabilized with atomic clocks, in both places. The satellite-based GPS provides a ”time stamp” for each proton pulse and each neutrino detection, accurate to within 2.3 nanoseconds, they claim.

Reading the time stamp is more complicated than glancing at a clock. For example, at CERN, the GPS signal arrives at a receiver at the central control room. It takes 10,085 nanoseconds for the signal to move through cables and electronics to the neutrino beam control room and the computer that digitizes the signal from the beam current transducer. That amount of time must be added to the time stamp. Meanwhile, data from the transducer show up at the computer 580 nanoseconds after they were generated, and that amount of time must be subtracted from the time stamp. Smaller corrections are also necessary. To get them all right, physicists must know the exact lengths of the signal cables and the reaction times of electronic devices.

What could possibly go wrong?

There are plenty of reasons to doubt that neutrinos travel faster than light. On 23 February 1987, physicists working with the Super-Kamiokande particle detector in Japan detected a blast of neutrinos that coincided with the fl ash of light from supernova 180,000 light-years away. If the neutrinos traveled as fast as the OPERA results imply, they should have arrived 4 years before the light did. Moreover, theorists have predicted that faster-than-light neutrinos would radiate energy and quickly slow down anyway.

So most physicists suspect that the OPERA team has made an error. But where? Faced with dozens of preprints second-guessing their work and tired of explaining how they already checked this or that, OPERA experimenters have decided not to respond to press inquiries, says the team's spokesperson, Antonio Ereditato of the University of Bern in Switzerland: “We will let our publications speak for themselves”.

Others have their hunches, however. For example, physicists say the OPERA team probably got the distance the neutrinos travel right. Relying on a professional

”geodesy” survey, OPERA researchers cite the distance as 731,278.0 meters, give or take 20 centimeters. They would have to be off by 18 meters to explain their results. “Any decent surveyor would walk away and cry if he had such an error”, says Fermilab’s Plunkett.

The problem may lie in the analysis procedure, physicists have suggested. OPERA researchers assume that the distribution of neutrino arrival times exactly mirrors that of the protons in a pulse. ’’They’re comparing apples and green apples”, says SLAC’s Stanley Wojcicki. But if the distributions have different shapes, then fitting one to the other might produce a misleading answer.

To rule out that possibility, the OPERA team repeated the experiment with pulses only 3 nanoseconds wide - so brief that if neutrinos arrived 60 nanoseconds early, the observed pulse and predicted pulse wouldn’t overlap on a graph. OPERA researchers could then simply use a ruler to measure the time between them. The 20 neutrinos they observed still arrived 62 nanoseconds early, as they reported in a 17 November update to their paper, which they have submitted to the Journal of High Energy Physics.

The stability of the GPS system may be a problem, says Chang Kee Jung of Stony Brook University in New York, who works on an experiment known as T2K, which studies neutrinos fi red 295 kilometers from the Japan Proton Accelerator Research Complex in Tokai to Super-Kamiokande. “In our experience at T2K, even though the GPS systems are advertised as stable, typically they jump” by as much as 100 nanoseconds, Jung says.

To finish. At Gran Sasso, physicists plot the arrival times of the neutrinos relative to the times of the proton pulses at CERN, again correcting for signal delays. To keep GPS receivers hundreds of kilometers apart synchronized to within a few nanoseconds, the OPERA team should have recalibrated them at least once a month, says Victor Zhang, an electrical engineer at the U.S. National Institute of Standards and Technology in Boulder, Colorado. In fact, he says, OPERA appears to have calibrated them only in May 2008 and July 2011.

We don’t have any data to support that [the synchronization] doesn’t change by more than a few nanoseconds over 3 years, Zhang says. An unstable GPS link would more likely produce random timing variations instead of a steady 60-nanosecond shift. Still, the poor calibration weakens the result, Zhangsays.

Finally, physicists say, the OPERA team may have been led astray by a simple mistake, such as an incorrectly measured cable or a bug in its software. Somebody could be dyslexic, so 28 nanoseconds get written down as 82 nanoseconds, Jung says. It's far more likely those OPERA researchers will get bitten by such "human error" than that they overlooked some basic point of physics, he says. "Human error is probably the hardest to find," Jung says.

Somebody else give it a try

Given the complexities, physicists say outsiders have no hope of divining where the 60 nanoseconds went in the OPERA experiment. "Unless you're there looking over their shoulder when they do the measurement, it's impossible to tell," says Wojcicki. So the only real test is to try to reproduce the result in another experiment, he says.

As a member of the MINOS team, Wojcicki is working on that right now. He and his colleagues shoot neutrinos 735 kilometers from Fermilab to a detector in the Soudan mine in Minnesota. MINOS researchers hope to have a result that can test OPERA's result early next year. Researchers with T2K may also try to reproduce the result. Because T2K's neutrinos fl y less than half as far as OPERA s, however, their timing must be twice as precise to get an equally reliable result.

If other experiments rule out the tantalizing result, physicists might never figure out what's going on. That's happened before. In 1985, for example, John Simpson of the University of Guelph in Canada reported that decaying tritium occasionally appeared to emit neutrinos thousands of times as heavy as neutrinos are now known to be. Multiple experiments also saw the particle; others did not. Eventually, Stuart Freedman of the University of California, Berkeley, traced most of the sightings to a peculiarity of the spectrometers used in those experiments.

