NOTE

SEESAW: A VISUAL SAWING SIMULATOR, AS DEVELOPED IN VERSION 3.0

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ABSTRACT

Program SEESAW is a computer simulation program for the sawing of pruned logs. It was developed to aid in the evaluation of pruned log types and to provide a tool for analysing their interactions with various sawpatterns and sawmill practices.

This version of the program accommodates important sawmill variables such as saw kerfs and number and positioning of knees on the carriage and, through the use of interactive computer graphics, simulates all sawmill activities, i.e., sawing, edging, docking and grading, and resawing.

Keywords: computer simulation; simulated sawing; pruned logs; sawpattern; cross-sectional analysis; **Pinus radiata**.

INTRODUCTION

The program SEESAW was specified by Park and implemented by Garcia (1987). Preliminary results and program evaluation have been discussed by Park (1987). Data acquisition is accomplished by either the "log reconstruction" method of Park & Leman (1983) or the cross-sectional analysis method of Somerville (1985).

The sawing simulation package has proved useful in the evaluation of pruned saw-logs (Park 1987). It has been further developed and modified to make the program resemble sawmill processes more closely and to make it easier to operate.

Modifications or additions to the original program for simulating the sawing of pruned logs include: using ellipses as the geometric form to approximate log cross-sections; allowing the user to select either the polygon representation of whorls or a "spoke" representation; enabling the simulation of resawing; enhancing the simulation of edging display; and including further capabilities in simulating docking.

These additions and modifications are contained in the currently operational version known as SEESAW Version 3.0, and are described briefly here.

The hardware, as described by Garcia (1987), remains unchanged. Changes in the software affect only the original Pascal code, with the major changes relating to the

branch representations, log profile, and scale factors of the five-panel screen display described by Garcia (1987) "In the first panel an end view of a log on the sawmill carriage is portrayed. The second panel gives the top view of this log. In the third panel information about the log is displayed; in panels four and five the current flitch faces, if any, are shown". The allocation and assignment of the special function keys around which the program is operated have also been altered (Fig. 1). As before, the MS-DOS operating system and Microsoft Pascal Compiler are used.

UNCUT	↕	UPCUT	PARAMS	CLRS	GRADE	BRANCH	FLITCH NO.	FIRST FLITCH	PREV. FLITCH	···· ····	NEXT FLITCH	LAST FLITCH	ANGLE	⌐	⌐	LIST	SAW	RESAW	EDGE	DOCK	EXIT
CUT	2	⇑	↑	↑↓	↓	↓	⇓	/←—	⊢←—	←—	←⊖—	MEAS.	—⊖→	—→	—→⊢	—→/	⊕	END	TOP	INFACE & OUTFACE	FULL

FIG. 1—The SEESAW Version 3.0 function key legend.

REPRESENTATION OF THE LOG

The external log profile, originally represented by a number of circular cross-sections connected together, is now represented by elliptical cross-sections to resemble the actual log shape more closely (Fig. 2, 3). The maximum number of cross-sections permissible has been extended from nine to 30 in order to increase options for log measurement and to handle data assembled using the cross-sectional analysis method.

Each elliptical cross-section of the log profile is represented by the central point (three co-ordinates — x,y,z), the lengths of the semi-major and semi-minor axes, and the angle of inclination from horizontal of the major axis.

Because of this change in representation the response time has increased. Typical response times for the drawing of the full five-panel display of a log comprising six
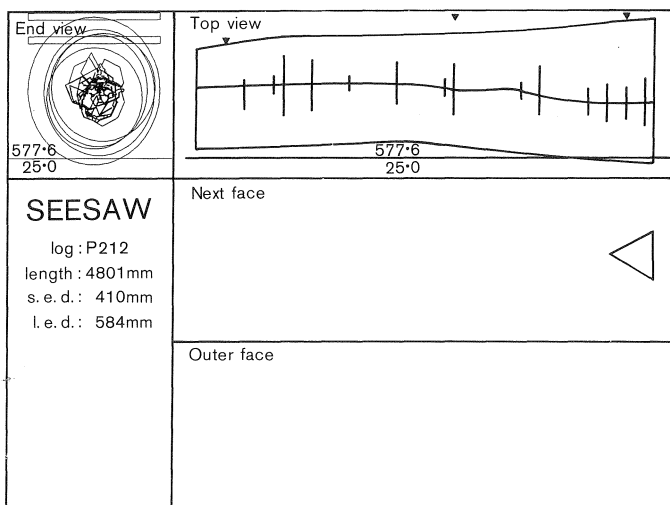

