HIGHER TECHNICAL INSTITUTE

ELECTRICAL ENGINEERING DEPARTMENT

DIPLOMA PROJECT

MULTIFUNCTION MCS 51 BOARD

E 1121

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HIGHER TECHNICAL INSTITUTE
NICOSIA – CYPRUS

MULTIFUNCTION MCS 51 BOARD

Project report submitted in partial fulfilment
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Project Number E1121

BY
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To my family,

To Polina and my friends,

For all their help which they offered me with love and understanding throughout my years at H.T.I and especially throughout this project.

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SUMMARY

Multifunction MCS 51 Board

by

Chrysanthos Papapetrou

The general objectives of this project are:

- to investigate the various types of microprocessors manufactured by Intel under their MCS51 brand series
- to investigate the various types of microprocessors manufactured by others such as Philips with compatibility and added features as that the Intel MCS51
- to select the appropriate microprocessor for use at H.T.I
- to investigate the types of possible solutions for a general purpose board and the facilities that are normally offered.
- to investigate the possibilities of programming these microprocessors in the laboratories of H.T.I
- to design, construct, build and test a general purpose MCS 51 based board that is easy to construct at low cost and provide all the basic features of a multifunction board.
- to provide some basic software to aid in the use of the board in the form of a simple BIOS.
- to provide a testing set-up to prove the functionality of the board.
- to provide utilities and resources for assisting the development of MCS 51 based solutions.

The main objective of this project was to construct a general purpose multifunction board. An 8051 microcontroller has been selected among the family of MCS 51 series because it has the best features for the purpose it is aimed for and it has a low cost . It has four 8-bit I/O ports. Two of them combined make a 16-bit address, which control the EPROM, the RAM and two 8255 Programmable Peripheral Interface. The two 8255 PPIs increase the number of ports to six. The 8051 microcontroller has also a serial port which in combination with MAX232 can serve for serial communication.

In order to test the multifunction board, basic software in assembly language has been developed . Originally the microcontroller was programmed for output operation only but the output could be monitored by an oscilloscope. In order to make the output visible a delay subroutine was introduced between the commands. Finally, by using input commands the output was displayed with the aid of light emitting diods (LEDs).

The construction of the general purpose board was successfully completed and tested.

The multifunction board can be used in various control applications. Its main advantages is the low cost of its components and the diversity of its uses.

INTRODUCTION

The engineering community became aware of the 8-bit microprocessors of the middle to late 1970's. The bit size, cost, and power of these CPUs were particularly useful for specific tasks involving data gathering, machine control, human interaction, and many other applications that granted a limited intelligence to machines and appliances. Because of the advances in the semiconductor technology, the "million pounds" computer of the 1960s is now available for less than five pounds, in an integrated circuit called microprocessor.

In 1976 Intel introduced the MCS 48 family consisting of the 8048, 8748, and 8035 microcomputers.These parts marked the first time a complete microcomputer system , including an 8-bit CPU, 1024 8-bit words of ROM or EPROM program memory, 64 words of data memory, I/O ports and an eight-bit time counter could be integrated onto a single silicon chip. Depending only on the program memory contents, one chip could control limitless variety of products, ranging from appliances or automobile engines to text or data processing equipment.

The 4-bit child has grown to a 32-bit adult, the increasing demand has led to new generations of complex CPUs . The engineering applications, however, continue to be best served by 8-bit CPUs with limited memory size and I/O power. Cost per unit also continues to dominate processing considerations. Using an expensive 32-bit microprocessor to perform functions that can be efficiently served by an inexpensive 8-bit microcontroller would doom the 32-bit product to failure in any competitive market.

Building working systems that interface digital logic to the microcontroller demands precise understanding of the electrical loading and timing requirements of an operating microcontroller. Timing and loading considerations are not trivial, an experienced designer is required to configure a system that will work reliably.