FACULTY OF ELECTRICAL ENGINEERING, UNIVERSITY OF BELGRADE

English for Software Engineering

A Lower Course Textbook

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Foreword

The present material *English for Software Engineering – Lower Course Textbook* represents an edited compilation of texts and exercises intended for the academic subject *English Language – Lower Course* at the Department of Software Engineering, Faculty of Electrical Engineering – University of Belgrade. More specifically, *English Language – Lower Course* is a one-term ESP course attended by the first year students of the Software Engineering Department.

The collection consists of 15 units covering topics such as personal computing, input devices, virtual reality, programming languages. However, grammar is not neglected, and thus, there are units covering specific nouns, adjectives and verbs in the Software Engineering register, as well as word-formation related to English for Computer Science. These units consist of a reading section, vocabulary and grammar exercises. The sources are listed in the Bibliography section.

The author would like to express his gratitude to **Professor Dr. Tijana Parezanović** (English Department, Faculty of Foreign Languages, Alfa BK University of Belgrade) for her genuine interest in the manuscript, her most constructive ideas, her immense expertise, lovely suggestions and her generous help. Nonetheless, the Author is responsible for whatever errors may be found in the textbook.

My boundless thanks go to **Professor Dr. Predrag Pejović** (Department of Electronics, Faculty of Electrical Engineering, University of Belgrade) for his genuine interest in the manuscript and his intense and rigorous scrutiny. Academically, I have been the fortunate recipient of Professor Pejović's brilliant knowledge, kindness and support. Professor Predrag Pejović, to whom I owe the immense intellectual debt, is a true visionary and a source of constant intellectual inspiration.

In Belgrade, 29th August 2023

Dr. Miloš D. Đurić

Unit 1: Personal Computing

In 1952, a major computing company took a decision to get out of the business of making mainframe computers. They believed that there was only a market for four mainframes in the whole world. That company was IBM. The following year they reversed their decision.

In 1980, IBM decided that there was a market for 250,000 PCs, so they set up a special team to develop the first IBM PC. It went on sale in 1981 and they set a worldwide standard for IBM compatibility, which, over the next ten years, was only seriously challenged by one other company, Apple Computers. Since then, over seventy million PCs made by IBM and other manufacturers have been sold. Over this period, PCs have become commodity items. Since IBM made the design non-proprietary, anyone can make them.

The history of the multi-billion dollar PC industry has been one of mistakes. Xerox Corporation funded the initial research on personal computers in their Palo Alto laboratory in California. However, the company failed to capitalize on this work, and the ideas that they put together went into the operating system developed for Apple's computers. This was a graphical interface: using a mouse, the user clicks on icons, which represent the function to be performed.

The first IBM PC was developed using existing available electrical components. With IBM's badge on the box it became the standard machine for large corporations to purchase. When IBM were looking for an operating system, they went initially to Digital Research, who were market leaders in command-based operating systems (these are operating systems in which the users type in commands to perform a function). When the collaboration between IBM and Digital Research failed, IBM turned to Bill Gates, then 25 years old, to write their operating system.

Bill Gates founded Microsoft on the basis of the development of MS/DOS, the initial operating system for the IBM PC. Digital Research have continued to develop their operating system, DR/DOS, and it is considered by many people to be a better product than Microsoft's. However, without an endorsement from IBM, it has become

a minor player in the market. Novell, the leaders in PC networking, now own Digital Research, so things may change.

The original IBM PC had a minimum of 16K of memory, but this could be upgraded to 512K if necessary, and ran with a processor speed of 4.77 MHz. Ten years later, in 1991, IBM were making PCs with 16Mb of memory, expandable to 64 Mb, running with a processor speed of 33 MHz. The cost of buying the hardware has come down considerably as the machines have become commodity items. Large companies are considering running major applications on PCs, something, which, ten years ago, no one would have believed possible of a PC. In contrast, many computers in people's homes are just used to play computer games.

The widespread availability of computers has in all probability changed the world forever. The microchip technology, which made the PC possible, has put chips not only into computers, but also into washing machines and cars. Some books may never be published in paper form, but may only be made available as part of public databases. Networks of computers are already being used to make information available on a worldwide scale.

Vocabulary:

commodity items – items, which can be produced and traded freely
non-proprietary – not belonging to any single company
capitalize on – profit from, turn to one's advantage

Task 1. Match each word (1-7) with the correct definition (a-g):

1. mainframe, 2. mouse, 3. Icon, 4. operating system, 5. software, 6. hardware, 7. microchip

(a) the set of software that controls a computer system
(b) a very small piece of silicon carrying a complex electrical circuit
(c) a big computer system used for large-scale operations
(d) the physical portion of a computer system
(e) a device moved by hand to indicate position on the screen
(f) a visual symbol used in a menu instead of natural language

(g) data, programs, etc., not forming part of a computer, but used when operating it

Task 2. Read the text and decide on a suitable title for it.

I think a suitable title for the text above is:

or alternatively:

Task 3.When you read the text to decide on a title, which of the following did you do? Did you:

- read the text slowly and try to understand every word?
- read quickly and try to understand the main theme?
- underline or mark sentences that you thought were important?
- make notes about important points?

Which of these reading strategies do you think is most appropriate for this kind of task? Which do you think is least appropriate?

Task 4. Answer these questions about the text.

1. **How many mainframes did IBM think it was possible to sell in 1952?**
2. How many PCs have now been sold?
3. Who paid for the initial research into PCs?
4. Which company later used the results of this research to develop their operating system?
5. What are command-based operating systems?
6. DR/DOS is an acronym. What does it stand for?

7. Since the invention of the IBM PC, many of its features have been improved. Which of the following features does the text not mention in this respect?

☐ a. memory ☐ b. speed ☐ c. size ☐ d. cost

8. Give three examples from the text of how the availability of computers has 'in all probability changed the world for ever'.

Task 5. Look back in the text and find words that have a similar meaning:

1. international	
2. contested	
3. errors	
4. paid for	
5. buy	
6. first	
7. recommendation	
8. improved	

Task 6. Reading. Read this passage about the structure of the processor and fill in the gaps using the words provided in the table below.

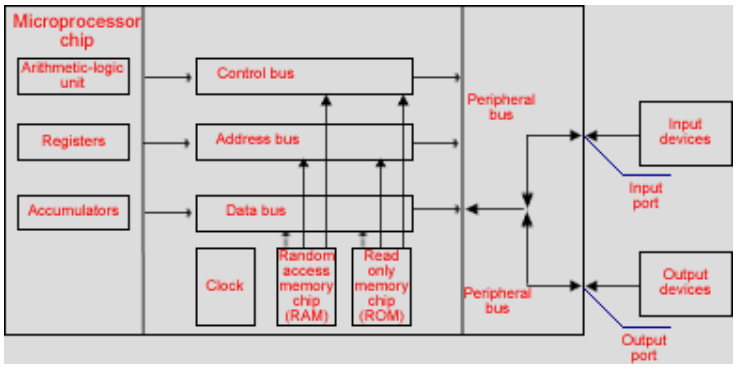
Structure of the processor

The processor consists of a [1] , which is a circuit board on which are mounted [2] chips, memory chips, and other components linked together by [3] lines or channels in the form of control, address, and data [4] . In addition, a processor has [5] , which are electronic circuits providing specialized functions such as graphics, or which connect a system board to [6] . The system board also consists of electronic

devices, such as an electronic [7] _____ for controlling the speed of operation; [8] _____, which store numeric data during the course of processing; and various [9] _____, including sequence control register, address register, and function register.

adaptor boards	registers	microprocessor
clock	conductive	buses
system board	accumulators	input or output devices

Task 7. Use the information in the reading passage and the diagram to help you match the terms below (1-9) with the appropriate explanation or definition (a-i).