FIG. 2—The five-panel display of the SEESAW program showing a log with elliptical cross-sections and polygon representation of whorls
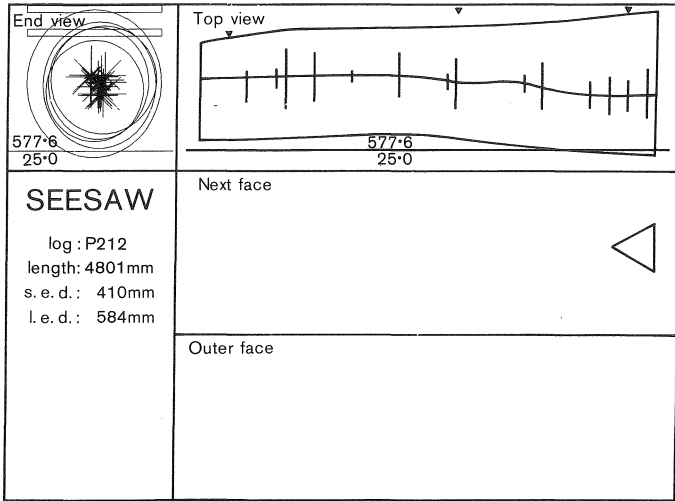
FIG. 3—The five-panel display demonstrating the same log with spoke representation of whorls.

cross-sections are 2.7 seconds using circular cross-sections and 3.2 seconds for the elliptical representation.

The internal characteristics of the log, i.e., pith and whorls, can be represented as in earlier versions, or for whorls the user can select either the original polygon representation or a "spoke" representation (Fig. 4). These defect representations can be displayed either separately or together (Fig. 5).
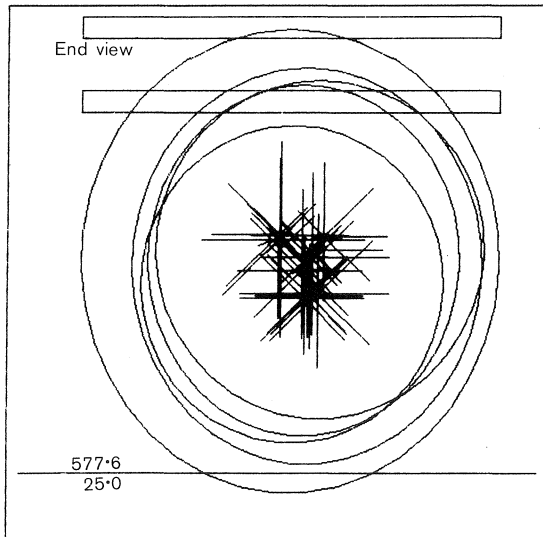

FIG. 4—Full-screen display demonstrating the spoke representation of whorls.
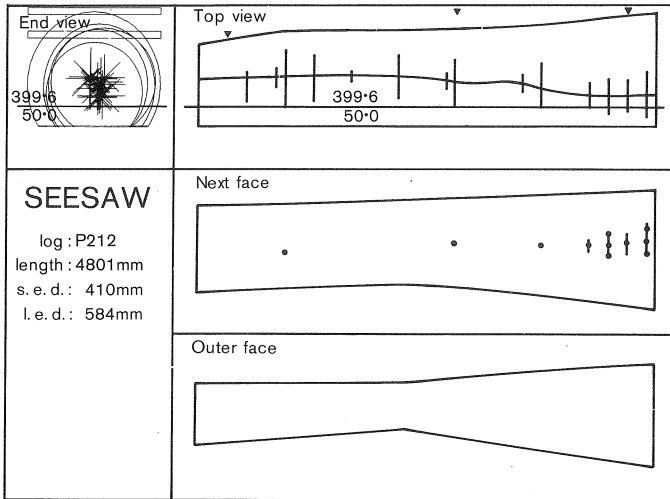
FIG. 5—Defect representations, in the sawing mode.

MODES OF OPERATION

A RESAWING mode has been introduced to the SEESAW model, bringing the number of modes in operation in SEESAW Version 3.0 to four – SAWING, EDGING, DOCKING AND GRADING, and RESAWING. Changes to each mode are described briefly below.

Sawing

The only change in the sawing mode is the conversion of the log profile representation to elliptical cross-sections with corresponding rescaling of the panels, as already outlined.

Edging

Several modifications have been made to the edging mode to speed up operation or to make the display more visually acceptable.

(1) The inner and outer face panels of the display have been combined to form one display when enlarged to fill the screen. The enlarged view of these faces also contains additional information, i.e., the log identification code, flitch number, thickness of the flitch, and angle through which it has been skewed (Fig. 6). This modification was included as it was found necessary to see both faces of the flitch simultaneously for edging, docking, and grading purposes.

(2) The user can now select the flitch required for edging or viewing rather than searching through the sawn sequence until the required flitch is displayed.

