

17 Programming

A Programming languages

Programming is the process of writing a program using a computer language. A **program** is a set of instructions which a computer uses to do a specific task (e.g. a solution to a Maths problem).

The only language a PC can directly execute is **machine code**, which consists of 1s and 0s. This language is difficult to write, so we use symbolic languages that are easier to understand. For example, **assembly languages** use abbreviations such as ADD, SUB, MPY to represent instructions. The program is then translated into machine code by software called an **assembler**.

Machine code and assembly languages are called low-level languages because they are closer to the hardware.

High-level languages, however, are closer to human languages; they use forms resembling English, which makes programming easier. The program is translated into machine code by software called a **compiler**. Some examples are:

- FORTRAN – used for scientific and mathematical applications
- COBOL – popular for business applications
- BASIC – used as a teaching language; Visual BASIC is now used to create Windows applications
- C – used to write system software, graphics and commercial programs
- Java – designed to run on the Web; **Java applets** are small programs that run automatically on web pages and let you watch animated characters, and play music and games.

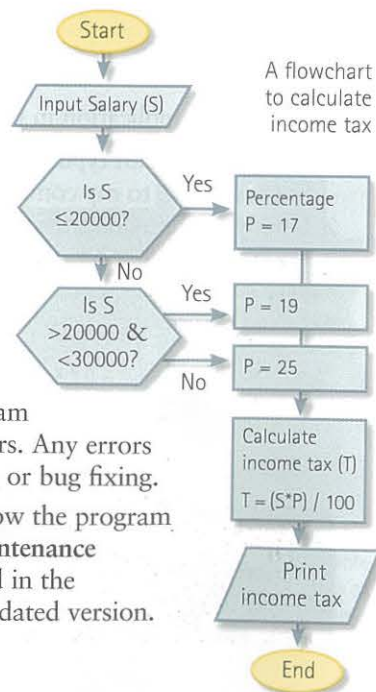
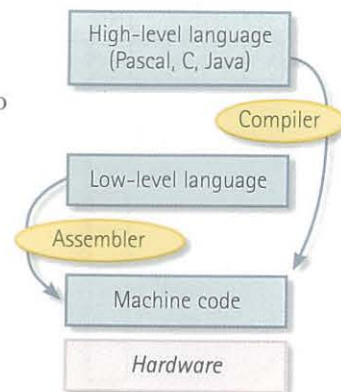
The languages used to create Web documents are called **markup languages**; they use instructions (markups) to format and link text files. Examples are:

- HTML – the code used to create Web pages
- VoiceXML – it makes Internet content accessible via **speech recognition** and phone. Instead of using a web browser on a PC, you use a telephone to access voice-equipped websites. You just dial the phone number of the website and then give spoken instructions, **commands**, and get the required information.

B Steps in writing a program

To write a program, software developers usually follow these steps.

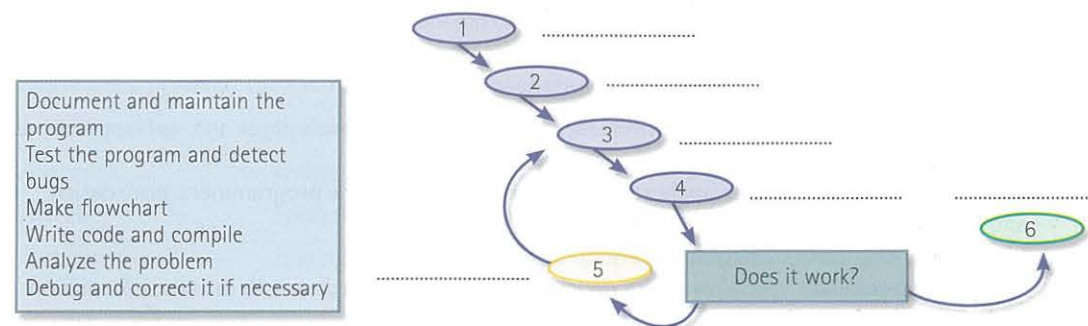
- First they try to understand the problem and define the purpose of the program.
- They design a **flowchart**, a diagram which shows the successive logical steps of the program.
- Next they write the instructions in a high-level language (Pascal, C, etc.). This is called **coding**. The program is then **compiled**.
- When the program is written, they test it: they run the program to see if it works and use special tools to detect **bugs**, or errors. Any errors are corrected until it runs smoothly. This is called **debugging**, or bug fixing.
- Finally, software companies write a detailed description of how the program works, called **program documentation**. They also have a **maintenance** program. They get reports from users about any errors found in the program. After it has been improved, it is published as an updated version.