A processor consists of many different electronic circuits and devices for performing control functions, arithmetic and logic operations, and data transfers. Data may be transferred from backing storage to the internal memory or from the internal memory to the arithmetic unit by means of conductive channels known as buses. The part of the processor, which controls data transfers between the various input and output devices is called the control unit.	

1. microprocessor chip, 2. registers, 3. accumulators, 4. control bus, 5. address bus, 6. data bus, 7. clock, 8. RAM, 9. ROM

(a) used to send address details between the memory and the address register

(b) consists of an arithmetic-logic unit, one or more working registers to store data being processed, and accumulators for storing the results of calculations

(c) a group of signal lines used to transmit data in parallel from one element of a computer to another

(d) groups of bistable devices used to store information in a computer system for high speed access

(e) an electronic circuit, usually a quartz crystal, that generates electronic pulses at fixed time intervals to control the timing of all operations in the processor

(f) used for storing part of the operating system and application software known as 'firmware'; can only be read; cannot be written to or altered in any way

(g) used to store numeric data during processing

(h) a group of signal lines dedicated to the passing of control signals

(i) used for the temporary storage of application programs and data; can be written and read from

Unit 2: Nouns, Adjectives and Verbs

Nouns

There are 12 nouns connected with computing in the box below. Use them to complete the sentences.

connector	field	password	procedure
database	model	plaintext	utility
fault	modem	platform	virus

1. The sales department keeps the information about the company's clients in a _____.
2. The user has to key in the _____ before he can access the network.
3. The _____ connects to one of the serial ports in your computer.
4. The _____ at the end of the cable will fit any standard serial port.
5. The employee record has a _____ for age.
6. This is the latest _____ of a computer.
7. This _____ sorts all files into alphabetical order.
8. A lost file cannot be found without file-recovery _____.
9. The technical staff are trying to correct a programming _____.
10. The messages were sent as _____ by telephone
11. This software will only work on the IBM PC _____.
12. If your PC is infected with a _____, your data is at risk.

Adjectives

Complete the sentences using the adjectives in the box. Use each adjective only once.

clean	downloadable	re-chargeable
crash-protected	electroluminescent	redundant
common	excessive	unformatted
concurrent	faulty	unpopulated
dedicated	normal	user-friendly

1. A _____ battery is used for RAM back-up when the system is switched off.
2. I'll have to start again – I've just erased the only _____ copy.
3. This is a _____ fault with this printer model.
4. Each _____ process has its own window.
5. There's only one _____ graphics workstation in this network.
6. The _____ procedure is for backup copies to be made at the end of each day's work.
7. It is impossible to copy an _____ disk.
8. There must be a _____ piece of equipment in the system.
9. If the disk is _____ you will never lose your data.
10. The screen coating is _____.
11. The program used an _____ amount of memory to accomplish the job.
12. The program is very _____. You can use it with ease.
13. These fonts are _____, and they can be found on our site.
14. The parity bits on the received data are _____ and can be removed.
15. You can buy an _____ RAM card and fit your own RAM chips.

Verbs

All the verbs in the box relate to computing matters. Use them to complete the sentences.

configure	generate	process	run	simulate
disconnect	install	purge	save	undo
expand	paste	recover	simplify	save

1. If you want to hold so much data you will have to _____ the disk capacity.
2. Hitting CTRL-S will _____ the document.
3. We will _____ the new data.
4. Each month, I _____ the disk of all the old email messages.
5. You've just deleted the paragraph, but you can _____ it from the option in the Edit menu.
6. You only have to _____ the PC once – when you first buy it.
7. Don't forget to _____ the file before switching it off.
8. It is possible to _____ the data but it can take a long time.
9. We can _____ an image from digitally recorded data.
10. This software is able to _____ the action of an aircraft.
11. Function keys _____ program operation.
12. The new package will _____ on my PC.
13. The system is easy to _____ and simple to use.
14. Now that I have cut this paragraph from the end of the document, I can _____ it in here.
15. Do not forget to _____ the cable before moving the printer.

Unit 3: This Week: Software

Software technology is getting more complicated. Developers have to cut through a jungle of computer languages, operating environments, and shifting standards to choose how they'll create their software. It's not an easy job. Software purchasers will have to live with the results for years to come. Which advances in software technology will prevail? Which ones will be just a flash in the pan?

I chose four well-known software developers and asked each to talk about current and future trends in software technology. Their comments reveal some common and diverse themes.

I began by asking them if they thought that software purchasers are getting what they need. What should developers be doing differently to give purchasers a better product?

Mary Evans: In general, I think people are getting what they want-there are a lot of creative things being done with paint software, word processing, DTP (desktop publishing) systems, and the like. Do users want more? Of course! Users will always want more. The computer is an incredibly powerful tool, and any software that makes it easier, faster, more creative, or more cost-effective will inevitably be in demand. But I'm generally optimistic about the way things are going at the moment. I think most of the major software manufacturers are able to read the market quite well.

Gerry Harper: I'm afraid I completely disagree with Mary. I just don't think that software purchasers are getting the technical support they need. While the products are getting more and more complex, and more and more expensive, it seems that support is starting to be thought of as an additional business opportunity, More generally, I've thought for some time that applications are getting too big, and that they're trying to do too much. Yes, they're versatile and powerful, but they're also often

overwhelming. I think what we need are simple little programs that are easy to understand and use, and that work together to accomplish more complex tasks.

Matt Andrews: I really can't agree with that. To imagine we can just go back to "simple little programs" just ignores the complex needs of many of today's software users. No, I'm sure that you can't stop progress. Suppliers know what their customers want – they just can't supply it quickly enough. I've studied the market very closely, and I've found that purchasers' needs seem always to exceed the capability of the available software by a constant time-frame of about six to twelve months.

Bob Bolton: I think users are getting what they want, provided that their needs fit the off-the-shelf application. Specialized software is usually so specific that it should be written in-house for businesses. Developers should add features that the customer needs, not what they think customers want. Some effort should be made to get feedback from the users before making an upgrade so that the proper features are added.

Vocabulary

a flash in the pan – a success that lasts only a short time and is not repeated

off-the-shelf – mass-produced: not made according to the individual needs of the customer

Task 1. Make a list of software products that you use (e.g. word processing, spreadsheets, etc.). Are there some features of the products you never use? Are there any features missing?

Task 2.

In the magazine article above, a number of software developers express their opinions on the future of software technology. Read the article and tick (√) the relevant boxes to show which opinions are expressed by the speakers.

Opinions	Mary Evans	Gerry Harper	Matt Andrews	Bob Bolton
In general, customers are getting what they want.	☐	☐	☐	☐
In general, customers are not getting what they want.	☐	☐	☐	☐
Software is too complex.	☐	☐	☐	☐
Software is not complex enough.	☐	☐	☐	☐
Software developers know what users want.	☐	☐	☐	☐
Software developers don't know what users want.	☐	☐	☐	☐

Task 3. Each of the following sentences from the text is followed by two paraphrases. Decide which paraphrase (a or b) is closer in meaning to the original comment. Remember to look at the comments in their original context.

1. 'Developers have to cut through a jungle of computer languages, operating environments, and shifting standards...'

a. The huge number of languages, environments, and standards makes life difficult for software developers.

b. Software developers have to act to reduce the number of languages, environments, and standards which currently exist.

2. 'Their comments reveal some common and diverse themes.'

a. They talk about ordinary and wide-ranging topics.

b. They agree about some issues, but disagree about others.

3. 'I think most of the major software manufacturers are able to read the market quite well.'

a. Most software manufacturers understand what consumers want.

b. Most software manufacturers know how to influence users to buy more of their products.

