



Introduction to Computing and VBA

By

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Lecture Outline

- Course Introduction
- Hardware and Software
- Brief History of Computers
- Software and Its Evolution
- Programming Languages
- Basic, Visual Basic and Excel
- Visual Basic for Applications
- Summary

Course Introduction

- This course “Computer Application in Petroleum and Natural Gas Engineering” is all about how to use computers to solve petroleum engineering problems.
- The course would be in two parts;
 - Visual Basic for Application for Problem Solving
 - Use of Petroleum Engineering Software for Problem Solving
- VBA (Visual Basic for Applications) has been chosen as the software that would be used for this course because of its versatility and ease of integration with Microsoft office suite, especially Excel for the Petroleum Engineer.
- Knowledge of computers and problem solving would be used and taught in this course

Hardware and Software

- Every computer has software and hardware
 - Hardware: Physical components that make up a computer system e.g. Input devices (mouse, keyboard), Display devices (visual display unit or monitor, printer, speakers), memories, processors, printer, scanner etc.
 - Software: These are the programs that operate the hardware. These include operating system, programming languages of all kinds and applications of all kinds.



CPU and Computer Memory

CPU (Central Processing Unit): This is the “brain” of the computer system, it is where all the logical and arithmetic computation is done.

ROM (Read Only Memory): This is a non-volatile memory, it is never erased when the computer is shut down. It stores programs that are permanently required by the computer to operate.

RAM (Random Access Memory): This is a non-permanent volatile memory. Its purpose is for storing programs and data that are required while running a program. It is erased once the computer shuts down.

Brief History of Computers

- Computers have gone through several huge changes in the last 50 years, and they have become smaller, faster, cheaper and more powerful.
 - First Generation Computers: These were built in the 1940s. They were known as **mainframe** computers. They were big, difficult to use and very slow. The electronics was based on vacuum tubes. They were mostly used in universities and research centers. E.g.
 - Second Generation computers: These emerged in the 1950s, the electronics was based on transistors (also used in transistor radios). They were smaller, faster and more reliable and had more memory capacity.

Brief History of Computers

- Third Generation Computers: These emerged during the mid-1960s and their electronics was based on the integrated circuits (IC) technology. This provided significant reduction in size over transistor based 2nd generation computers. They were also cheaper and known as **minicomputers**. A lot were bought by several organizations, governments and universities.
- Fourth Generation Computer: This were built in the late 1970s and were know as micro-computers. The electronics was based on the Silicon chip. This became small enough to fit on office and home desktops. They are now more known as Personal Computer (PC). Example are the Apple II microcomputer by Steve Jobs and Steve Wozniak of Apple Computers



The Coming of the IBM PC

IBM (International Business Machines) which was originally a mainframe and minicomputer manufacturer decided to venture into PC (personal computers) market.

In doing this, they employed **Microsoft** to write the code for their Operating System called DOS (Disk Operating System) and **Intel** to incorporate the 16-bit 8086 microprocessor into their computer. This processor evolved into the 80486, which was later replaced by the Pentium processor in mid-1990s.

Thus IBM became a standard in the PC market and there were either PCs that were IBM compatible and those that were not. Today however, we use the term “Windows’ compatible for such PCs as against Macintosh compatible (Apple PCs).

What is Software?

- Software are the program a computer needs to operate. Software comprises of two components;
 - First a computer needs a program that will control all the hardware units to link together so that act in unity and enable the user to interact with the computer. This type of program is called the ***Operating System (OS) or Operating Software.***
 - Secondly, it needs program that can perform specific tasks that the user wants performed e.g. sending emails, writing documents, plotting graphs, solving engineering problems etc. These programs are called ***application programs or application software.***

