**Assembly Project- 3**

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

*Answer:*

An assembler program creates object code by translating combinations of mnemonics and syntax for operations and addressing modes into their numerical equivalents. This portrayal regularly incorporates an activity code ("opcode") and also, control pieces and information. The assembler also calculates constant expressions and resolves symbolic names for memory locations and other entities. The utilization of representative references is a vital component of constructing agents, saving dull estimations and manual location refreshes after program changes. Most assemblers also include macro facilities for performing textual substitution – e.g., to generate common short sequences of instructions as inline, instead of called subroutines.

Every computer architecture has its own language. The instruction set sheet for your microprocessor, understand your addressing modes, and other data representation issues, and then convert that to something convenient, like a hexadecimal notation. Then we convert it to get that information in to the device’s memory, using some device specific process. Considering 6503. The first loads the Accumulator (A) with $00, 0 in hex. The # symbol tells the assembler tells us using the "immediate" addressing mode (the 6502 has 13 total addressing modes). The second load the Accumulator with the value of the memory location located at address $0000. On the 6502, it has a "zero page" mode, so it can more easily access memory from the first page of memory (addresses $0000-$00FF). The third loads the Accumulator with the value of the memory location located at address $1234. This is absolute addressing, simply specifying the actual address of the memory where we want to find particular information.

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| **Mnemonic Code** | **Object File - machine code and tables** | |
| ; Dble subroutine  Arg DAT ; input argument to Dble  DAT ; CALL return address  Dble LDA Arg ; start of subroutine  ADD Arg ; double the input value  OUT  CALL Pause  JMP Dble-1  PUB Arg ; Arg is a Public Label  PUB Dble ; Dble is a Public Label  Pause EXT ; Pause is an External | 00: 000  01: 000  02: 100  03: 300  04: 600  05: 000  06: 901 | **Relocatable Address Locations**  02, 03, 06 |

Assembly is the closest it can get to machine code while also being human-readable.  
There is almost one-to-one relation between the machine code (mcc) and assembly code (asm).  
So each asm command has one mcc.

Eg  
push = 01h  
Mov = 02h  
Jmp = 03h

(Note some instr may have more than one mcc, but if you consider the details you will realize they are different.)

Eg: 02 and 04h may both mean mov but 02h may be mov reg, reg. And 04 may be mov mem, reg.

Then we similarly have register codes.  
ax = 01h.  
bx 02h etc

So now coverting asm to mcc is more like a substitution task.  
Mov ax, bx.  
= 02 01 02.

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

*Answer:*

A program executes a particular data according to given format. In this way the knows which file it has to execute. Programs compatible with a file format can give an overview of a file but may not be able to display all the file features. Also, with some programs opening a file format that is not supported may give you [garbage](https://www.computerhope.com/jargon/g/garbage.htm).

There are many common file formats such as image, video, audio, and alphanumeric, integers, floating-point numbers.

*Image:* There are numerous image file types out there so it can be hard to know which file type best suits your image needs. Some image types such a TIFF are great for printing while others, like JPG or PNG, are best for web graphics. Most image files fit into one of two general categories—raster files and vector files—and each category has its own specific uses. This breakdown isn’t perfect. For example, certain formats can actually contain elements of both types. Tiff: TIFF or Tagged Image File Format are lossless images files meaning that they do not need to compress or lose any image quality or information (although there are options for compression), allowing for very high-quality images but also larger file sizes. Bitmap: BMP or Bitmap Image File is a format developed by Microsoft for Windows. There is no compression or information loss with BMP files which allow images to have very high quality, but also very large file sizes. Due to BMP being a proprietary format, it is generally recommended to use TIFF files. JPEG: JPEG, which stands for Joint Photographic Experts Groups is a “lossy” format meaning that the image is compressed to make a smaller file. The compression does create a loss in quality but this loss is generally not noticeable. JPEG files are very common on the Internet and JPEG is a popular format for digital cameras - making it ideal for web use and non-professional prints. GIF: GIF or Graphics Interchange Format files are widely used for web graphics, because they are limited to only 256 colors, can allow for transparency, and can be animated. GIF files are typically small is size and are very portable. PNG: PNG or Portable Network Graphics files are a lossless image format originally designed to improve upon and replace the gif format. PNG files are able to handle up to 16 million colors, unlike the 256 colors supported by GIF. An EPS or Encapsulated PostScript file is a common vector file type. EPS files can be opened in many illustration applications such as Adobe Illustrator or CorelDRAW.