4.'...it seems that support is starting to be thought of as an additional business opportunity.'

a. Increased technical support is a means of making software more attractive to businesses.

b. Software manufacturers are using the fact their products are complex to start selling technical support to their customers.

5. '...purchasers' needs seem always to exceed the capability of the available software by a constant time-frame of about six to twelve months.'

a. It takes about six to twelve months for purchasers to understand fully the software they buy.

b. The software customers want now what will only become available in about six to twelve months.

Task 4. Which of the four speakers do you most agree with? Why?

Task 5. Look back in the text and find words or phrases in the text that have a similar meaning to:

1. penetrate
2. changing
3. win, survive
4. buyers
5. understand
6. flexible
7. too big/complex to manage
8. achieve
9. go beyond
10. information about a product/service

Task 6. Translate Mary Evans's comments (the paragraph beginning 'In general, I think people...') from English into Serbian.

Task 7. Discuss the following questions:

1. If you were a developer of software, what kind of software package would you develop? Why? Insert in the table below the characteristics of your software package(s), followed by advantages and disadvantages.
2. Do you think software developers should develop educational software more like the software developed for games? Why?

	Characteristics	Advantages	Disadvantages
Software package 1			
Software package 2			
Software package 3			
Software package 4			
Software package 5			

Unit 4: Curating the Digital Age

> Out-of-copyright materials in NYPL digital collections are now available as high-resolution downloads. No permission required, no hoops to jump through: just go forth and reuse! — *New York Public Library*

As I mentioned in my February 2013 column, "Balancing Act," the belief that our life offline is separate from our life online has been denounced as digital dualism. But there's less of a debate when it comes to differentiating between analog objects and digital data. Yes, the print and electronic copies of the same book contain the same words, but it's obvious to most people (and, increasingly, to researchers) that the two reading experiences are quite different.

We need to understand such differences because the world is going to see a lot more digital data in the near future. This includes born-digital data, which is originally created in an electronic format, as well as born-analog data, which starts life as a physical object and then is reborn digital. A great example of this digitization came earlier this year when the New York Public Library announced that it was making more than 180,000 digitized items available to anyone with an Internet connection, no questions asked.

That librarians would turn themselves into digital curators is no surprise, since as analog curators for the past few centuries they have been constantly bumping into the physical constraints of storage space and material decay. One approach is to get rid of stuff, and librarians and archivists employ a pleasing variety of terms related to the removal of unwanted or duplicate material from their collections: Weeding and culling generally refer to the removal of individual items, while purging, screening, and stripping are most often used for the removal of multiple related items. But the main problem with physical materials is that they possess what archivists call, poetically, inherent vice: the tendency for something to deteriorate over time because of some fault in the material itself or the way the material reacts with its surroundings. The digitization of analog materials can solve these problems, and engineers are constantly trying to find faster ways to turn atoms into bits. For now, though, we mostly have to rely on the skills of scanops (scanner operators) to generate those bits,

although on their less skilled days those operators end up scanning their own body parts, such as fingers and hands, a phenomenon known as Google hands. Some companies are applying the principles of crowdsourcing and gamification to the digitizing realm, creating leisure activities that let users contribute to the process. (I would be remiss if I didn't mention the opposite process: turning digital Web documents and data into books and zines, a genre called the printed Web.) Ideally, digitized data is online (readily available), but it might end up either offline (not available) or nearline (only indirectly available). It can also end up in dark archives (which are inaccessible to the public), dim archives (which are usually inaccessible but can be made accessible), or light archives (another term for those that are fully accessible). Having digitized some data, the archivist now faces a new problem: the eventual obsolescence of the data structures or media used to store the data, necessitating a format migration (or a media migration) to something newer. Copying the data without changing the format or media type is called refreshing. There is a large cottage industry of life coaches and self-appointed gurus who recommend, with varying degrees of urgency and stridency, that we become digital dualists and spend less time online. Fulminations against digitization are harder to find, and that's just as well, since, with enlightened institutions such as the New York Public Library leading the way, having digital access to books, photos, and other analog materials can only be a good thing. Try to ignore the fingers.

(Taken and adapted from *IEEE Spectrum*)

Task 1. Answer the following questions.

1. According to the author of the text, what is the difference between born-digital and born-analog data?
2. How would you explain the concept reborn digital?
3. What would be the main difference between digital curators and analog curators?
4. Why did the author mention the digitization of analog materials?
5. Can you explain the word *scanop* and do you know any other similar newly-coined word?
6. Can you explain the terms crowdsourcing and gamification?

7. What do the dark archives refer to?
8. What about dim archives and light archives?

Task 2. Speaking. Explain the following concepts:

- Format migration
- Refreshing

Task 3. Try to describe in your own words your ideas concerning digital data storage.

Unit 5: Input devices

These are devices that are used to input data into the computer. There is a variety of such devices, from the common mouse and keyboard to the more specialised devices such as barcode readers and magnetic ink character readers, as well as the type of input devices used in computer control. These will all be described in this section.

Computer keyboards

The computer keyboard is the most common input device. It is used for inputting text and instructions using a number of software applications. As well as text, numbers, punctuation marks and symbols that are entered using the keyboard, there are some very important keys such as the Control (Ctrl), Alt, Shift, Tab, Enter, Function and cursor arrow keys.

The QWERTY keyboard pictured above (so-called because these are the first letters along the top line of letter keys) is the most common keyboard but it is not the easiest to use. Because the earliest keyboards were designed for use in mechanical typewriters the most frequently used keys were deliberately kept apart so that the keys would not jam. A much more efficient layout is seen in the DVORAK keyboard, named after its inventor. It is much easier to use than the QWERTY version but because the vast maj ority of computer users are used to using the QWERTY keyboard the DVORAK is unlikely to increase in use.

Ergonomic keyboards, sometimes called ergonometric keyboards, are a recent invention.

Because more and more people are becoming frequent users of computers an increase in repetitive strain injury (RSI) has become apparent. These keyboards are shaped so that the user is less likely to suffer from RSI.

Another type of keyboard is the overlay or concept keyboard. This usually consists of an A4-sized tray that can have an overlay sheet in it. The overlay sheet can consist of boxes with phrases in, letters of the alphabet, numbers or other symbols. It is used by people who may have disabilities, as it is easier to press a large symbol than to press the key on the keyboard.

♦ Keyboards are used to input text, for example into a word-processed document. There are other devices used for copying text, so keyboards tend to be used where the

text concerned is original and is entered directly by the author of the document. Examples of such documents are letters, business documents, user guides etc.

♦ Keyboards are also used to type commands into a computer, for example pressing the control (Ctrl) key at the same time as pressing X (to cut selected text) or C (to copy the selected text) or V (to paste the selected text).

♦ They are also used to type in unusual selections of characters, such as passwords.

Advantages

♦ They allow accurate entry of data, in combination with a monitor to check accuracy.

♦ They allow quick entry of original text.

♦ They are robust devices.

♦ Concept keyboards are helpful to people with disabilities.

Disadvantages:

♦ Conventional keyboards can be difficult for people with disabilities to use.

♦ They are not very quick for inputting data compared with direct data entry devices such as barcode readers, and magnetic ink character recognition (MICR) and optical mark recognition (OMR) devices.

♦ They take up more space than other input devices.

Numeric keypads

A numeric keypad is used specifically to enter numbers, although alphabetic characters can be entered by using the function key.

Uses. They are used in situations where only digits have to be entered, for example:

♦ at electronic point of sale (EPOS) terminals, where they are very useful when a barcode is damaged; when this happens, the checkout operator can key in the number using the numeric keypad

♦ with automated teller machines (ATMs)

♦ on mobile phones

♦ when delegates at a conference need to record their responses to questions

♦ when inserting personal identification numbers (PINs), such as for chip and PIN credit/debit cards.

Advantages:

♦ They are small and compact and can be carried easily.