But Freedman's analysis didn't explain Simpson's first result, which was made with a different type of device, says Nathaniel Tagg of Otterbein University in Westerville, Ohio, who was later a student of Simpson's and spearheaded the previous MINOS measurement of neutrino speed. Tagg says he doesn't expect clarity on the

OPERA result, either: “I wouldn’t be surprised if the initial OPERA result stands and is never explained.”

Review Questions

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

1. Most particle physicists suspect that the purported speedup of the neutrinos is the product of some error in the experimental setup.
2. History is littered with anomalous results that were refuted when subsequent experiments failed to replicate the data and always explained.
3. Researchers record many of the 10.5-microsecond proton pulses, each one starting the clock on a new trial.
4. To keep GPS receivers hundreds of kilometers apart synchronized to within a few nanoseconds, the OPERA team should have recalibrated them at least once a 2 years.
5. There are plenty of reasons to doubt that neutrinos travel faster than light.

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 has GPS used to synchronize separated cosmic ray detectors?
   a) GPS has used the system to synchronize separated cosmic ray detectors;
   b) GPS has used the subsystem to synchronize separated cosmic ray detectors;
   c) GPS has used the software to synchronize separated cosmic ray detectors;
   d) GPS has used the hardware to synchronize separated cosmic ray detectors.
2. What is the principle of measuring the distance?
   a) physicists measure the distance from where the neutrinos emerge at CERN to the OPERA detector and multiply the distance to the speed of light;
   b) physicists measure the distance from where the neutrinos emerge at CERN to the OPERA detector and add the distance by the speed of light;
   c) physicists measure the distance from where the neutrinos emerge at CERN to the OPERA detector and divide the distance by the speed of light;

d) physicists measure the distance from where the neutrinos emerge at CERN to the OPERA detector and divide the distance by the speed of sound.

3. What was the time shift that makes the two distributions coincide?
   a) that shift was 60 seconds shorter than it should have been if the neutrinos traveled at light speed;
   b) that shift was 60 nanoseconds shorter than it should have been if the neutrinos traveled at light speed;
   c) that shift was 60 nanoseconds longer than it should have been if the neutrinos traveled at light speed;
   d) that shift was 60 seconds longer than it should have been if the neutrinos traveled at light speed.
4. What happened with the 20 neutrinos they observed?
   a) the 20 neutrinos they observed still arrived 65 seconds early;
   b) the 20 neutrinos they observed still arrived 6 seconds early;
   c) the 20 neutrinos they observed still arrived 62 nanoseconds early;
   d) the 20 neutrinos they observed still arrived 600 nanoseconds early.
5. What did the OPERA experiment report?
   a) neutrinos appearing to travel slower than light;
   b) neutrinos appearing to travel faster than light;
   c) protons appearing to travel faster than light;
   d) protons appearing to travel slower than light.

Language Work: Participle

Exercise 6. *Read and translate the following sentences paying attention to the Participle II.*

1. The operation of the receiving station influenced by a number of factors was discussed by engineers.
2. The generation of electricity from magnetism dealt with by Faraday was a very important scientific discovery.
3. The work of Rutherford followed by great help for understanding many natural phenomena.

4. Gagarin's first space flight followed by many others was very important for the development astronautics.

5. Molecules of even a good insulator acted upon by electric field produce a motion of electrons due to the field.

6. Some drawbacks of the reactor referred to in this article will be eliminated.

7. The dimensions of the body referred to in that textbook will be used in our experiment.

Language Work

Exercise 7. *Read and translate the following word combinations and make up the sentences using them.*

Industrial purposes, the application of electrical energy, the invention of electronic devices, considerably enlarged, has, it possible to solve, currents, the problem of obtaining high-frequency are the basis, radio engineering, television, and other branches, of modern engineering.

Writing

Exercise 8. *Describe the steps (60-80 words) in website development. Use the sequence words in the box and the information below.*

talk to customers, analyze information, create specification, design and develop website, specialist writes content, programmer do HTML coding, test website.

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

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.

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.

Second deadly sin of software development: Gluttony

(failing to refactor)

Nothing is more gratifying than shipping software. Once you have a working product out in the wild, the temptation is strong to begin planning the next iteration. What new features should it have? What didn't we have time to implement the first go-round?

It's easy to forget that code seldom leaves the door in perfect shape. Then, as features accumulate with successive rounds of development, programmers tend to compound mistakes of the past, resulting in a bloated, fragile code base that's too tangled to maintain effectively.

Instead of gobbling up plate after plate of new features, restrain yourself. Evaluate your existing code for quality and maintainability. Make code refactoring a line item on your budget for each new round of development. Clients may see only the new features in each release, but over the long term, they'll thank you for keeping off the fat.

Exercise 10. *Write an abstract «Development of Microelectronics» 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. Дискети мають значно меншу ємність, але їх можна виймати та зберігати окремо; нові типи змінних дисків зовні нагадують дискети, але їх ємність понад 100 мегабайт, що наближається до ємності малих жорстких дисків.
3. В цілому комп'ютер складається з трьох частин: центрального процесора, пристроїв вводу-виводу та блоку пам'яті.
4. Комп'ютерна міцність вимірюється об'ємом пам'яті та швидкістю обробки даних.
5. Одиницею виміру обсягу пам'яті є байт, який відповідає одному символу тексту.

Exercise12. *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.*

Second deadly sin of software development: Gluttony

(failing to refactor)

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Discussion Question

Exercise 14. *What makes the difference between a robot and a simple computer? Give reasons. Use keywords from the box.*

Robotics, benefits, reliability, security, computer, ability, computer system, virus.

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.

   a) 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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