DESIGN OF SAP-1 CONTROLLER AND SIMULATION USING MENTOR GRAPHICS

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ABSTRACT

The control unit of the microprocessor is responsible for providing the necessary timing and control signals to all operations in a microcomputer. One technique for designing microcontrol logic is the micropogrammed control, which derives the sequencing and control logic from the contents of a ROM. This paper presents the design of a microprogrammed control unit for a theoretical computer called the SAP-1 (Simple-As-Possible computer).

The sequencer controller is designed and modeled using the Mentor Graphics Design Architect and QuickSim II package respectively.

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With the name of ALLAH the Most Gracious, Most Merciful alone is worth all praises. I bear witness that there is no god save Allah alone, no partners unto Him, and I bear witness that Muhammad is as his servant and his Messenger, sent him along with the truth, as giver of glad tidings and as a Warner, and to tell that the hour is fast-approaching, no doubt in it. Allah forgives me and straightens me.

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MAY ALLAH BLESS ALL OF US.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The SAP-1 computer has been designed for the main purpose of teaching the crucial ideas behind computer operation. Its simple architecture allows students to easily understand how a computer works. The SAP-1 computer has been designed with a hardwired controller-sequencer, which sends out control words or microinstruction during each T-state or clock cycle.

The hardwired controller-sequencer can be replaced by a microprogrammed controller-sequencer where microinstructions are stored in a ROM rather than produced by a hardwired control matrix.

The microinstruction required for each instruction and also for the fetch routine can be stored in a control ROM with each instruction routine assigned to a particular address.

In order to fully appreciate the microprogrammed controller designed for the SAP-1, it is necessary to understand the architecture of computers, in particular the SAP-1.

1.2 Basic Computer Organization

Every computer contains the arithmetic-logic unit (ALU), the memory unit, the control unit, the input unit and the output unit as shown in Figure 1.0.