♦ Many devices can be connected to the same computer at conventions.

♦ They are easy to cover up when entering a PIN.

Disadvantages:

♦ It is difficult to enter text.

♦ They can be too small for the numbers to be used effectively.

Mice

A mouse is a pointing device. It is moved by the user in order to control the position of a pointer on the computer screen. It consists of a small plastic case, held under the user's hands, and normally has two buttons, although Apple® computers use a one-button mouse. Inside the case can be a ball, which allows the mouse to glide over the desk surface it is being used on. However, an increasingly popular type of mouse is the optical mouse, which relies on movement being detected using reflected light, rather than by using the movement of a ball. It has no moving parts, which means less damage through regular use, unlike mechanical mice, which can fail due to dirt getting inside the mouse. Mechanical mice also require a special surface, such as a mouse pad, which optical mice do not. A further development has been the introduction of cordless mice, which need a transmitter and a receiver. The transmitter is based in the mouse, while the receiver is usually a separate device that is sometimes similar in appearance to a memory stick and fits into a universal serial bus (USB) port on the computer. Most mice also have scroll buttons so that documents can be moved through quickly. Uses

♦ Mice are used to move the pointer on the screen as well as for selecting items such as check boxes, radio buttons and options from a drop-down menu.

♦ They can be used to draw objects in drawing and art packages.

Advantages:

♦ They allow faster entry of the chosen option, compared with typing on a keyboard.

♦ They allow fast navigation through slideshows/ websites.

♦ They are smaller and more compact than keyboards.

Disadvantages:

♦ They can be difficult to use for people with disabilities.

♦ They can be damaged fairly easily.

♦ They can be difficult to use for entering data other than choices on a menu, radio buttons or by means of hyperlinks.

Touchpads

A touchpad is incorporated into most laptops and is meant to simulate the use of the mouse. It usually has two buttons close to it, similar to a mouse, but these tend to be sunk below the level of the touchpad itself. The user touches the touchpad with a finger and by gently tapping it can make choices on menus, and so on. By keeping the finger in contact with the touchpad and moving the finger around, the user can control the pointer on the screen.

Uses

On a laptop a touchpad can be used in much the same way as a mouse is with a desktop computer. It can be used to move the pointer on the screen as well as for selecting items such as check boxes, radio buttons and options from a drop-down menu.

Advantages:

♦ They allow faster entry of the chosen option compared with typing on a keyboard.

♦ They allow fast navigation through slideshows/ websites.

♦ They are integrated within the laptop computer and don't have to be plugged in.

Disadvantages:

♦ People with disabilities can find them difficult to use.

♦ Many users find them difficult to control compared to a mouse.

♦ They can be difficult to use for entering data other than menu choices, radio buttons or by means of hyperlinks.

Tracker balls

A tracker ball is an upside-down mouse-like device. It has been designed for users who have limited ability regarding movement of their fingers or hands. The key feature is the large ball in the middle of the device that is controlled by using the palm of the hand and enables the user to control the pointer on a screen. There are also a number of buttons, depending on the application. There are usually three, with two tending to be used in the same way as the left-and right-click buttons on a mouse, while the third button is usually used instead of a double click. As it is stationary, it is useful where the user has limited motor skills or where there is a lack of space.

Uses

♦ They can used for any application by people with disabilities or RSI where the use of a mouse would be too difficult.

♦ They are used in control applications where objects on a screen are used to control a process.

♦ Pilots on fast ferry ships and air traffic controllers use them to control the appearance of radar screens and their contents.

Advantages:

- They do not require the fine control that a mouse does.
- They are easier for people with disabilities or RSI to use.
- They can be more accurate when positioning the pointer on a screen.
- They are fixed, so they cannot be knocked accidentally (for example, onto the floor, where a disabled person could have problems retrieving them).

Disadvantages:

- It is difficult to enter data that the button has not been programmed for.
- They can be slower for selecting options compared with using a mouse.

Video digitisers

A video digitiser is used to input video to a computer from a television or video camera. In order for the computer to be able to handle the resulting images the video has to be converted from analogue to digital using the digitiser. Video digitisers are usually video cards that are fitted into your computer.

Remote controls

A remote control is used to control other devices remotely by emitting an infrared signal to the external device. Buttons are pressed to choose different options such as selecting channels on the television or radio, changing the sound volume, setting times for recordings, and much more. Remote controls are small, so that they can be held in the hand, and wireless, communicating with the device by means of infrared signals.

Uses

They are mainly used with home-entertainment devices such as televisions, satellite boxes, video / digital versatile disk (DVD) recorders and stereo systems.

Advantages:

♦ They can be any distance from the device and still operate it.

♦ People who have difficulty walking find it easier to control devices.

Disadvantages:

♦ People with disabilities or RSI can find it difficult to use.

♦ If somebody or an object comes between the remote control and the device, the device can no longer be controlled remotely.

Joysticks

A joystick carries out similar functions to the mouse and tracker ball. It consists of a stick that is gripped by the hand and moved around and buttons that can be used to select options. The stick is used to control the cursor, pointer or other objects on the screen. Generally, the stick is used to move people or other objects around a screen and the buttons for firing weapons or increasing/decreasing speed.

Uses

♦ They are used with video/computer games.

♦ They are used in the training of airline pilots to control various aspects of flying an aircraft.

Advantages:

♦ They allow faster entry of the chosen option compared with typing on a keyboard.

♦ They can be used to control objects in three dimensions.

Disadvantages:

♦ They can be difficult to use for entering data other than menu choices, radio buttons or by means of hyperlinks.

♦ It is more difficult to control the pointer than other windows, icons, menu and pointer (WIMP) input devices.

Unit 6: Virtual Reality in Computer War Games

We asked a number of people to answer the following question: Do you think the use of virtual reality in computer war games is going to affect young people's attitude to violence?

Here are some responses. Read them and decide which point of view (if any) most closely matches yours. Discuss your opinions.

Rita Harper: 'Yes, I do, I think anything which portrays violence as fun is going to alter young people's perception of violence in a very dangerous way. Violent crime amongst young people is increasing, I think manufacturers of computer war games must take some of the responsibility.'

Susan Clark: 'No, not really, kids – particularly boys – have been playing with toy guns ever since guns were invented. Surely playing with toy guns in the real world is more dangerous than playing with imaginary guns in an imaginary world.'

Mark Watts: 'It's difficult to say. Some of my friends get very aggressive when they play computer war games. But I don't really know if it makes them more violent when they're doing other things. I play a VR jet lighter game, and I don't think it has made me more violent.'

(Taken from *Oxford English for Computing*)

Unit 7: The Hacker Manifesto

Another one got caught today, it's all over the papers. "Teenager Arrested in Computer Crime Scandal", "Hacker Arrested after Bank Tampering"...

Damn kids. They're all alike.

But did you, in your three-piece psychology and 1950's technobrain, ever take a look behind the eyes of the hacker? Did you ever wonder what made him tick, what forces shaped him, what may have molded him?

I am a hacker, enter my world...

Mine is a world that begins with school... I'm smarter than most of the other kids, this crap they teach us bores me...

Damn underachiever. They're all alike.

I'm in junior high or high school. I've listened to teachers explain for the fifteenth time how to reduce a fraction. I understand it. "No, Ms. Smith, I didn't show my work. I did it in my head..."

Damn kid. Probably copied it. They're all alike.

I made a discovery today. I found a computer. Wait a second, this is cool. It does what I want it to. If it makes a mistake, it's because I screwed it up. Not because it doesn't like me... Or feels threatened by me...

Or thinks I'm a smart ass...

Or doesn't like teaching and shouldn't be here...

Damn kid. All he does is play games. They're all alike.

