GPSS/360 - NORDEN, A PARTIAL CONVERSATIONAL GPSS

by

Sherman Hunter and Julian Reitman
Systems Simulation Group of Engineering Operations
Norden Division of United Aircraft Corporation

ABSTRACT

Norden has modified GPSS/360 to improve the man-machine interaction between the computer and the modeler at a 2250 display unit. This modified language operates in a partition of a multi-programming environment, thus permitting GPSS to be in the foreground while other jobs are being processed in the background. A part of what will be a complete operational system is now operational. This includes model building, and input and assembly error detection with means for correction. Detection of running errors is not yet implemented. Use of this system reduces the lapsed time required to obtain an operational model.

INTRODUCTION

One major requirement for successful simulation is the ability to have a correct model quickly available. This requires a means to circumvent the turnaround time delays usually experienced at data processing centers. The alternate is an extensive desk check to insure that the model will operate correctly. Usually, this technique is futile because the modeler's understanding of the language is inadequate. Therefore, the computer run is the cheaper way to find certain types of errors.

The equipment now available -- the 2250 with its light pen, function keys and alpha numeric keyboard -- provides a practical alternative and supplement to the off-line printer for GPSS. The 2250 display unit can be utilized to permit the modeler to introduce the GPSS statements, assemble the model, find out which statements are in error, and then revise the model to correct the errors. Ideally, the display unit should also provide a window into the model so that the modeler can sense the dynamics of the simulation and be able to alter the simulation either permanently or temporarily. We have developed an interface between GPSS and the 2250 display unit to permit the modeler to introduce GPSS statements, assemble and run the models, find statements in error, and reuse the model to correct the errors.

GPSS/360 - NORDEN

The structure of GPSS/360 has had to be modified for the requirements of real time use. For instance, it was necessary to reduce the amount of core required by a model so that it could be run in a multi programming environment. This required a modification to GPSS to permit matrix savevalues to be stored on disk and a restructuring of the model blocks so that they can also be stored on disk at the discretion of the modeler. These changes reduced the amount that had to be stored on core memory at any one time.

Other changes within the structure of GPSS pertain to abnormal terminations by the Supervisor (Control Program).

For example, if a model is too large for the available core the normal GPSS and O/S 360 response is to terminate the run with an 80A code.and control is returned to the Supervisor. This is an awkward situation since the modeler does not want the job to be terminated; he does want to know what caused the failure, and be able to take remedial action, without recourse to hard copy printout. GPSS was modified so that instead of an abnormal termination, the modeler is informed that he has exceeded available core. The modeler then reallocates some entities to get the model within the available partition size. The 2250 is of economical and practical use when the accounting routines are based on partial use of the computer rather than total time spent at the 2250.

GPSS/360 - NORDEN is used to create and maintain source statements of a model that reside on a direct access device (2311 or 2314).

The features of GPSS/260 - Norden allow the modeler to insert a line on the 2250 as shown in Figure 1A. The light pen detects on the word "insert" and on that line. The line to be inserted is then overtyped at the bottom of the screen. The "replace" command permits any line to be highlighted and replaced through the alpha numeric keyboard. There is also the ability to "delete" a specified line. The selection of any line in the model is made by a "line" command and the use of the numbers and "end of block" at the

bottom of the screen. The line selected then appears in the center of the 20 lines presented as a single frame on the screen. Likewise, a light pen detect on the "page" command allows the modeler to select any page. When an assembly or input error occurs, there is the addition of the word "error" and a display is produced of the type shown in Figure 1B. This shows the error and the line to which the error is referred. The modeler can go back and forth between the error listing and the model listing through light pen detections.

The functional keyboard is used as shown in Figure 1C to assemble the model. Figure 1D shows the normal GPSS output being displayed on the 2250 with function key 16 illuminated. This permits the next output to be selected at the modeler's discretion, or, when all of the output report has been presented, to insert to the next "start" card. The details of the functional keyboard are shown in Figure 2.