Software and Its Evolution

- **Operating System (OS) Software**

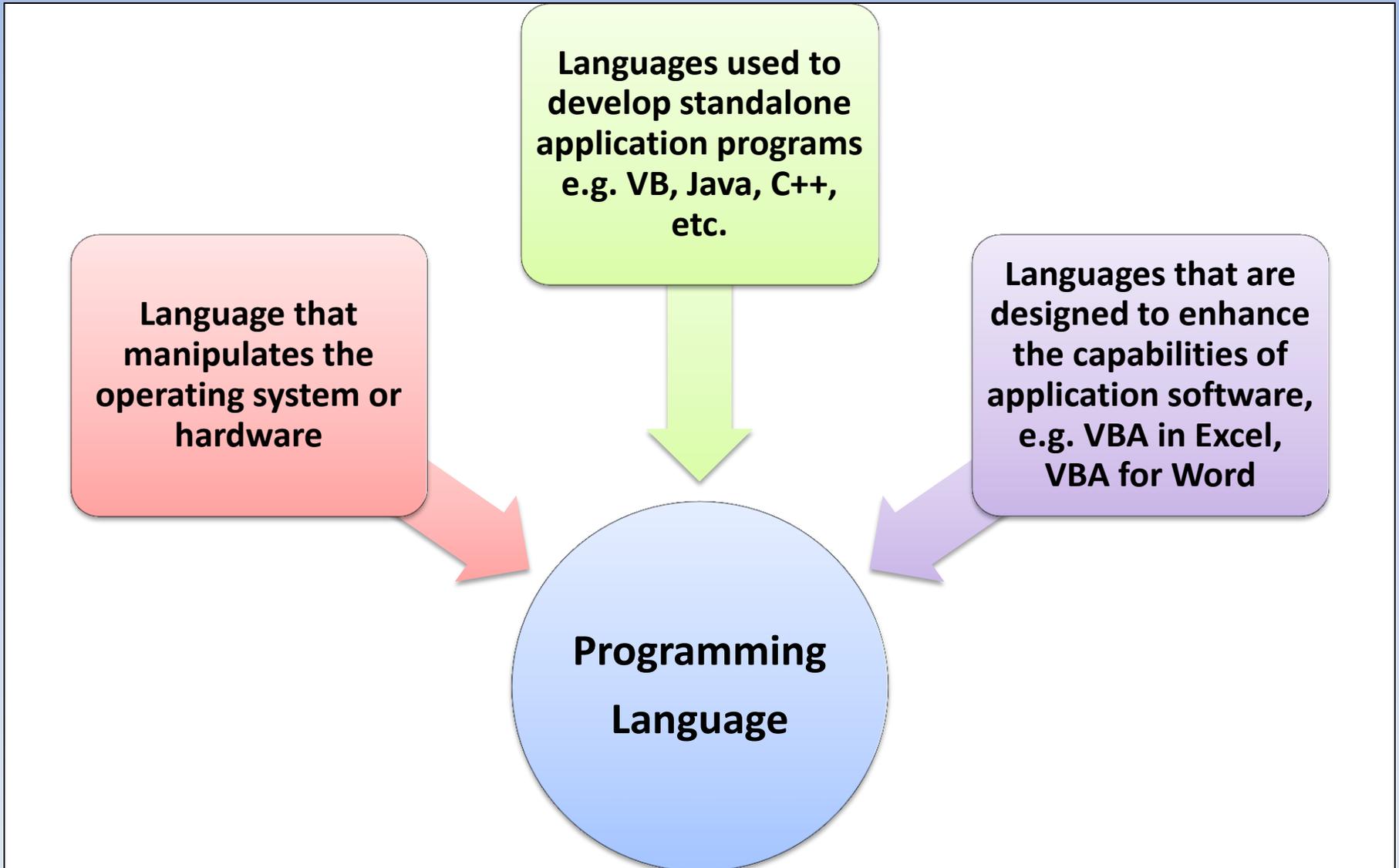
- This is the most important software running on a computer system. Examples of OS software include DOS, UNIX, Linux, Windows XP, Windows 7 etc.
- Earlier OS like DOS were command prompt based, which means the user had to learn and lots of commands and the right syntax
- However, the introduction of OS with GUI (graphical user interface) made OS more user friendly. This led to naming such interface “windows”.

Software and Its Evolution

- **Application Software**

- These are primarily used for specific applications as required by the user e.g. Microsoft Word is used for word processing applications. Also, applications can be developed by using programming languages.
- Programming Languages-: These are software programs that can be used to develop special and unique solutions for end users. For example VB (Visual Basic) can be used to develop specific and generic solutions in Engineering, Accounting, Science etc.

Classification of Programming Languages



Evolution of Programming Languages

- Programming Languages have changed over the years, here we summarize these changes.
 - **First Generation Language (Machine Code):** The first generation computers (1940s) used program codes written in binary digits (BITS) i.e. 0s and 1s. This is known as machine language, it was very difficult to understand and a good knowledge of the hardware was needed to write a program. The program was cumbersome and highly inefficient.
 - **Second Generation Languages (Assembler Languages):** Assembler languages replaced machine code in the early 1950s, it is called assembler because an “assembler” is required to translate the program into machine code. It was better to work it by programmers than machine code.