And then it happened... a door opened to a world... rushing through the phone line like heroin through an addict's veins, an electronic pulse is sent out, a refuge from the day-to-day incompetencies is sought... a board is found.

"This is it... this is where I belong..."

I know everyone here... even if I've never met them, never talked to them, may never hear from them again... I know you all...

Damn kid. Tying up the phone line again. They're all alike...

You bet your ass we're all alike... we've been spoon-fed baby food at school when we hungered for steak... the bits of meat that you did let slip through were pre-chewed and tasteless. We've been dominated by sadists, or ignored by the apathetic. The few

that had something to teach found us willing pupils, but those few are like drops of water in the desert.

This is our world now... the world of the electron and the switch, the beauty of the baud. We make use of a service already existing without paying for what could be dirt-cheap if it wasn't run by profiteering gluttons, and you call us criminals. We explore... and you call us criminals. We seek after knowledge... and you call us criminals. We exist without skin color, without nationality, without religious bias... and you call us criminals.

You build atomic bombs, you wage wars, you murder, cheat, and lie to us and try to make us believe it's for our own good, yet we're the criminals.

Yes, I am a criminal. My crime is that of curiosity. My crime is that of judging people by what they say and think, not what they look like.

My crime is that of outsmarting you, something that you will never forgive me for.

I am a hacker, and this is my manifesto. You may stop this individual, but you can't stop us all... after all, we're all alike.

(The Conscience of a Hacker by The Mentor, Written on January 8, 1986)

(Taken from http://phrack.org/issues/7/3.html)

Unit 8: Word-Formation in English for Computer Science

Choose the correct word to complete each sentence. You may have to change some words slightly.

instruction	***instruct***	***instructed***	***instructor***

1. Our maths _____ explained to us the principles of binary arithmetic.
2. We were _____ to document our programs very carefully.
3. Both _____ and data have to be changed to machine code before the computer can operate on them.

compilation	***compiler***	***compile***	***compiled***

4. Our university computer does not have a PASCAL _____ .
5. Usually, a programmer _____ his program before he puts in the data.
6. A source program cannot be directly processed by the computer until it has been _____.

result	***results***	***resulting***

7. The linkage editor links systems routines to the object module. The _____ program, referred to as the load module, is directly executable by the computer.
8. The _____ of these mathematical operations were obtained from the university mainframe and not from my micro.

specification	***specify***	***specific***	***specified***	***specifically***

9. Our company bought three packages with very _____ applications: payroll, accounts receivable, and accounts payable.
10. An applications program is designed to do a _____ type of work, such as calculating the stress factor of a roof.
11. Did the analyst give the new programmer the _____ necessary to start on the project?

create	*created*	*creating*	*creation*	*creativity*

12. The _____of this database will give us a huge advantage over our competitors in the long run.
13. The procedure for _____ a new file is very simple.
14. The new position we are advertising is going to require someone with enormous _____ .

generate	*generated*	*generative*	*generation*

15. Exercises can be quickly _____ using this program.
16. Our company is working on a new _____ of software products.
17. This development is sure to _____ great interest.

access	*accessed*	*accessible*	*accessibility*

18. All user requests to _____ a database are handled by the database management system.
19. _____ to the computer room is restricted to authorized personnel.
20. Those files are not _____ unless you know the password.

analyse	*analysed*	*analysis*	*analyst*

21. When a text is _____ , all pronouns, prepositions, conjunctions, and verb forms are automatically identified.
22. This _____ shows that most PC users are not aware of the fun potential of the software products they buy.
23. The DBMS first receives the request and _____ it for syntax errors.

consider	*considered*	*consideration*	*considerable*	*considerably*

24. We'll have to _____ using another company if they can't provide the software we need.
25. The company has invested a _____ sum of money in ergonomic workstations.
26. The CEO has submitted this proposal for your _____ .
27. This computer is _____ faster than the old one.

apply	*applying*	*applicant*	*application*	*applicable*

28. We have interviewed five _____ for the new position.
29. The last part of the form is not _____ to foreign students.
30. My student is thinking of _____ for a government grant to continue his research.
31. The new book uses business _____ to teach computer studies.

explain	*explained*	*explaining*	*explanation*	*explanatory*

32. The package includes an _____ booklet.
33. The instructions are very clear and do not require any further _____ .
34. It will only take a couple of minutes to _____ how the program works.
35. If you are new to this system, almost everything will have to be _____ .

depend	*depending*	*dependent*	*dependence*	*dependable*	*dependably*

36. The company has supplied us _____ for over ten years.
37. We have to reduce our _____ on imported goods.
38. This is very _____ equipment. We have never had a serious breakdown.
39. Today, many companies_____ more on FAXs than on mail.

connect	*connected*	*connecting*	*connector*	*connectivity*	*connection*

40. _____is an important concept in global communications.
41. He only got that contract because he has _____ in the government.
42. Make sure the _____ is not loose before you call a service technician.
43. Once the new telephone lines are _____ , our system should be more efficient.

Unit 9: Programs and programming languages

Computers can deal with different kinds of problems if they are given the right instructions for what to do. Instructions are first written in one of the high-level languages, e.g. FORTRAN, COBOL, ALGOL, PL/I, PASCAL, BASIC or C, depending on the type of problem to be solved. A program written in one of these languages is often called a source program, and it cannot be directly processed by the computer until it has been compiled, which means interpreted into machine code. Usually a single instruction written in a high-level language, when transformed into machine code, results in several instructions. Here is a brief description of some of the many high-level languages:

FORTRAN acronym for FORmula TRANslation. This language is used for solving scientific and mathematical problems. It consists of algebraic formulae and English phrases. It was first introduced in the United States in 1954.

COBOL acronym for COmmon Business-Oriented Language. This language is used for commercial purposes. COBOL, which is written using English statements, deals with problems that do not involve a lot of mathematical calculations. It was first introduced in 1959.

ALGOL acronym for ALGOrithmic Language. Originally called IAL, which means International Algebraic Language. It is used for mathematical and scientific purposes. ALGOL was first introduced in Europe in 1960.

PL/I Programming Language I. Developed in 1964 to combine features of COBOL and ALGOL. Consequently, it is used for data processing as well as scientific applications.

BASIC acronym for Beginner's All-purpose Symbolic Instruction Code. Developed in 1965 at Dartmouth College in the United Sates for use by students who require a simple language to begin programming.

C developed in the 1970s to support the UNIX operating system. C is a highly portable general-purpose language.

Other such languages are APL (developed in 1962), PASCAL (named after Blaise Pascal and developed in 1971), and **LISP** and **PROLOG**, both of which are used for work in artificial intelligence. LOGO is a development of LISP, which has been used to develop computer-based training (CBT) packages.

When a program written in one of these high-level languages is designed to do a specific type of work such as calculate a company's payroll or calculate the stress factor on a roof, it is called an applications program. Institutions either purchase these programs as packages or commission their own programmers to write them to meet the specifications of the users.

The program produced after the source program has been converted into machine code is referred to as an object program or object module. This is done by a computer program called the compiler, which is unique for each computer. Consequently, a computer needs its own compiler for the various high-level languages if it is expected to accept programs written in those languages. For example, in order that an IBM RS/6000 may process a program in FORTRAN, it needs to have a compiler that would understand that particular model and the FORTRAN language as well.

The compiler is a systems program, which may be written in any language, but the computer's operating system is a true systems program, which controls the central processing unit (CPU), the input, the output, and the secondary memory devices. Another systems program is the linkage editor, which fetches required systems routines and links them to the object module (the source program in machine code). The resulting program is then called the load module, which is the program directly executable by the computer. Although systems programs are part of the software, they are usually provided by the manufacturer of the machine.