CONCLUSION

The effectiveness of the modeler is improved by the ability to interact with the computer. The requirements for this interaction are relatively severe changes in the GPSS structure. However, the developments from this use of GPSS indicate that a full conversational capability will do a great deal to enhance the use of GPSS and the use of simulation techniques. There is still more to be done before these techniques evolve into a complete procedure for the modeler.

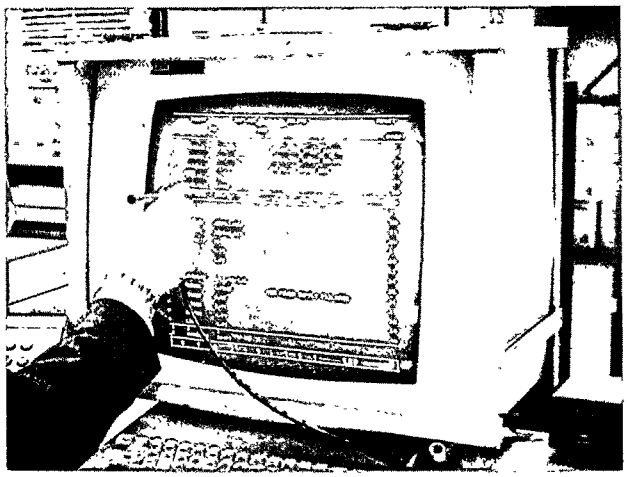

Figure 1A.

Modeler Inserting Line
on 2250

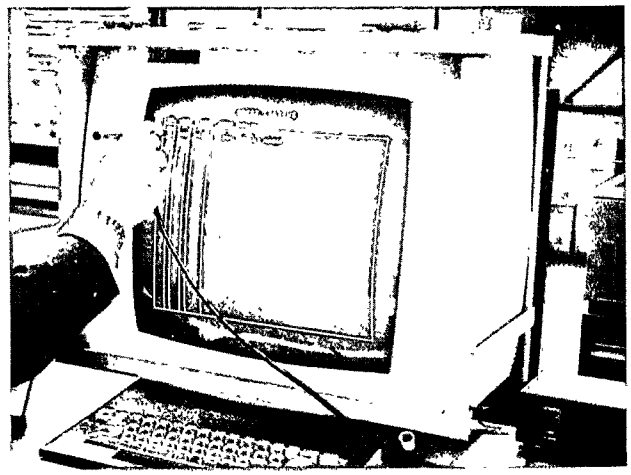

Figure 1B.

Modeler Requesting Display
of Assembly Input Error

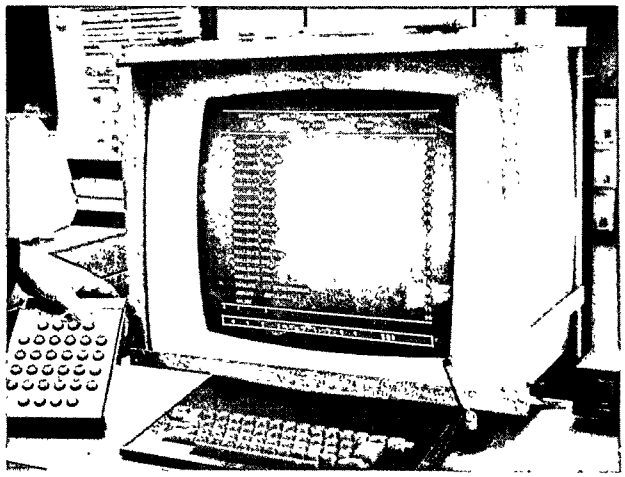

Figure 1C.

Functional Keyboard Used
To Assemble Model

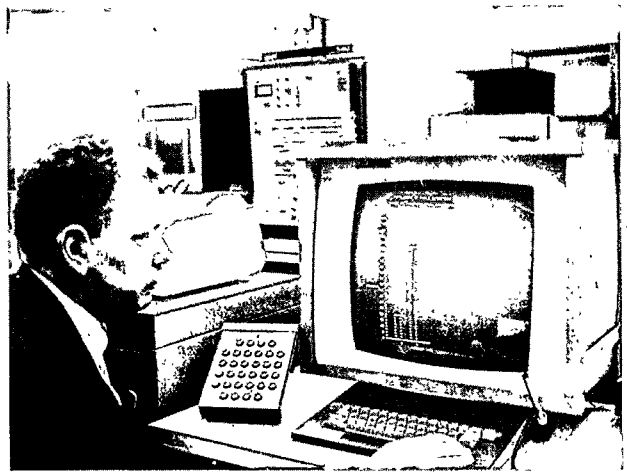

Figure 1D.