17.1 Match the terms from A opposite with their definitions.

- | | |
|-----------------------|---|
| 1 programming | a basic language which consists of binary codes |
| 2 machine code | b programming language such as C, Java or Visual BASIC |
| 3 assembly language | c writing computer programs |
| 4 high-level language | d low-level language translated into machine code by an assembler |
| 5 Java applet | e software which converts a source program into machine code |
| 6 compiler | f language used to create and format documents for the Web |
| 7 markup language | g small self-contained program written in Java |

17.2 Look at B and then put these programming steps into the correct order.



17.3 Complete this article about the VoiceXML application language with the words from the box.

HTML dial VoiceXML commands speech recognition

Internet: Voice recognition takes off

You don't need a sophisticated cell phone to surf the Internet when you're on the road – just your own voice. That's the idea behind a new breed of voice service that is popping up all over the place. Subscribers (1) a toll-free phone number and use spoken (2) to listen to anything from weather conditions to stock quotes, or flight information to news stories. Half a dozen of these services – such as Audiopoint, BeVocal, TellMe and TelSurf Networks – have already gone live or are testing their systems.

These launches are all happening because two crucial technologies have come of age.

(3) software from companies such as Lucent, Nuance and Speechworks can now understand a wide range of accents and diction without having to be trained to a specific voice. And computer languages such as VoiceXML make it as easy to write voice services as (4) has made it to write web pages. With (5), the human voice becomes a substitute for a computer mouse and the spoken command for a click. It doesn't, however, call up conventional web pages, but content which is specially composed for a telephone: sound clips, numbers, music, spoken texts.

The Economist

You and computers

Access the *Professional English in Use ICT* website at www.cambridge.org/elt/ict. Then do the activity **Computer languages**.

| | | | |
|---------------|----------|-----------|--------------|
| Lisp | FORTRAN | C++ | Visual BASIC |
| COBOL | Pascal | Ada | HTML |
| Objective-C | Perl | SmallTalk | PROLOG |
| JavaScript | LOGO | Clipper | Delphi |
| Visual FoxPro | Assembly | SQL | Java |

```

include <stdio.h>
main()
{
printf("hello, world\n")
}
  
```

This C program tells the computer to print the message 'hello, world'.

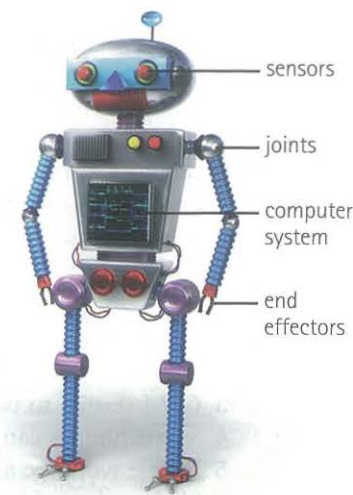
30 Robots, androids, AI

A Robots and automata

A **robot** is a computer-programmed machine that performs actions, manipulates objects, etc. in a precise and, in many cases, repetitive way.

Robots may be **automata**, or man-like machines, whose basic components are similar to a human body.

- They have mechanical links, **joints**, which connect their movable parts.
- Their heart and muscles are the electric or pneumatic motors or systems, the **actuators**, which create the movement.
- Robots also have hands, usually tools or grippers, called **end effectors**.
- They may be equipped with cameras or infrared controls, **sensors**, which transmit information to the central system in order to locate objects or adjust movements.
- Finally, robots depend on a **computer system**, the brain that directs the actions.



B Uses for robots

The word *robot* comes from *robota*, meaning compulsory labour in Czech; similarly, robots are helpful in activities which are too dangerous, too boring or too precise for human beings.

Robots in industry

Robotic arms, telescopic or bending arms, are widely used in the automobile industry to paint, weld and assemble car parts. Robots are also used in electronic assembly of microchips where precision of movements is essential.

Robots and space

Planetary rovers, remotely-operated vehicles, and **space probes**, unpowered spacecrafts, are used to explore space.

Robots and health

Surgical robots, which help human surgeons, are programmed to assist in very delicate microsurgery operations or mimic the surgeons' movements in telesurgery operations.

Robots and safety

Mobile robots, vehicles controlled by human operators, are used for defusing bombs and handling hazardous materials.