Unlike systems programs, software packages are sold by various vendors and not necessarily by the computer manufacturer. They are a set of programs designed to perform certain applications, which conform to the particular specifications of the user. Payroll is an example of such a package, which allows the user to input data – hours worked, pay rates, special deductions, names of employees – and get salary calculations as output. These packages are coded in machine language (0s and 1s) on magnetic tapes or disks, which can be purchased, leased, or rented by users, who choose the package that most closely corresponds to their needs.

Vocabulary

Payroll – list of employees and the amount of money to be paid to each of them

Task 1. Fill in the gaps in these sentences.

1. A _____ _____ is a program written in one of the high-level languages.
2. A program written in a high-level language must be interpreted into _____ _____ before the computer will read and process it.
3. A program designed to perform a specific task is called an _____ _____.
4. The _____ _____ or _____ _____ is the program produced when the original program has been converted into machine code.
5. A _____ is a program that converts a high-level language into machine code.
6. The systems program which fetches required systems routines and links them to the object module is known as the _____ _____.
7. The _____ _____ is the program directly executable by the computer.

Unit 10: Programming Languages

Algorithms are designed to solve problems. Programming languages are used to implement algorithms. They create the programs (software) that communicate instructions to a computer.

There are many different types of programming languages. But they all have the ability to:

- input data from a device such as a keyboard
- output data to a device such as a screen
- process calculations like addition and subtraction
- process decisions based on certain conditions being met
- process repetition for a certain number of times, or while a condition is met, or until a condition is met

Languages are defined as human-readable or machine-readable.

Human-readable instructions are encoded in a language that humans can use and understand, while machine-readable instructions are in a language that computers understand, and are in binary code.

Languages are also described as high level or low level. Low-level languages, such as assembly language, more closely reflect the mechanical workings of the CPU.

High-level languages include Java, JavaScript, C++, Ruby, BASIC or Python, while low-level languages include C, assembly language, and machine code.

A computer's CPU only understands (executes) series of binary numbers - so all programming languages are converted into binary code. Low-level instructions can be processed more speedily than high-level languages, but they are more difficult for people to read and write.

For major web applications and powerful games, developers need to know how to code in low-level languages in order to maximise the speed and efficiency of a program. Modern games are typically programmed using a variety of languages.

Assemblers, compilers and interpreters

Translators - usually included within programming software - convert high-level code into machine code. Translators are assemblers, interpreters or compilers.

Assembler

'An assembler translates assembly language into machine code. Assembly language is a low-level language written in mnemonics that closely reflects the operations of the CPU.

Interpreter

An interpreter translates code into machine code, instruction by instruction - the CPU executes each instruction before the interpreter moves on to translate the next instruction. Interpreted code will show an error as soon as it hits a problem, so it is easier to debug than compiled code.

An interpreter does not create an independent final set of source code - source code is created each time it runs. Interpreted code is slower to execute than compiled code.

Interpreted languages include JavaScript, PHP, Python and Ruby. Interpreted languages are also called scripting languages. These are ideal for using within dynamic web applications. They are used for client-side and server-side coding, as they are small programs that are executed within the browser.

Compiler

A compiler translates the whole program into machine code before the program is run. It can be difficult to test individual lines of compiled code compared to interpreted languages as all bugs are reported after the program has been compiled.

The machine code is saved and stored separately to the high-level code. Compilation is slow but machine code can be executed quickly.

Java and C++ are compiled programming languages. Java is a high-level programming language which is compiled to produce bytecode which is then interpreted by a virtual machine (VM). Bytecode is code which is compiled and can then be interpreted.

Debugging

Debugging is the process of working through the program in a systematic way to eliminate any flaws or glitches. A debugger program is usually included within the IDE.

If a section of code gives you different results from what you would expect, try to make that section of code work in isolation. You may have to give it 'dummy' values to make it work.

If there is something that is supposed to happen but does not, find the section of code that is responsible and make sure that it is running when you expect it to.

If something is happening that should not be, find the section of your code that makes that particular thing happen.

When a computer program does not do what you expect, it is likely that the algorithm that you designed is flawed. Go back to your algorithm and separate it into parts and see how this relates to the program that you have created.

Being able to see what is happening inside a program is very useful when debugging.

You can use print statements to see what value is being held in a variable and remove it later, or use specifically designed debugging tools. Python includes a logging module that allows you to print values and analyse errors.

Unit 11: Phrasal Verbs in English for Computer Science

Exercise: Phrasal Verbs in English for Computer Science

Each of the sentences below should contain a phrasal verb. Complete the given sentences by selecting the appropriate verb from the first column and the correct preposition from the second column.

Verbs	Prepositions
Warm	Up
Turn	In
Shut	Up
Turn	Off
Log	Up
Plug	Off
Round	On
Log	Down
Key	On
Call	Down
Break	In
Back	Down

1. The precise amount is 8.5341, but we can _____ it _____ to 8.5.
2. Your printout will arrive in a couple of minutes: the laser is still _____.
3. When you've downloaded the information you need, then _____ from the system.
4. Don't forget to _____ everything ____ before you go home.
5. My computer's _____ again! I need a new computer, really.
6. When he found the virus the first thing he did was to _____ the entire system.

7. I _____ all the customers' addresses from the database and checked them on screen.
8. If you don't _____ regularly you could lose data.
9. We _____ the latest data, after that terrible event.
10. Pushing the big red button on the front _____ the CPU _____.
11. You have to give your password in order to _____ to the system.
12. No wonder it isn't working: you haven't even _____ it ___!

Exercise: Adjectives – Word Formation

The italicised words in Column 1 are all nouns. You should make adjectives originating from these nouns, and then complete the sentences in Column 2 using the correct adjective forms.

Column 1	*Column 2*
1. She asked about the IBM-*compatibility* of the hardware.	She asked whether the hardware was IBM-_____.
2. The board has total *confidence* in the effectiveness of the new system.	The board is totally _____.
3. The *sophistication* of the new package is remarkable.	The new package is remarkably _____.
4. We checked the *validity* of the password.	We checked that the password was _____.
5. He commented on the *electroluminescence* of the TV screen coating.	He commented that the TV screen coating is _____.
6. The keyboarders are finding that the manuscript lacks *legibility*.	The keyboarders are finding that the manuscript is hardly _____.
7. What is the *difference* between these two computer models of?	What makes these two computer models _____?
8. He is doubtful about the *efficiency* of the new networking system.	He is doubtful about whether the new networking system is _____
9. We gave the printer *capability* to produce high-quality colour images.	Our printer is _____ of printing a lot of documents.
10. They reported that there was data *corruption* on the disk.	They reported that the data on the disk was _____.

Unit 12: The Robotics Revolution

Many of the robots in use today do jobs that are especially difficult for human workers. These are the types of jobs that require great strength or pose danger. For example, robots are particularly useful in the auto-manufacturing industry where parts of automobiles must be welded together. A welding tool used by a human worker weighs about 100 pounds or more and is difficult to handle. As mechanical supermen, robots may be called upon to do anything from moving heavy components between workstations on a factory floor to carrying bags of cement.

Spray painting is another task suited to robots because robots do not need to breathe. Unlike human painters, they are unaffected by the poisonous fumes. Robots are better at this task, not because they are faster or cheaper than humans, but because they work in a place where humans cannot.

Third in the list of useful jobs for robots is the assembly of electronic parts. Robots shine at installing chips in printed circuit boards because of a capability that robots have that people don't. A robot, once properly programmed, will not put a chip in the wrong place. This automatic accuracy is particularly valuable in this kind of industry because locating and fixing mistakes is costly.

Earlier robots were usually blind and deaf but newer types of robots are fitted with video cameras and other sensing devices that can detect heat, texture, size, and sound. These robots are used in space projects, nuclear reactor stations, and underwater exploration research.

