Design & Development of A Simulator For Microprocessor Application Trainer (MATSOFT385)

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Abstract—MATSOFT385 is the creation of a flexible framework that is competent of providing real-time simulation and visualization services for users moving in the computational field of 'Microprocessor' (μP). The most interesting aspect of this system is that learn the art of programming in machine language with the awareness of design and debugging techniques, etc. mounted on an elegant cabinet. It is the system that enables the students at home or at their personnel PCs to get same ability and knowledge as hardware kit gives. The attribute which differentiate with other systems is that it is not constrained to run on a single specific machine (PC) [3]. MATSOFT385 system allows the users to quickly master the software in an environment very similar to the real hardware. The scope of this simulation is to perform the Instruction set of 8085 μP and load, examine and modifying the contents of memory location. It also examines and modifies the contents of Processor registers and It will perform input/output experiments extends to the study the signals generated by the Microprocessor.

Keywords— Microprocessor Trainer, MAT385 Simulator, Visual studio.

I. INTRODUCTION

In the past twenty years, computer technology growth has fundamentally changed the practice of business and personal computing. During these two decades, the wide acceptance of personal computers and the explosive growth in the performance, capability, and reliability of computers have fostered a new era of computing. The driving forces behind this new computing revolution are due primarily to rapid advances in Microprocessor and semiconductor technologies. The 'Microprocessor Trainers' are designed to learn the Microprocessor programming and interfacing with the key and practical knowledge. Trainers are helpful to understand the Instruction set of Microprocessors, to get familiarization of the components used in typical Microprocessor based instruments. Helps to design application oriented equipment and student

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projects.

Throughout the history of trainers, domination of the market comes and goes. In the mid 1970's [7] the first Microprocessor based trainer was needed to build when μPs (Intel 8085, Moto 6800) introduced commercially and rapidly build as an industry, to teach the μP concepts (Programming Concepts) to the elders who wants to work with it. Nowadays, following with technology trends and advancement, simulations are getting rich attention though they know the old saying 'form is temporary, class is permanent' firmly in mind.saying 'form is temporary, class is permanent' firmly in mind.

Table.1 Different μP Based Trainers

Trainers Features	MAGNA 31B	CMM2	MAT 385	Flite's MPF-1B
CPU	8051/8032 @ 12.0 MHz.	8085 @ 3.072 MHz	8085 @ 3.072 MHz	Zilog Z80 @ 1.79 MHz
Input	ASCII 56 keys Keyboard	32 keys keyboard	24 push button key.	36 keys
Output	LCD Module with 2 rows X 16 characters	6-digit, half-inch size, 7 segments LED display.	6 digit numeric red display.	6 digit 7-segment LED
Memory	EPROM: 32K / 64K X 8 with Monitor Program. RAM : 32K / 64K X 8	EPROM programmer interface to program 2716 through 27512.	ROM:2048(2K) 8-bit EPROM. RAM:256 bytes Static RAM, Monitor ROM	6116 2Kbyte SRAM, User RAM,27648 KB,Monitor EPROM
Power	+5V @ 1.2A.	+5 v @ 900 m a	+5v dc	+ 5V @ 500mA
Interface Signals	I/O port signals, Serial port signals. RS 232 Serial port. Centronics parallel printer port	Parallel I/O:48 TTL compatible lines (2 x 8255). Serial I/O: RS 232C compatible with standard modem control signals.	Serial I/O Interface through 8085 SID and SOD.	_____

Peripherals	8255: 24 I/O lines. Numbers of 16bit Timer/Counter using 8253.	8255: to give 24 programmable I/O lines. 8253:3 programmable interval timers. 8251: for serial communication. 8279: to control keyboard and display.	Teletype, VDU, Cassette I/O. 8155:22 Programmable I/O lines, 256 bytes of static RAM 14 bit timer/Counter. 8755(EPROM):16 I/O lines, 2K (2048) 8-Bit Words Memory.	8255: PPI. Socket for Peripheral I/O (PIO) chip providing 16 digital I/O lines. A speaker. Ear and microphone jacks for audio cassette.
Purpose	To learn both 8051 basic Interpreter and Assembly language very fast.	for Software And Hardware development in R & D labs,	For the starters to learn basics of µP principles and working of 8085 µP family of peripheral components.	As a learning tool for use in the teaching of µP, microelectronics, and control technology.

II.   NEED FOR THE MAT385 SIMULATOR

µP Application Trainer (MAT) 385 was developed by Feed Back Instrument Limited in 1986. MAT 385 are intended to enable a student who has some electronic knowledge but no previous computer knowledge or experience to learn the elements of µP application techniques. The fast growth of Embedded Technology and its influence in our day-to-day life has made study of this technology need of the day

III.   FUNCTIONALITY OF MAT385

Although some 8085 µP based Simulators [5] and trainers [7] are available, but they have their limitations. No any Simulator is the duplication of Hardware kit, which would, helps users to be master with the same hardware Kit.