Video : Video formatting has evolved many times over the years. Videos that once required reels of film tape can now be digitized and stored on small USB drives with room to spare. As you prepare to adapt your own home videos for the digital age, it’s important to first understand the many different video file formats available. The best-known codec standards are MPEG-2, MPEG-4 and H.264. They store and transmit real time video that produces movie quality images with the video data compressed since there are very few networks that are able to stream high-quality video without deep compression.

Audio: An audio file format is a file format for storing digital audio data on a computer system. The bit layout of the audio data (excluding metadata) is called the audio coding format and can be uncompressed, or compressed to reduce the file size, often using lossy compression. The data can be a raw bitstream in an audio coding format, but it is usually embedded in a container format or an audio data format with defined storage layer. Each time a sample is taken, the amplitude of the sample is measured by an electronic circuit that converts analog to digital known as A-to-D converter. Most of the famous file formats for storing audio waveforms is .MOD format which is used to store samples of sound that will be manipulated and combined to produce a new sound. MIDI format is used to read the sounds and signals between a computer and connected musical instrument. .WAV format is used to use to store and reproduce snippets of sound. Mp3 and AAC are derivatives of MPEG-2 and MPEG-4 for transmission and storage of music.

Alphanumeric: Alphanumeric is a combination of alphabetic and numeric characters, and is used to describe the collection of Latin letters and Arabic digits or a text constructed from this collection. Any data that is entered as characters, symbols, number digits and punctuation is an alphanumeric data. Numbers are often processed differently from text. All alphanumeric means is a mix of letters (alpha, as in alphabet) and numbers (numeric, as in numerals). ... Alphanumeric format is nothing but your Standard Password which contains Numbers as well as alphabets. Example: Hello123, 1H2El0Onv78.

Floating Point Numbers: Vector file formats occasionally store key points in floating-point format, and a number of different floating-point formats are in common use. Most floating-point data, however, is stored in a portable manner. Suppose consider a number like 7.895. You want to store this in register. So, we need to divide this number in two parts. One part consists of the numbers before the decimal point and the other part consists of the numbers after the decimal point. Floating point is a method that allows the point to float around. To express a large number, the floating point moves all the way to the right, and vice versa to express a small number. This is achieved by taking a number and splitting it into two parts. There are more possibilities in high level programming languages. Some special languages like Lisp, Smalltalk, REXX, Haskell, Python and Perl 6 supports arbitrary precision integers or infinite precision integers or big nums. Boolean or Flag type is type that can only represent two values 0 and 1. There is also a short integer type which takes less storage as compared with the standard integer and a long integer type whose range is greater than or equal to that of a standard integer on the same machine.

Bibliography

1] *Wikimedia Foundation. (2021, February 22). Integer (computer science). Wikipedia. https://en.wikipedia.org/wiki/Integer\_(computer\_science).*

*2]* Englander, I. (2014). The \*architecture of computer hardware, systems software, and networking: An information technology approach: An information technology approach. In The \*architecture of computer hardware, systems software, and networking: An information technology approach: An information technology approach. Hoboken: Wiley.

3] *Wikimedia Foundation. (2021, April 18). Assembly language. Wikipedia. https://en.wikipedia.org/wiki/Assembly\_language.*

4] *Generation of Executable Code from source Program Files. (n.d.). Retrieved May 01, 2021, from http://teaching.idallen.com/dat2343/10f/notes/370\_LMC\_link.html*