Evolution of Programming Languages

Third Generation Languages (3GLs): This became known as **high level languages**, they were written in such a way that single statement could be converted to into several low level machine instructions. A translator program would then be used that would convert the high-level instructions into machine language. This translator is called a **compiler** (some programs like VB uses Interpreters).

A compiler is a program that translate high-level source code into machine language and creates an executable file.

An executable file is a file that can be executed directly from the operating system.

Examples of high-level languages include FORTRAN (**FOR**mula **TRAN**slation), developed by IBM in 1954, COBOL (**CO**mmon **B**usiness **O**riented **L**anguage) developed in 1959 etc. C was also popular because it compiles faster because it provides low-level language and high level facilities.

Evolution of Programming Languages

Fourth Generation Languages (4GL): These support visual program development. The programmer can create graphical user interfaces by pointing and clicking with a mouse, similar to when using a Windows OS. Much different from previous generations where programs must be written with a keyboard. 4GL are possible due to the development of GUI operating systems such as Windows. Some characteristics of 4GLs are;

- Visual environment for development
- Easier to learn
- Built in 3GL language support
- Faster to develop applications when compared to 3GLs

For example, VB and VBA are 4GLs that evolved from Microsoft Basic, which was on the first generation of microcomputers (PCs). In VBA programs are written in an Integrated Development Environment (IDE).

Delphi is another of such 4GL that evolved from Turbo Pascal. A Delphi code is compiled when running hence faster, while VBA is interpreted line by line.

Evolution of Programming Languages

Fifth Generation Languages (Artificial Intelligence Languages): Artificial Intelligence (AI) languages are totally different from previous generation programs because they solve problem using a totally different methodology. Previous generation programming languages are “procedural”, i.e. you have to know how to solve a problem. However the AI languages uses the declarative methodology i.e. they solve a problem by knowing what the problem and then using built in logic programming capabilities to reason facts and draw conclusions. Two most common AI languages are Lisp and Prolog

Basic, Visual Basic and Excel

- In this section we look at the relationship and developmental history of VB and Excel
- Basic and Visual Basic
 - Visual Basic evolved from a 3GL called BASIC (Beginners All Purpose Instruction Code). It was originally developed in 1965 in a mainframe computer. However, Microsoft created a version of Basic in 1970 for PCs.
 - Basic was successful because it has low memory and it didn't need a compiler unlike FORTRAN and COBOL
 - In the 1990, a major change was effected on Basic to make it work in the Windows OS, this gave birth to Visual Basic. It is called Visual because it supports the graphical user interface operations used in the Windows operation system.
 - Since this humble beginning, Visual Basic has become a very successful standalone visual programming language.



Microsoft Excel

Spreadsheet software application was first developed in a program called VisiCalc, it was commercially available in the 1970s. It was written for Apple II microcomputer.

However in 1983, Lotus 1-2-3 was developed for use on the IBM PC and it proved really successful. Lotus was the first spreadsheet to integrate “macros”, which gave users a means to automate repetitive tasks. During this time, Microsoft was also marketing a spreadsheet called Multiplan.

Excel was released in 1985 by Microsoft and it evolved from Multiplan. It was originally released for use on the Apple Macintosh. However, Microsoft made Excel macro much better than Lotus 1-2-3 by introducing a macro language in Excel 4, also the file can be written and saved separately as a **XLM** file. This early macro language ultimately transformed into VBA today.

Visual Basic for Applications (VBA)

- VBA is a programming language created by Microsoft that can be built into applications. For example VBA for Excel is a programming language that is contained within Excel.
- VBA was first introduced with version 5 of Excel, it is a version of Microsoft's Visual Basic programming language. Its main purpose is to enhance and automate applications that use Excel. There are lots of advantages in integrating VBA into Excel programs.
- VBA is not to be confused with Visual Basic (VB). VB is a standalone program that runs independently. However, VBA is part of Microsoft Office applications. VBA for Excel is part of the Excel program and cannot run without MS Excel. However there are many similarities in the language syntax.
- VBA is also present in Word, PowerPoint and Access which are all Microsoft Applications.

Summary

- In this lecture we looked at;
 - Computer software and hardware was reviewed
 - Brief Evolution of computers
 - Brief Evolution of computer software and languages
 - Evolution of Excel, Visual Basic and Visual Basic for Application.



References

- Keith Darlington, “VBA for Excel Made Simple”, Made Simple Books
- E. Joseph Billo, “EXCEL for Scientists and Engineers, Numerical Methods” Wiley, 2007



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