In their efforts to expand the range of robotic applications, researchers are looking beyond traditional designs to examine a variety of potential models from the biological world. The industrial arm is a classic example. Scientists have been able to model robots to imitate the vertebrate spine of a snake in order to paint the interior of automobiles. They have simulated the muscle structure and movement of an elephant's trunk in an attempt to create a robotic arm capable of lifting heavy objects. Scientists have also emulated the flexibility of an octopus where the tentacles can conform to the fragile objects of any shape and hold them with uniform, gentle pressure. A variation of this design can be used to handle animals, turn hospital patients in their beds, or lift a small child.

The challenge of equipping robots with the skills to operate independently, outside of a factory or laboratory, has taxed the ingenuity and creativity of academic, military, and industrial scientists for years. Simply put, robot hands -like robot legs, or eyes, or reasoning powers -have a long way to go before they can approach what biological evolution has achieved over the course of hundreds of millions of years. Much more will have to happen in laboratories around the world before robots can be compared to nature's handiwork.

In the meantime, the robotics revolution is already beginning to change the kind of work that people do. The boring and dangerous jobs are now assumed by robots. By the turn of the century, more and more humans will be required for tasks that machines cannot do. There are some industrialists who hope that by the year 2000 all their employees will be knowledge workers, no longer standing on assembly lines but rather sitting at desks and computer terminals to deal with information. These changes are already under way, and their pace accelerates every year.

Vocabulary

welded – (of pieces of metal) joined together by heating

shine at – do very well at

has taxed – has made heavy demands on

Task 1. Speaking Practice.

Some jobs are suitable for robots, while some must be done by people. Make two lists in the table below.

Types of jobs suitable for robots	Types of jobs done by humans

Task 2. *Summarizing reasons*.

Summarize the reasons that certain jobs and environments are suitable for robots by completing the table below.

Job or environment	*Reason*
Welding	
Carrying components	
Spray painting	
Assembling components	
In nuclear reactors, underwater, etc.	

Task 3. These are answers to questions about the text. Write the questions.

1. About 100 pounds.
2. Because locating and fixing mistakes is costly.
3. In space projects, for example.
4. They are examining the potential of certain biological models.
5. No, they cannot be compared yet.
6. They will be doing intellectual rather than manual work.

Task 4. Look back in the text and find words in the text which have a similar meaning to:

1. Manipulate
2. Correcting
3. Expensive
4. Increase
5. Copy
6. Reproduced artificially
7. Easily damaged
8. Gets faster

Unit 13: Classification of Types of Robot

One way of classifying robots is in terms of their similarity to humans. An automaton is any machine capable of operating independently, such as a clothes dryer. A flexible machine is a special case of an automaton with different capabilities, that can be programmed as the need arises. An example is a welding robot on the factory floor that can be programmed to participate in other production operations.

A mobile robot is a flexible machine capable of moving freely in its own environment. It can partly select its own goals and communicates with other agents, including humans. An android or humanoid is a mobile robot, whose structure approximately resembles a human structure. Finally, a cyborg is a humanoid with organic structures. Cyborgs have some physiological structures similar to those of humans.

Task 1. Read the short text above, then match each robot type with the appropriate definition.

1. Mobile robot
2. Cyborg
3. Automaton
4. Flexible machine
5. Android/Humanoid

(a) Machine capable of independent operation following a predetermined series of behaviours, e.g. a cuckoo clock
(b) Flexible machine capable of moving and communicating with humans. e.g. a sentry robot
(c) Humanoid having both organic and inorganic structures, with some physiological similarity to humans
(d) Mobile robot of human proportions
(e) Versatile, programmable automaton. e.g. an assembly robot

Task 2. **Renumber the robot types, 1-5 (1 = the most similar to humans; 5 = the simplest).**
1. Mobile robot
2. Cyborg
3. Automaton
4. Flexible machine
5. Android/Humanoid

Unit 14: Fancy a Fantasy Spaceflight?

Make a wish and you can go anywhere. That is the reality for a new computer invention, Chris Partridge says.

Computers are about to take people to places they have never been able to visit before, including the surface of other planets. Such a trip will be an illusion, but one that comes closer to real life than anything on stage or screen. Artificial worlds are being built up in a computer memory so that people can walk through at will, look around, and even touch objects.

The system is called virtual reality, so called from the mathematical concept of an image that has the virtues of a real object without the substance.

Virtual reality systems are being developed throughout the world for a range of uses including enabling people to walk 'inside' nuclear power stations, while controlling a robot that actually goes into an area in which no human could live and conducting architects through a computer-generated building before it is constructed.

British scientists have a world lead in virtual reality, despite the fortunes being poured into research by Japanese and American companies, which see it as a technology for the next century.

In Britain, Robert Stone, of the National Advanced Robotics Research Centre at Manchester University, is developing systems that could put men on Mars without shooting them into space and could plunge divers under the North Sea without taking them out of the office.

The problem with guiding a robot by looking at a picture from a video camera mounted on it and twiddling the controls is that it is not a natural system, Mr Stone says. The operator spends all his time controlling the robot and none solving the problem. The time lag between seeing the image and sending a corrective control signal is another difficulty.

A virtual reality system consists of a helmet with a colour display in front of each eye, and wide-angle lenses to cover the entire field of view and give a stereoscopic effect. The helmet contains sensors, rather like electronic compasses, to record where it is

pointing. A computer calculates what the wearer should be seeing in that direction and displays it on the screen.

In more advanced systems, the operator wears an electronic glove that detects exactly what the fingers are doing and transmits the information to the computer. If the user tries to pick up something, the computer will make the object follow the hand to give the illusion of carrying it.

Pads in the latest type of gloves press into the insides of the fingers and palm when an object is encountered, to create the illusion of feeling it. Complete 'exoskeletons' covering the user and allowing the computer to simulate almost anything possible in real life are still in the laboratory.

A fire-fighter in a nuclear power plant, for example, would move through a computer model wearing an exoskeleton, while a robot would move through the real thing. The computer program will be derived from the data used to design the plant in the first place.

Mr Stone has developed a data glove with air pockets that are inflated to give a sensation of touch in collaboration with Air-muscle, the supplier of the pneumatic systems that made the *Spitting Image* puppets really spit.

The biggest initial market is likely to be for a new generation of video games. W Industries, of Leicester, recently launched a virtual reality system for video arcades. The system, called *Virtuality*, consists of a cockpit in which a player sits, wearing the helmet, at a set of controls that can mimic a bobsleigh, a space-ship, or whatever the imagination of the games programmer can devise.

The helmet has a pair of liquid crystal displays with wide-angle lenses giving a stereoscopic image, and a set of magnetic sensors to tell the computer what the helmet is looking at as it moves.

The first game is a fighter simulation. Another is based on a sequence in the film, *Return of the Jedi*, in which flying motor-cycles race through a forest. The computer can link and control several helmets at once for a group game.

Vocabulary

time lag – time delay

Spitting Image – satirical British TV programme, using computer controlled animated puppets

bobsleigh – large vehicle, moving on strips of wood, for travelling fast over ice and snow

Task 1. Virtual reality is still seen as a toy by most people. Can you think of any potential applications of VR other than in computer games? Make a list.

1. _____
2. _____
3. _____
4. _____
5. _____

Task 2. Answer the following questions about the text:

1. Where does the term 'virtual reality' come from?
2. Which country leads the field in VR research?
3. Why are robots controlled via mounted video cameras less effective than the VR solution?
4. How does Robert Stone's system allow the user to 'fee' objects?
5. What application of VR is expected to be the commonest to start with?

Task 3. Look back in the text and find the words/phrases that match the defintion/explanation:

1. one that comes closer to real life
2. which see it as a technology for the next century
3. without taking them out of the office
4. it is not a natural system
5. to record where it is pointing
6. and displays it on the screen

7. to give the illusion of carrying it

8. while a robot would move through the real thing

Task 4. Choose the appropriate form of the word to fit the meaning of the sentence. Make sure you understand the different forms of the word and their meanings.