(3) A further single-key function has been implemented which enables the user to key in an angle through which he wishes the flitch to be skewed rather than pressing the incremental skewing key several times to increment the default value, although this method may still be used if required.
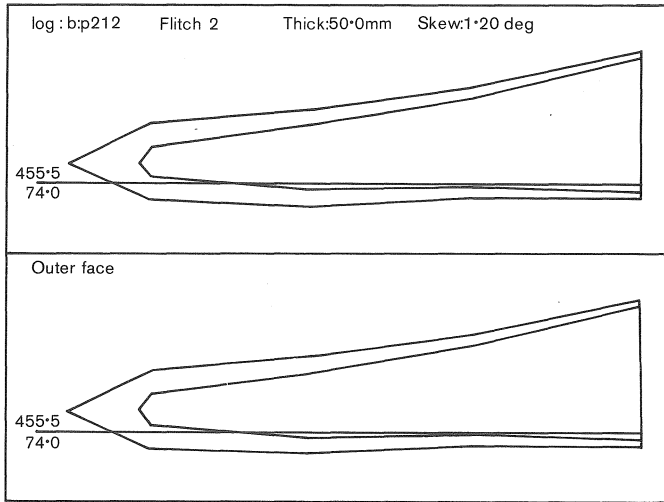
log : b:p212   Flitch 2   Thick:50·0mm   Skew:1·20 deg

455·5
74·0

Outer face

455·5
74·0

FIG. 6—Extended view of the inner and outer face panels of the edging display,
showing a flitch which has been skewed.

(4) When the skewing operation has been invoked, the flitch rather than the sawline
is now skewed. This is visually more acceptable as the sawline no longer becomes
jagged. However, as the panels must be re-scaled, this operation takes longer than
before. The time taken can be reduced by extending the two edging panels (as
described above) to fill the screen (Fig. 6).

(5) Fully dimensional pieces produced from the saw with no wane can be automatically
edged. Typical response time for automatic edging is approximately 0.25 seconds
compared to 3.0 seconds for stepping the sawline and cutting the piece.

(6) The flitch can now be "flipped over", if required, enabling the edging operation to
be performed from either edge.

Docking and Grading

Two function keys have been implemented to hasten the docking operation. These
enable the vertical docking sawline to be moved directly, either to the right or to the
left, to the next point of intersection of the wane with the edging sawline (Fig. 7),
hence greatly reducing the time required for the operation.

The grading facility remains unchanged but the user should note that the calculation
of the number and lengths of clear cuttings is still computed according to the pre-
specified minimum lengths and rounding specifications (i.e., whorl defect width,
minimum clear cuttings length, docking step) as declared in the SEESAW default
values file or updated by the user using the appropriate function key.

Resawing

This mode permits the user to resaw previously sawn baulks, hence increasing the
number of sawing patterns that can be simulated.

Sawing can be simulated only if at least two orthogonal faces of the log have been
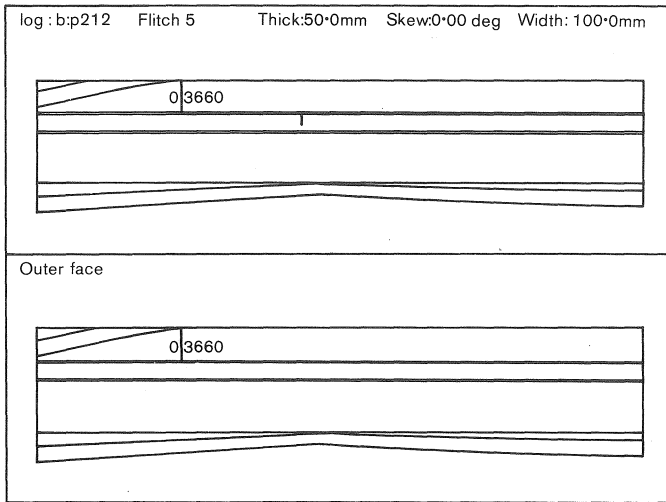sawn and must be invoked prior to any edging operations on the baulks.

FIG. 7—Display in the docking mode, indicating the position of intersection of the edging sawline with the wane.

As with the sawing operation, the flitch can be turned in 90-degree steps and simulation of resawing continued on another face. The resawing cut can be "undone" if required. If flitch 6 (Fig. 8) is resawn then the resawn flitches are labelled 6A, 6B, 6C, etc. Resawing 6B will give rise to the flitches 6BA, 6BB, 6BC, etc.

OTHER ALTERATIONS

If the log is too short for the pre-specified length of the carriage, a message to that effect appears on the screen. The user can then edit the knee positions of the carriage in the defaults file and then re-enter SEESAW.