Robotic arms are common in industry



Artificial Intelligence?

C Artificial Intelligence

Artificial Intelligence (AI) is the science that tries to recreate the human thought process and build machines that perform tasks that normally require human intelligence. It has several applications.

Androids are anthropomorphic robots designed to look and behave like a human being. Most androids can walk, talk and understand human speech. Some react to gestures and voice inflection. Some 'learn' from the environment: they store information and adapt their behaviour according to a previous experience.

Expert systems is the term given to computer software that mimics human reasoning, by using a set of rules to analyze data and reach conclusions. Some expert systems help doctors diagnose illnesses based on symptoms.

Neural networks are a new concept in computer programming, designed to replicate the human ability to handle ambiguity by learning from trial and error. They use silicon neurons to imitate the functions of brain cells and usually involve a great number of processors working at the same time.



An android and a human being: can you tell one from the other?

30.1 Complete the article with words from A opposite.

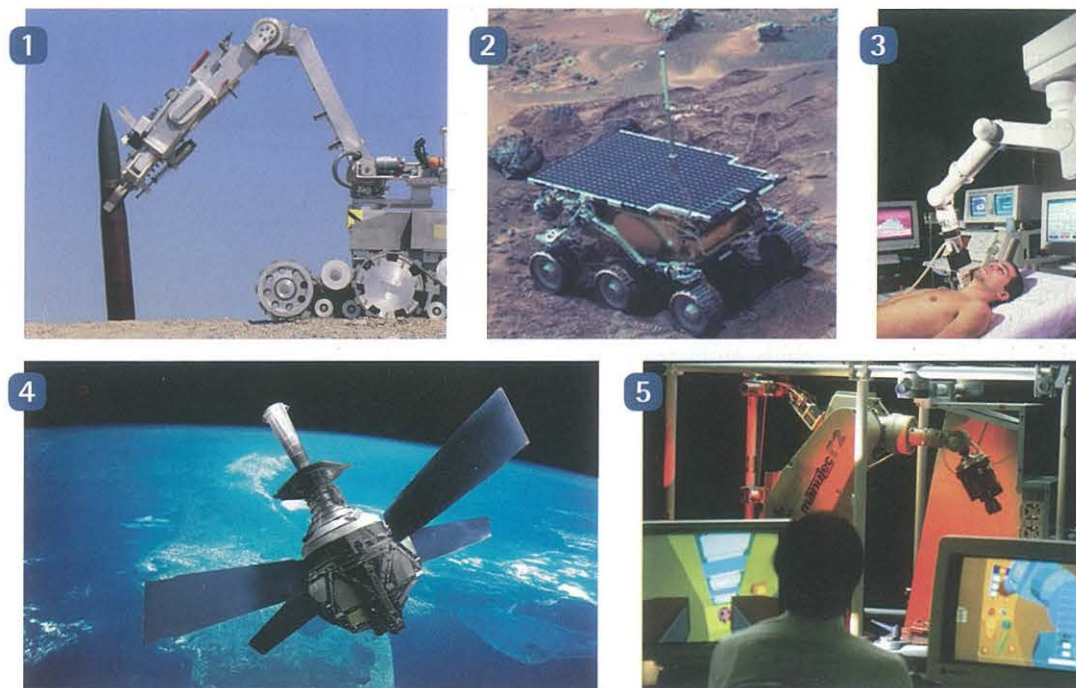
ACTION ROBOT TO COPY HUMAN BRAIN

Scientists at Aberystwyth University are working on a machine which they hope will recognize objects with cameras that will work as (1), and retrieve objects with an arm that will be its (2)

Although the arm will have (3) that will link its muscles and an electric motor that will be the (4), this new (5) won't move like a human, i.e. it won't be like the (6) of science-fiction films: forget *Star Wars*' C3PO. It will be desk based: no walking, or climbing stairs.

The team hopes to discover how the brain performs 'multi-tasking' and to use that information to develop the (7) to create a robot that can think for itself.

30.2 Match the pictures below to the types of robots in B opposite.



30.3 Complete the extracts with words from C opposite.

The term (1) is defined as the automation of intelligent behaviour, but can (2) really be intelligent?

(3) are made of units that resemble neurons. They are often used to simulate brain activity and are effective at predicting events.

(4), also known as knowledge-based systems, mirror the structure of an expert's thought.

You and computers

Make a list of other uses of robots at home and at work.