**Assembly 3 Project**

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Q1) Please explain how to transform an assembly language program into a binary executable file using the necessary reference tables.

Ans) Assembly language (or assembler language), is a low-level programming language in which there is a very strong correspondence between the instructions in the language and the architecture's machine code instructions. Assembly code is converted into executable machine code by a utility program referred to as an assembler. An "assembler" is a translating program that translates each "low-level" instruction into a single "machine-level" instruction; each "machine-level" action is represented by a single, simple "low-level" textual code, called a "mnemonic" code. Mnemonic coding provides a reasonable way of controlling the computer at the machine level, although it would be a tedious method for developing very large programs or systems.

Steps in Assembler to Machine Language Translation-

i) Determining symbolic-actual address pairs - read the code in a "first pass" determining the memory location for each instruction and data item; specifically, the memory addresses of any symbolic labels should be recorded

ii) Translation - read through the code again (the "second pass"); for each instruction, replace any symbolic address with its memory location as determined during the first pass, then translate the mnemonic operation and its address into a machine level instruction (using a table of mnemonic-to-machine codes)

Q2) Please explain the formats of the different types of data (image, video, audio, and alphanumerical, integers, floating-point numbers).

Ans2.i) Different formats of Image data are bitmap images and object images.

1. Bitmap Images-Most images photographs, graphical images, and the like—are described most easily using a bitmap image format. The basic principle for representing an image as a digital bitmap is simple. A rectangular image is divided into rows and columns. The junction of each row and column is a point (actually a small area) in the image known as a pixel, corresponding to each pixel is a set of one or more binary numerical values that define the visual characteristics of that point. Most commonly, colour and colour intensity are the primary characteristics of interest, but secondary characteristics such as transparency may also be present. The meaning and scales for these values are defined within the image metadata that is included with the image, along with the number of rows and columns, identification of the bitmap format in use, and other relevant information about the image. The Graphics Interchange Format (GIF), Portable Network Graphics (PNG), and Joint Photographic Experts Group (JPEG) formats commonly used on the Web are all examples of bitmap image formats.
2. Object Images-Object images are made up of simple elements like straight lines, curved lines (known as Bezier curves), circles and arcs of circles, ovals, and the like. Object images are created using drawing software, rather than paint software. They are also produced by various software packages that display special graphic images, such as the charts in Microsoft Excel or the flowcharts in project management software.

ii) Video format – The Video format is determined by a codec, or encoder/decoder algorithm. There are a number of different standards in use. The best-known codec standards are MPEG-2, MPEG-4, and H.264. The MPEG-2 and MPEG-4 formats store and transmit real-time video that produces movie quality images, with the video data compressed to 10–60 MB or less of data per minute, even for high-definition images. This reduction in data is critical for streaming video, i.e., video that is transmitted through a network and displayed in real time as it is transmitted, since very few networks are able to stream high-quality video without deep compression.

iii) Audio format -The .WAV format is a general-purpose format used primarily to store and reproduce snippets of sound. MP3 and AAC are derivatives of the MPEG-2 and MPEG-4 specifications for the transmission and storage of music. They have gained popularity because of the large numbers of MP3- and AAC-encoded recordings posted on the Web and because of the availability of low-cost portable devices that can download, store, decode, and reproduce MP3 and AAC data.

iv) Alphanumeric format - Three alphanumeric codes are in common use. The three codes are known as Unicode, ASCII (which stands for American Standard Code for Information Interchange, pronounced “as-key” with a soft “s”), and EBCDIC (Extended Binary Coded Decimal Interchange Code, pronounced “ebb-see-dick”). EBCDIC was developed by IBM. Its use is restricted mostly to IBM and IBM-compatible mainframe computers and terminals. The Web makes EBCDIC particularly unsuitable for current work. Nearly everyone today uses Unicode or ASCII. Still, it will be many years before EBCDIC totally disappears from the landscape.

v)Integer Number format - Positive or negative whole numbers. The string of characters representing a number is converted internally by a conversion routine built into the program by the compiler and stored and manipulated as a numerical value.

vi) Floating-point Number format - numbers with a decimal portion, or numbers whose magnitude, either small or large, exceeds the capability of the computer to process and store as an integer. Again, the routine to convert a string of characters into a real number is built into the program.

**References**

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