Thesis Proposal:

AN INTERACTIVE COMPUTER MODEL BASED ON THE SOLAR LOAD RATIO METHOD FOR THE ANALYSIS OF PASSIVE SOLAR DESIGNS.

Submitted to:

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INTRODUCTION

Passive solar design has become widely recognized as a very effective way to achieve a ~~large~~ decrease in the amount of energy required for the space heating in buildings. It has become generally accepted that passive solar strategies can work well and are cost effective. They offer ease of operation, reliability, and are livable and comfortable. Today most small buildings based on passive solar heating strategies are designed by using rules-of-thumb gained through experience. This is partially due to the complexity and cost of most analysis methods. It is the primary purpose of this thesis to enhance a design analysis method on micro-computers for the thermal analysis of buildings which are skin load dominated. The thesis itself will be the development of a computer program based on the Solar Load Ratio (SLR) method developed by the Los Alamos Scientific Laboratory to predict heating load requirements for passive solar buildings. The program will provide a ~~useful~~ improved? tool for analysis in the critical design phases. It will require little time or mathematical expertise to use. Three basic passive solar building types will be analyzed: direct gain, greenhouse, and thermal storage walls. The economics of passive solar design will also de predicted with reasonable accuracy using the thermal performance predictions based on this method.

The thermal design of buildings has become a significant criteria for design. Time spent in analysis and money spent in cinservation and passive solar will pay back the investor

quickly. Today, the thermal integrity and performance of buildings has become as critical an issue as site development, functional arrangement, aesthetic appearance and quility of craftsmanship. This thesis intends to extend the capabilities of the designer with a useful tool that will enable him to integrate thermal performance with these other design considerations.

PROBLEM DEFINITION

Through the method described in the Passive Solar Design Handbook, Volume Two of Two Volumes: Passive Solar Design Analysis, the thesis will develop a computer program to be used in the programming, schematic, design development and working drawing design phases. A problem with such a computer program is how to get designers to use such a simple tool in their design process. The complexity of the problem begins to be defined as more than the development of thermal analysis software but also the development of a sophisticated user interface that will become an intricate part of each design process. Confirmation of the usefulness of such a computer program will be an intregal part of its development. It will include experiments within the studio to help determine its usefulness in each design phase.

METHODOLOGY

I. Background

a. literature of computer models -user interface

b. critical analysis of the SLR method as described by L.A.S.L.

c. introduction to the IBM personal computer and potential interface with designers

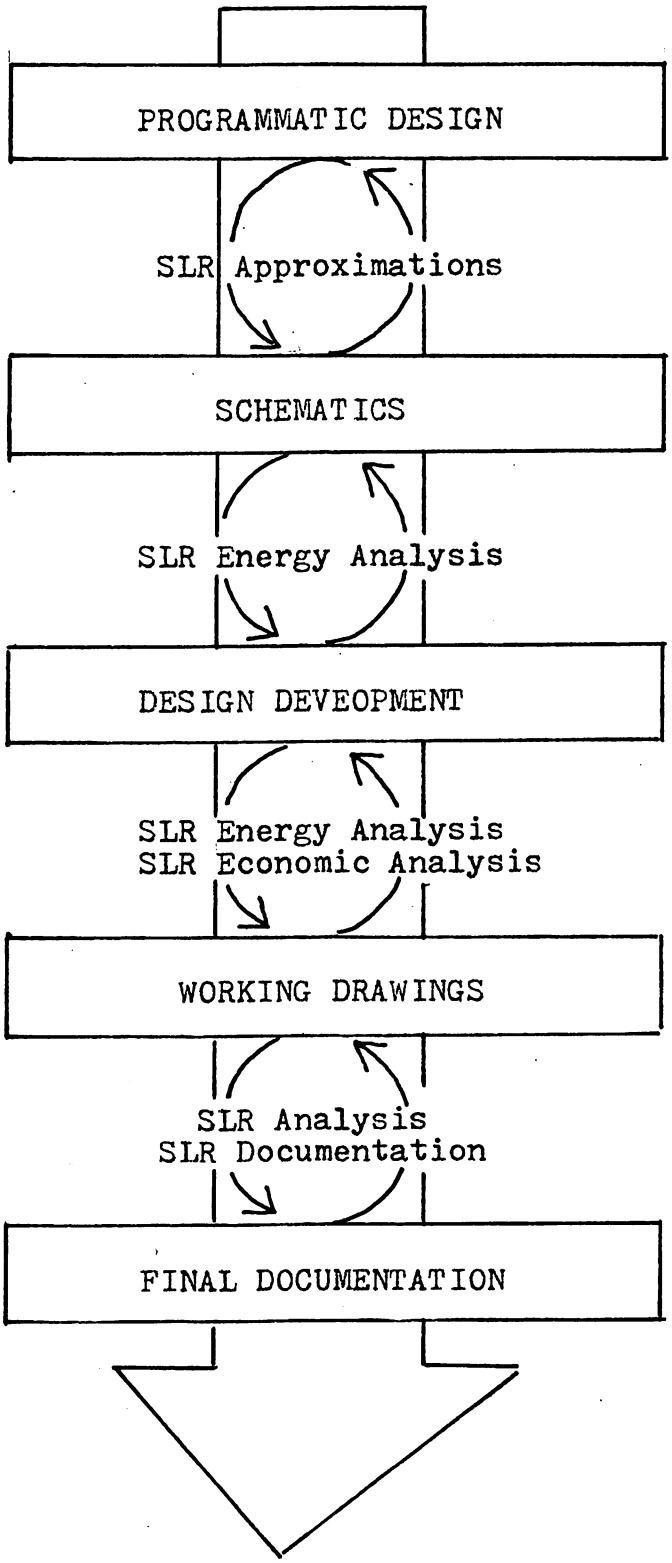
d. example of existing models

The background material will provide a basis for understanding user interfaces with computer models and how that user interaction should be performed to cater to the design process. A complete understanding of the SLR method will be required before any attempt is made to create computer software based on this method. An introduction to the IBM personal computer will be necessary to be able to fully utilize the capacities and limits of the machine for user interfacing.