Typical Graphic Display
of Output of GPSS
Shown on 2250

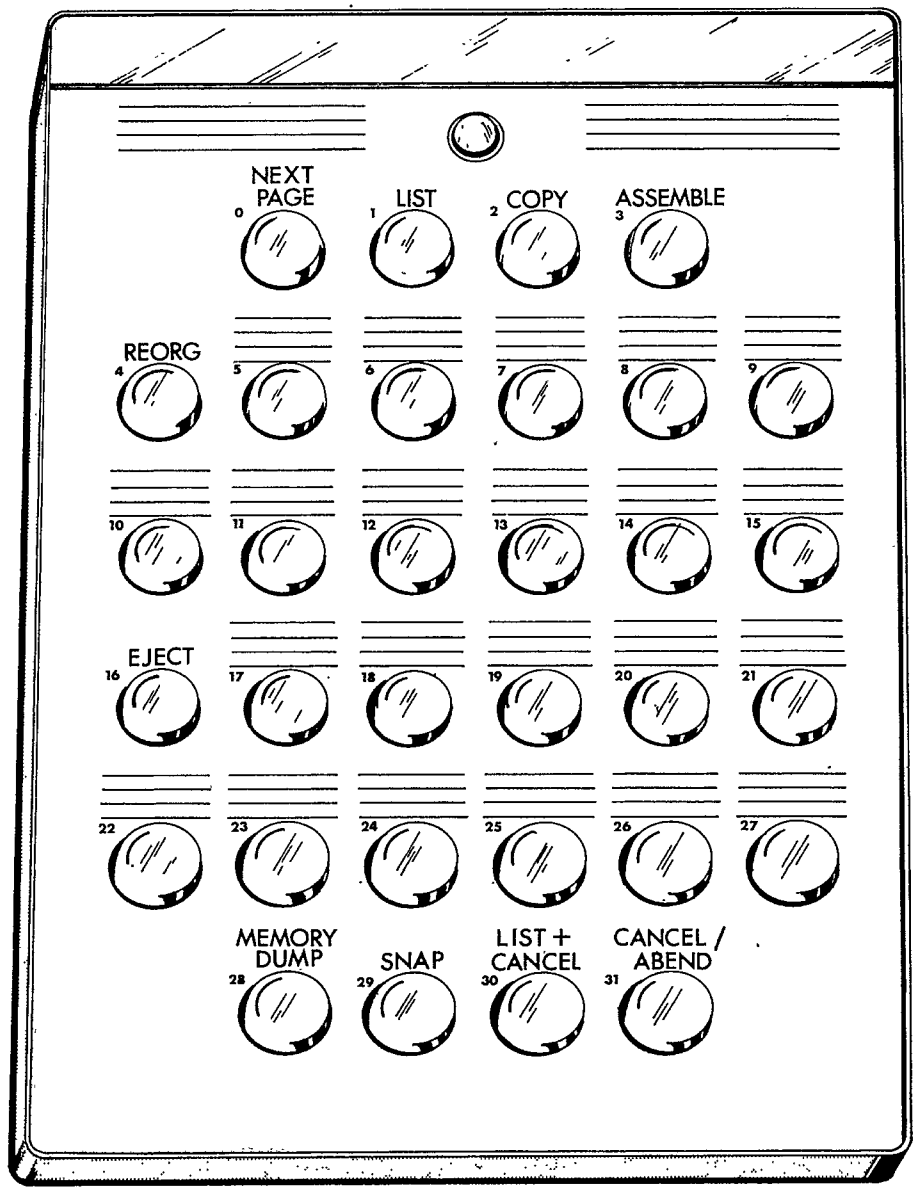

Figure 2. Functional Keyboard Details