



Laboratory work №3Week 3

Use LMC



Software: machine code

- Software code that runs on the hardware
- CPU implements "machine code" instructions
- Each machine code instruction is extremely simple
- o e.g. add 2 numbers
- o e.g. compare 2 numbers



Software: machine code

The language of the machine code is hardwired into the design of the CPU

- o it is not something that can be changed
- Each family of compatible CPUs (e.g. the very popular Intel x86 family) has its own machine code which is not compatible with the machine code of other CPU families.



Lyrics

CPU is capable of performing simple instructions if you load them into RAM. For example addition/subtraction of two numbers, jumping to another instruction. While CPU is performing an instruction the temporary results are stored inside CPU itself in the fastest, smallest memory locations – registers. CPU starts by fetching an instruction from RAM and then executes/performs it. Then again fetches and executes... This is all CPU does. Initially all programs are on hard disk. When user double-clicks a program icon the machine instructions of that program get loaded to RAM where CPU can access them and execute.



What are the instructions?

CPU has list of defined instructions, such as:

- add values
- store values
- copy values
- increment value
- go to command



Example

- Signals sent to CPU
- •(10110000 01100001) (read in hex B0 61)
- •B0 means "Move a copy of the following value into AL (place in memory)"
- Value in AL memory is equal to 61 in hexadecimal



What is assembly language

- •CPU understands only electrical signals, such as: (10110000 01100001)
- •But to be understandable to programmers, assembly languages were created.
- Assembly languages use words instead of binary commands, as: MOV AL, 61h

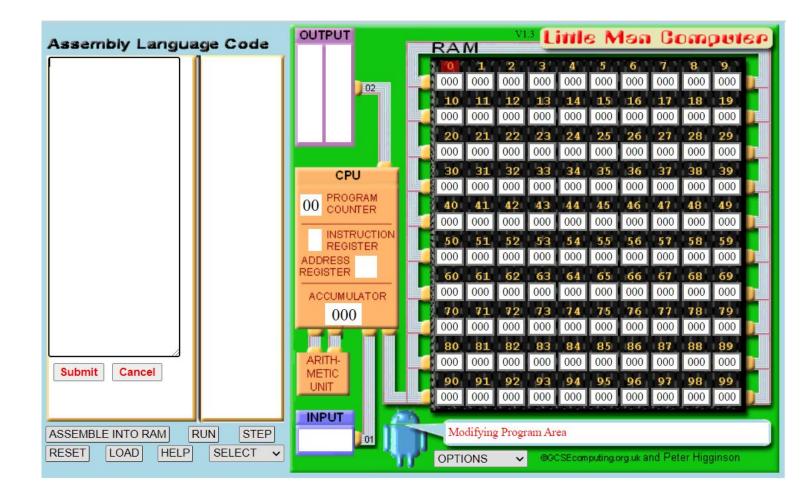


Little Man Computer

- The Little Man Computer (LMC) is an instructional model of a computer.
- The LMC is generally used to teach students, because it models a simple architecture computer - which has all of the basic features of a modern computer.
- It can be programmed in machine code or assembly code.



LMC





Set of instructions:

Mnemonic Code INP ADD

STA

LDA

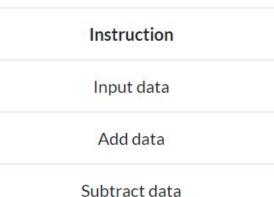
BRA

BRZ

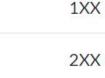
BRP

OUT





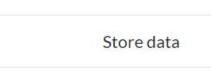


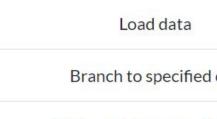


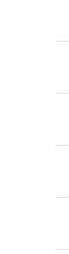


5XX

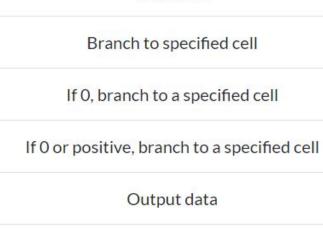
902













Try it: Little Man Computer

- http://robowriter.info/little-man-computer/
- http://peterhigginson.co.uk/LMC/
 Battle Tank:
- http://pddring.github.io/cpu-battle-tank/



Practice

- T1: Read two numbers and output their sum and difference
- T2: Enter two numbers, and output them in ascending order
- T3: Read three numbers and output them in ascending order



Deadline

Laboratory work 3 deadline 07.02.21 at 23.59 pm.



