

COMPARISON OF THE EFFECTS OF
CODING TECHNIQUES
ON SIMULATION CONCEPTS
IN PASCAL

by

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1.0 INTRODUCTION

In this Master's Report, we will compare the effects of two coding techniques on simulation concepts in Pascal. The first technique is the use of monitors and Concurrent Pascal to implement simulation concepts. The second will use Sequential Pascal to implement the same simulation concepts using a co-routine approach.

A comparison of performance between these two techniques has been conducted. This comparison was achieved by implementing and running experiments using both techniques. The concurrent technique was previously implemented by Rich McBride at Kansas State University Computer Science Department [13]. The sequential approach was implemented by the author.

An examination has been made of other factors that affect the decision-making process in deciding between these two techniques. Examples of these factors are portability and ease of use. Each will be examined and discussed as to its impact on an intelligent choice between these two techniques.

The author's assumption will be that the reader is familiar with the Pascal language, both Sequential and Concurrent, as defined by Brinch Hansen [3],[32]. The

technical reports [10],[20] will familiarize the reader with the Pascal implemented at Kansas State University. This paper will cover those areas of simulation needed to understand the processes involved.

1.1 SIMULATION CONCEPTS

A brief overview of Simulation Concepts is necessary to understand the ideas implemented in this report. This overview will include the use and purpose of simulation, the process approach to simulation, other approaches to simulation, and a description of the facilities implemented in the simulation package described in this report.

Simulations have many uses and are used for many purposes. Simulation studies are an attempt to examine a model of the real world and real situations. The analysis of these models using simulation gives information that could not be obtained from the real world or which would be impractical to acquire. An example would be a model of aircraft performance; information which might be impossible to acquire with a real plane, or only at a high cost, could possibly be acquired with a simulation. Simulations are used for performance evaluations, as a design aid, for structural investigation, and for project planning. The accuracy of a simulation is directly related to how closely the model represents reality. This must be remembered when examining the results of any simulation.

There are many simulation languages. A general dichotomy can be made between those that are extensions of programming languages, and those that are a separate

language. The method we will examine is an extension of the Pascal Programming Language. This approach has advantages in that a programmer does not need to learn a new, distinct language, but can instead build upon his/her prior programming ability in the language to use the "new" simulation concepts.

Simulation languages are implemented in several ways. The implementation utilized in this report is the process approach. The process approach is one in which the simulation is written in terms of the flowing of an entity through various processes. An example of the process approach is described in Figure 1, the Simulation of a Car Assembly Plant.

This model follows a car as it is processed or assembled. The simulation code describes the various processing steps of assembly until the entire process is finished and a completed car rolls off the assembly line. Each step is described and coded in this light. Physical resources (ex. welding machines, tróllies, etc.) have specific properties such as speed or number of actions they can do. Each process can itself be a simulation model.

The key in this approach is that accuracy is dependent upon how close the model describes reality. The process approach is the method used for the languages examined in