The basic things that MATSOFT 385 can perform are:

- To provide an easy and effective access to each user .
- Accurate edition , execution , and testing of programs as on real MAT 385 kit .
- Deal Op-Codes and provide duplication of environment.
- Examine the contents of all memory and register locations.
- Deposit program step or data in RAM or register locations.
- Execute programs or subroutines upon command.
- Reset (start) the monitor upon command.
- Interrupt and start operation at a location you specify upon command.

- You may either use the keyboard or display on the board or a teletype writer as the console device by operating a switch.

IV.   IMPLEMENTATION

Keeping in view the simulation design, visual environment allowed for rapid prototyping and development of the program for a Windows environment, the compiled nature of Visual Basic provides adequate performance of the simulation, compared to some other interpreted visual languages. The trainer Command pad and display hardware are simulated as well, at the microprocessor instruction level. Students can edit, execute, and test programs exactly as they would on the real trainer.

Some of the salient features can be gauged as follows.

- Coding input very easy through a Code Command Pad
- Includes provision for saving, opening & editing coding files, so that you don't have to Command the same data over and over again.
- Offers easy and extensive debugging including Breakpoints & Single Step running
- Complete transparency of registers, RAM memory, IO Memory & status flags.
- Has provision to add "Interrupt Service Routines" (ISR) and other subroutines.
- Automatic resizing of interface so you can work with any size and resolution as you are comfortable with
- Compactness

V.   SYSTEM REQUIREMENTS

'MAT SOFT 385' contains a set of macros that uses Visual Basic environment. This application runs on a Personal Computer (PC) with Windows operating system as a desktop application. 'MAT SOFT 385' runs with these minimum requirements:

- Personal Computer (PC) with Intel Pentium processors running Windows 2000 or Windows NT operating system with a minimum RAM of 64 MB (Windows 2000 with 128 MB memory is recommended)
- The user must have knowledge of Operational Codes (opcodes)
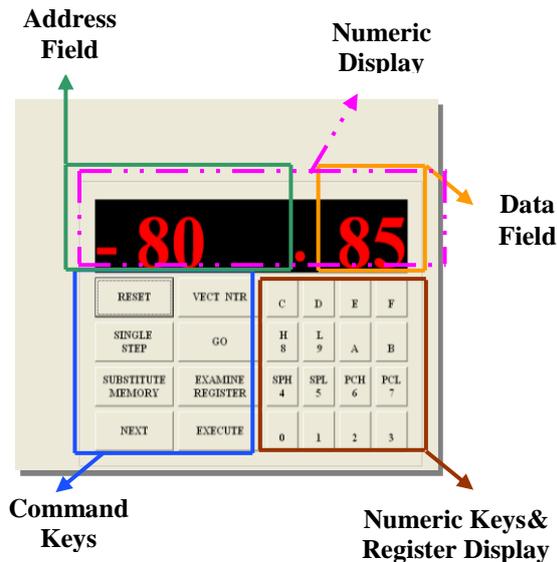- The user should be familiar with Functional Commands

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Fig.1 User Interface Of 'MAT SOFT385' For Students / Beginners

VI.   HOW 'MAT SOFT 385' WORKS

Before understanding with the 'MAT SOFT 385' working three things must be remember;

☐   As 'MAT SOFT 385' is duplication of the MAT 385, so, it is necessary to have some knowledge about the 'OPCODES', their working and the 'Instructions Set' that the simulator can perform and one key thing is to understand how much byte instruction is?

☐   As MAT 385 has user program area 2800h to 28FFh; shown in Figure, in the same manner this simulator works within the range of as mentioned above below or above this range simulator is not able to work, it will display error.

☐   The user can use his / her stored data at particular memory location until the user run out from the 'MAT SOFT 385' environment.

When you will use this simulator you will see a login window shown in figure, and then you can enter into the MATSOFT 385 environment.

Fig. 2 Login Window

VII.   CONCLUSION

This Paper has introduced a Simulator which assist students and programmers to develop and understand the concepts of µP technology in a more efficient and effective way. The way of working of our Simulator ('MAT SOFT 385'), will not be new for MAT385 users.

The simulator we have designed allows the students to quickly master the software in an environment very similar to the real hardware. In our experience, it is important that students be allowed to make the types of mistakes that are possible only with real hardware. As an extreme example, although a reverse polarized capacitor that explodes or bursts into flame is a far more effective teacher than a computer dialog box that informs the student, but it is more expensive and need more university resources because that component has been inserted backwards and 'MAT385' kits are short in numbers in university. With our Simulator 'MAT SOFT 385' students can do practice in their home at any time to familiar with 'MAT385' Kit and get complete basic knowledge of 8085 µP in the same programming fashion.

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