Grade has been added to the "progress" display showing the cut flitches (sawn and/or resawn) (Fig. 9). This allows the user to check, at a glance, for any obviously incorrectly graded boards. It also provides a check that any waste pieces have not been allocated a grade by mistake. (The output from each sawing simulation contains all such graded pieces. These are further processed by a revised version of the grade study program, GSTUDY (Park & Leman 1983), to provide conversion, value, and grade results.)

The user, upon creating a file for continuation at some later date, can now enter a title/comments which appear above the "progress" display.

The "progress" display has been separated from the list of flitches for easier viewing.

FUTURE DEVELOPMENT

It is envisaged that further development of SEESAW will encompass a more detailed approach to branch representation. Initial representation of branches as cones at any orientation in space is envisaged, with intersections of the cones with a surface represented by conical sections.
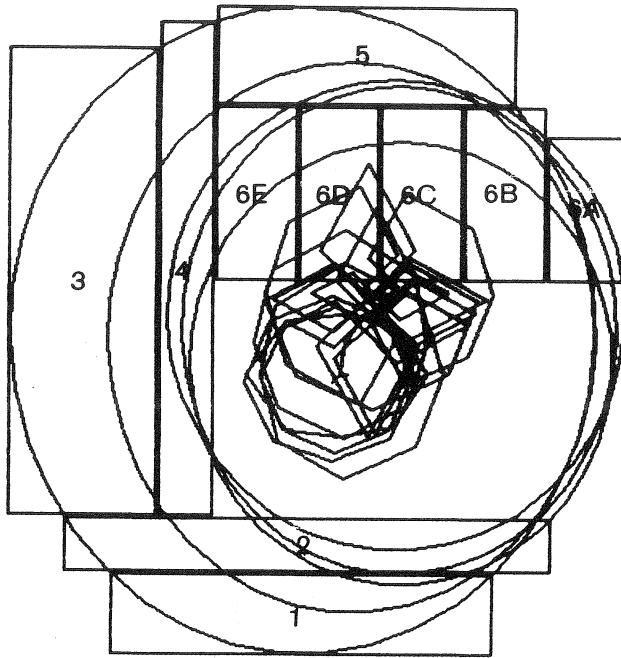
log : b:p212

FIG. 8—The "progress" display, demonstrating a resawn baulk.
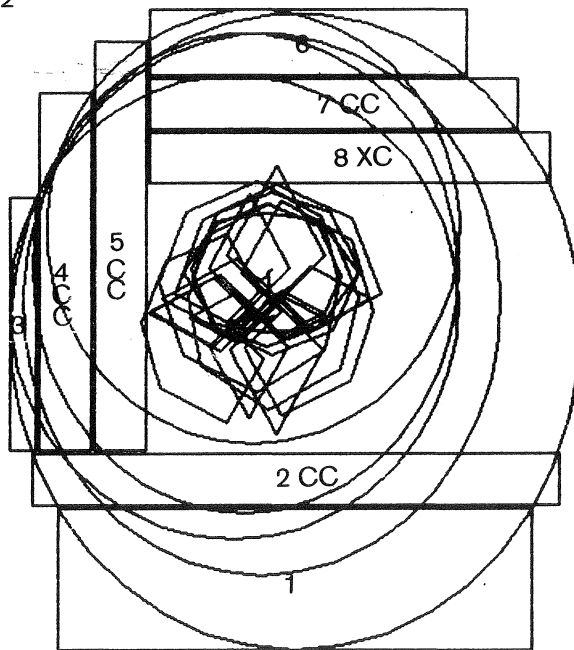
log : b:p212

FIG. 9—The "progress" display, demonstrating graded flitches.

ACKNOWLEDGMENTS

REFERENCES

GARCIA, O. 1987: SEESAW: A visual sawing simulator. Part II: The SEESAW computer program. Pp. 107–16 in Kininmonth, J. A. (Comp.) "Proceedings of the Conversion Planning Conference". **Ministry of Forestry, FRI Bulletin No. 128.**

PARK, J. C. 1987: SEESAW: A visual sawing simulator. Part I: Data, methods, and program evaluation. Pp. 97–106 in Kininmonth, J. A. (Comp.) "Proceedings of the Conversion Planning Conference". **Ministry of Forestry, FRI Bulletin No. 128.**

PARK, J. C.; LEMAN, C. S. 1983: A sawing study method for evaluating timber from pruned logs. **New Zealand Forest Service, FRI Bulletin No. 47.**

SOMERVILLE, A. 1985: A field procedure for the cross-sectional analysis of a pruned radiata pine log. **New Zealand Forest Service, FRI Bulletin No. 101.**