II. Development of Computer Software

The computer software will be based on the method developed by the Los Alamos Scientific Laboratory. The estimation technique requires only monthly solar radiation, degree-day weather data and building characteristics. The method is appropriate for the design calculations for small skin load dominated buildings. A very active and simple program interface will allow designers to estimate the relative performance of solar design alternatives.

A primary concern of this thesis will be the development of a tool that will readily fit into the design process and be accepted by architects for its usefulness. This will require strategic and careful programming for each level of the design process. The integration is graphically described below.



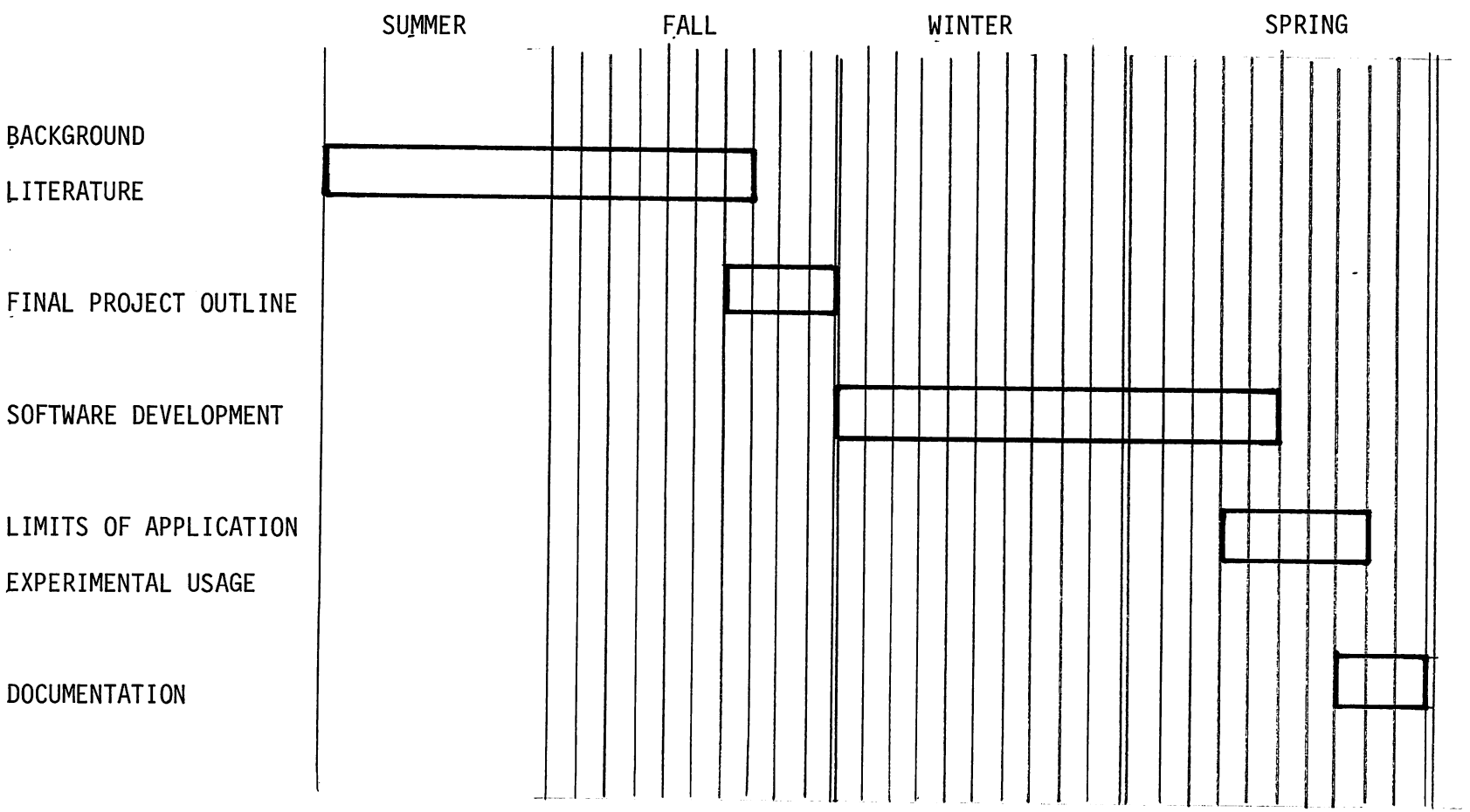
III. Limits of Application

A computer program must be proven useful to the designer to be of significant value. A method for determing its usefulness will include experiments within the design studios to determine the design levels that such a model would be best suited. This will provide knowledge of where the program fits into the design process and aid in directing its programming. The limints of application become critical and it is the purpose of this thesis to provide a very versitile and flexible program that will be readily adaptable and useful at all designs levels. A final validation will consist of providing an architect with this program and evaluating the usefulness of the program as a design tool.

Conclusions

The SLR method for determing auxillary heating load requirements is an acceptable method by architects concerned with today's energy issues. The computer program when developed will increase the accuracy of the method by eliminating hand calculated inaccuracies from reading data from empirical curves and mathematics. The computer program will become an effective design tool which with speed and accuracy will direct and aid the designer into creating buildings which work well and are cost effective.

TIME SCHEDULE



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- clear instructions
- is there no computing software?

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