1. correct	**correctly**	**correction**	**corrective**	**correctness**

a If an error occurs, it is important to take _____ action immediately.

b The 'spell check' facility checks the _____ of your spelling.

c The data was entered _____, so the result must be accurate.

2. detect	**detection**	**detectable**	**detective**

a There were _____ traces of radiation in the water sample.

b The analyst could not _____ any errors in the system.

c She tried to escape _____ by disguising herself.

3. sense	**sensor**	**sensation**	**sensitive**

a An infra-red _____detects the presence of intruders in the building.

b The probe is _____ to heat and light.

c The new system caused a _____ when it was launched last month.

Unit 15: Visions of Tomorrow

First, safety. Radiation screens are available, and have been for some years. Most of them place an emissions barrier between you and the front of your display, while others encase the entire monitor, protecting you from side and rear emissions as well. Many offices already have these screens available for their workers.

The paperless office is still a dream, but the basic tools are in place. We receive mail in two basic forms: on paper in an envelope, or electronically on our computers. Most of us have access to e-mail in one form or another. That's half the battle won. The other half is a bit more difficult, but it can be, and is being, done. All mail can be opened in the mail room and scanned into the computer using optical character recognition (OCR). Then a document-image-processing program takes over and lets you accomplish electronically what you would normally do with paper. Various personal computer products are available for this purpose.

Pen-based computing is coming into its own. Pen-input capabilities are beginning to show up in hardware, applications, and operating systems. You can’t take notes that will go directly into your computer, and the technology wouldn't know what to do with your doodles, but it would know that a doodle isn't a valid word. And that's a start – a good one.

Multimedia really needs no explanation. There are many packages that help you create multimedia presentations, and the tools to create customized multimedia training programs are also plentiful. CD-ROM disks, such as Ziff- Davis’s Computer Select and Microsoft’s Bookshelf, let you access mountains of information with ease.

Computers are already much smaller than they used to be, and you can't go to an industry show these days without finding some company promoting its 'small footprint'. When you start talking about laptops, notebooks, and palmtops, the question becomes, 'How small is too small?' FAX capabilities are already available on boards that you can plug into your computer. When you combine the technologies present in internal modems with voice recognition, the basics for having your computer replace your phone-voice line are in place.

Voice recognition is another technology that may appear limited in its present form, but it shows great promise for the future. Current voice-recognition systems can handle speaker- dependent continuous speech or speaker-independent discrete speech.

Speaking to your computer will be a major factor in the office of the future. In some locations, it is already a 100 major factor in the office of today. Stock is traded in some brokerage houses by verbal command from the broker to the computer. So, you ask your computer a question, and it answers you -verbally. Depending on the rate of speech sampling used and the resolution the A/D converter uses for each sample, we can already create a credible approximation of human speech with digitized sound.

Large display screens? You can get screens of up to 35 inches now, and between Barco and Mitsubishi competing for the honor of having the largest monitor, it's hard to predict just how big they will get in the future. As for color, some companies offer upwards of 16 million. Somewhere in that number must lie the perfect color for reducing eye-strain.

The real disaster that most of us still have to deal with is the traditional keyboard, which is the cause of much pain and suffering in the form of carpal tunnel syndrome and other repetitive-strain injuries. Wrist rests are available to alleviate the problem, and new designs for strange-looking keyboards, Star Trek-style, are moving from the drawing board to the factory.

Enterprise networks are proliferating almost as fast as LANs did just a year or two ago. Public data networks are ripe for the dialling up and signing on. And the Internet already exists, with several of the research and educational facilities on its membership rolls.

Worldwide connectivity is already available in the enterprise networks of some major corporations (e.g. DEC's DECnet and IBM's Systems Network Architecture). Admittedly, these are proprietary networks, but they are living proof that the concept can and does work.

Vocabulary

doodle – meaningless drawing

brokerage houses – companies that buy and sell shares for clients

carpal tunnel syndrome – chronic wrist-strain caused by repetitive movement. such as typing

Star Trek – futuristic American television series of the 1970s/1980s.

Task 1. Each of the following sentences from the text is followed by two paraphrases. Decide which paraphrase (a or b) is closer in meaning to the original comment. Remember to look at the comments in their original context.

1. Pen-based computing is coming into its own.

a. Pen-based computing is receiving the recognition it merits.

b. Pen-based computing is good for tasks where a conventional pen would normally be used.

2. …you can't go to an industry show these days without finding some company promoting its 'small footprint'.

a. At every exhibition these days, you will find at least one company advertising its own miniature computer.

b. It is impossible to get invited to a computer show these days unless you have a contact in a company manufacturing miniature computers.

3. Current voice-recognition systems can handle speaker-dependent continuous speech or speaker-independent discrete speech.

a. Some of today's voice-recognition systems are set up to recognize continuous speech from certain people, while others can recognize specific words from anyone.

b. All of today's voice-recognition systems are set up to recognize either continuous speech from certain people or specific words from anyone.

4. Public data networks are ripe for the dialling up and signing on.

a. There are public data networks waiting to be used.

b. Public data networks are now sufficiently developed to be used.

Task 2. Reading comprehension and discussion.

1. Do you think the English in the text is:	
a	very formal?
b	quite formal?
c	neutral?
d	quite informal?
e	very informal?

2. Do you think this article originally appeared in:	
a	a computer magazine?
b	a general magazine for young people?
c	a general magazine for adults?
d	an online bulletin board?
e	the science page of a newspaper?
3.	Do you think this article is written by:
a	a British person?
b	an Australian?
c	an American?
d	a non-native speaker of English?

***Task 3*. Look back in the text and find words with a similar meaning to:**
1. whole
2. usually
3. acceptable
4. seem
5. believable
6. decreasing
7. spreading
8. ready

***Task 4*. Now find words or phrases that mean the opposite of:**
9. danger
10. destroy
11. rare
12. separate
13. minor
14. less than
15. enjoyment
16. aggravate

***Task 5*. Discussion. We have looked at some of the benefits of replacing people with computers in the office. What are the negative aspects of this policy?**

Task 6. Writing. Write two paragraphs, one listing the benefits, the other listing the negative aspects of replacing people with computers.

Bibliography

[1] Boeckner, Keith & P. Charles Brown (1993) *Oxford English for Computing*. Oxford: Oxford University Press.

[2] Glendinning, Erich H. & John McEwan (1993) *Oxford English for Electronics*. Oxford: Oxford University Press.

[3] Glendinning, Erich H. & John McEwan (2002) *Oxford English for Information Technology*. Oxford: Oxford University Press.

[4] Hill, David. (2013) *English for Information Technology 2*. London: Pearson Longman.

[5] Leadbetter, Chris, Roger Blackford & Tony Piper (2013) *Cambridge International AS and A Level Computing Coursebook*. Cambridge: Cambridge University Press.

[6] Olejniczak, Maja (2011) *English for Information Technology 1*. London: Pearson Longman.

[7] Remacha Esteras, Santiago (2010) *Infotech: English for Computer Users*. Cambridge: Cambridge University Press.

[8] Remacha Esteras, Santiago & Elena Marco Fabre (2007) *Professional English in Use for Computers and the Internet*. Cambridge: Cambridge University Press.

[9] Sargent, Brian & Graham Brown (2011) *AS and A Level Applied ICT*. Cambridge: Cambridge University Press.

[10] Thomas, Shirley (1965) *Computers: Their History, Present Applications and Future*. New York: Holt, Rinehart and Winston, Inc.

[11] https://ieeexplore.ieee.org/document/7439589

[12] http://phrack.org/issues/7/3.html