8.1. Introduction

Specially trained engineers are required to develop the simulation model of a manufacturing system. Not many engineers who can write correct simulation code are available. In this chapter development of a Simulation Model Generator (SMG) that can automatically generate the simulation model of a system is presented.

8.2. Need for SMG

Generally, developing simulation models are a time consuming process. Moreover, simulation languages are not designed to be universally applicable. All available features of the language have to be understood in a general context and those features which are suitable for a specific system should be applied by the analyst. The difficulty in modelling a specific level of detail for the system being studied can be overcome by a simulation model generator. SMG is useful for the analyst in model development, update, as well as in the analysis of alternative scenarios [43].

SMG has been developed using C language and generates the simulation code in Simple_1 (Ver 4.0) language.

8.3. SMG Description

8.3.1 Job details

The first screen that is displayed when the SMG is executed is shown in Fig.8.1. All the details regarding the jobs to be scheduled are obtained from the user using the
interactive dialogues shown in the figure.

1. Maximum how many jobs can remain in the system simultaneously : 10
2. Maximum how many parts are there in any incoming job : 150
3. Arrival of the jobs follow what distribution
   <Enter appropriate number> *
   1. Exponential
   2. Normal
   3. Uniform
   4. Weibull
* Appropriate statistical parameters are requested from the user depending upon the number entered
4. Each arriving job is made up of parts at how many levels:
5. Assembly time at level 1 follows what distribution :
   <Enter appropriate number>* 1. Exponential
   2. Normal
   3. Uniform
   4. Weibull
   5. Depends upon the number of pre assemblies
* Appropriate statistical parameters are requested from the user depending upon the number entered
6. Give the range for the value of bought out items used at level 1
   Min. value :
   Max. value :
7. Give the range for the number of subassemblies required at level 2
   Min. value :
   Max. value :
8. Give the range for the number of manufactured components at level 2
   Min. value :
   Max. value :
9. Give the range for the number of operations to be performed on the parts at level 2
   Min. value :
   Max. value :
10. Give the range for the number of manufactured components at level 3
    Min. value :
    Max. value :
11. Give the range for the number of operations to be performed on the parts at level 3 varies
    Min. value :

**Figure 8.1. First Screen of the SMG**

Simple_1 models are made up of five segments. In the first segment namely DECLARE the variables used in the model and the entities are declared. In the case of array variables the first and second indices indicate the job number and the part number respectively. The responses obtained for the first two prompts are used to fix these two
values. Each part is treated as an entity having a maximum of 38 attributes. The values for some of these attributes are obtained through the remaining interactions shown in Fig. 8.1. The remaining attribute values are calculated by the simulation model.

8.3.2. Simulation run details

The information required for fixing the simulation run are obtained through another screen shown in Fig. 8.2. The second segment of the Simple_1 model is called a PRERUN

<table>
<thead>
<tr>
<th>What is the simulation stop time?</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the kill count?</td>
</tr>
<tr>
<td>(Simulation to be stopped at the completion of how many jobs)</td>
</tr>
<tr>
<td>Specify the name of the output file:</td>
</tr>
</tbody>
</table>

Figure 8.2 Second screen of the SMG

segment wherein the simulation run length and the input and output files are specified. In order to generate that segment information obtained through screen 2 would be used.

8.3.3. Shop details

The third segment of the Simple_1 simulation model contains the specification of the arrival process, the logic specifying the flow of entities, various labelled segments to represent machines and queues and statistics collection. Some of the information obtained through screen 1 and all the details obtained with screen 3 (Fig. 8.3) are used
in the generation of this segment of the model. Fourth segment is used only in the case of continuous systems. The last segment is used for writing the reports.

<table>
<thead>
<tr>
<th>How many work centres are in the system</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of machines in work centre 1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>work centre 2</td>
<td>2</td>
</tr>
<tr>
<td>work centre 3</td>
<td>2</td>
</tr>
<tr>
<td>How many assembly stations are there in the system</td>
<td>3</td>
</tr>
<tr>
<td>What priority rule to be used for dispatching</td>
<td>1. FIFO</td>
</tr>
<tr>
<td></td>
<td>2. FCSFS</td>
</tr>
<tr>
<td></td>
<td>3. SPT</td>
</tr>
<tr>
<td></td>
<td>4. EDD</td>
</tr>
<tr>
<td></td>
<td>5. EFT</td>
</tr>
<tr>
<td></td>
<td>6. LP_ROPT</td>
</tr>
<tr>
<td></td>
<td>7. MIN_LF</td>
</tr>
<tr>
<td></td>
<td>8. MIN_Q</td>
</tr>
<tr>
<td></td>
<td>9. TWKRRP</td>
</tr>
<tr>
<td></td>
<td>10. NUSEG</td>
</tr>
<tr>
<td></td>
<td>11. TWK/PL</td>
</tr>
<tr>
<td></td>
<td>12. HV</td>
</tr>
</tbody>
</table>

<Enter the appropriate number>:

Figure 8.3. Third screen of the SMG

8.4. Summary

In this chapter a system has been developed to generate the simulation model automatically in Simple_1 language by obtaining relevant information about the manufacturing system from the user. The SMG can assist the analysts in developing the alternative manufacturing scenarios very quickly without the need for going into the details of the simulation code.