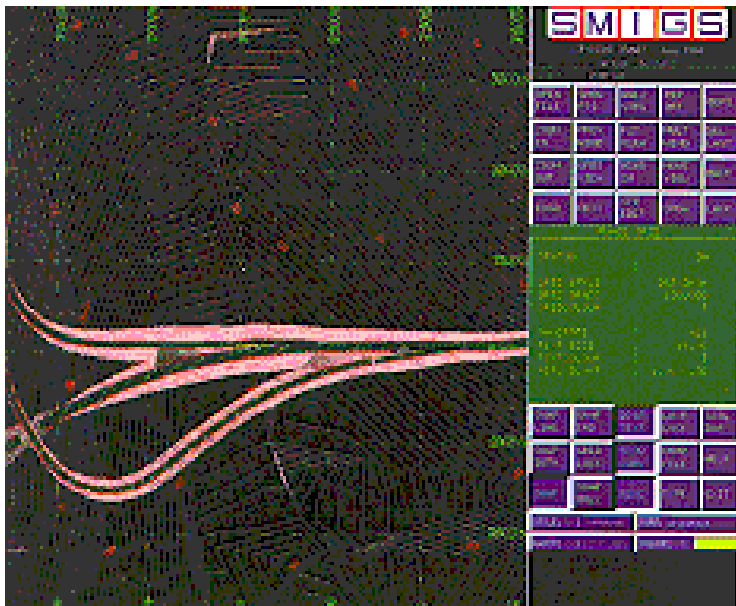


What is SMIGS? SMIGS is a Surface Modelling Interactive Graphics System and is one of the world's most powerful software packages for Civil Works Applications. SMIGS enables the fastest and most accurate production of terrain models, and fully documented civil works designs.

The wide-reaching applications of SMIGS extend to the great diversity of projects in which surveyors, site developers and engineering designers are involved with on a day-to-day basis.



THE SMIGS PHILOSOPHY

When SMIGS was first developed by CEANET, the functional philosophy of the software development was dictated by a market need for fast, accurate, interactive production of terrain models and engineering designs. The philosophy specified several key software attributes:

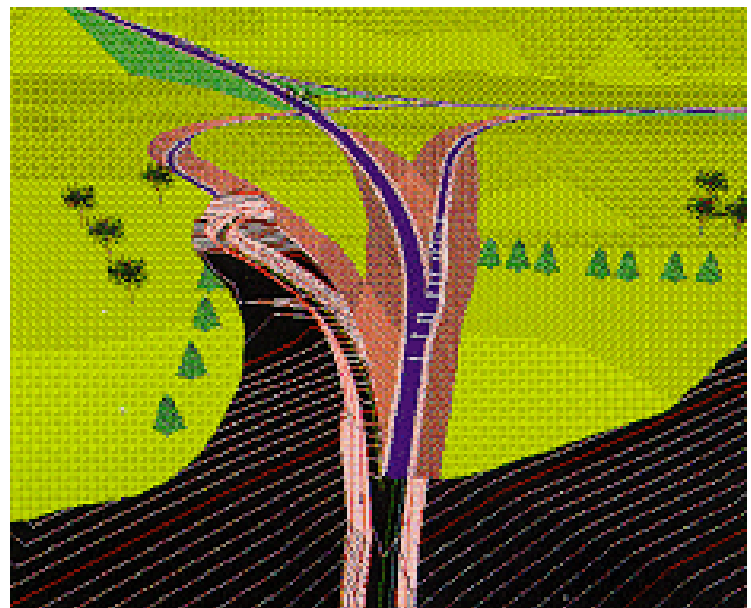
- On-Screen, interactive "Heads-Up" approach to design, to ensure maximum efficiency
- All work to be performed using mouse-based point-and-click functions: picking options from a graphics menu and operating directly upon a graphical representation of the site model
- The ability to handle very large site models for every aspect of design, from direct survey input, through Triangular Irregular Network (TIN) Model generation to finished design and documentation

Today these three key attributes continue to be the driving force in the development of SMIGS and continue to provide SMIGS users with ease of use and the powerful tools needed for many varied applications.

SMIGS UNIQUE FEATURES

Unlimited Model Size SMIGS has NO limits to the amount of data in any one model. In addition, SMIGS has the powerful ability to operate on models composed of other models; to "cut" out an area for manipulation and "paste" it back into a model, effectively eliminating the need to work on an entire model for particular design projects.

String Modelling By adopting a string-based approach to design, SMIGS improves processing and interpretation of large volumes of data. Graphic primitives, such as contours, feature strings or road centre-lines are modelled by lines connecting a series of points. These lines are called strings. Because each string is stored and manipulated as a single entity, exceptionally high interactive speeds are achieved. Data types supported within SMIGS include: contour strings, feature strings, grouped entity sets, text, circular arcs, spirals, meshes, surface polygons and userdefined symbols.



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Multiple Layers SMIGS supports 180 layers for data discrimination, each layer able to be named by the user. Layer attributes are held against each data entity, allowing the user to work within the model on a "What-You-See-Is-What-You-Get" (WYSIWYG) basis. Additionally, each entity can also be named and this attribute can be used for sophisticated mask-based model manipulation if desired. These features contribute significantly to the power and ease of use of the package.

Macro Language SMIGS includes a sophisticated yet easy to use Macro Language (SML) which is used for functions ranging from tailoring the user interface through to complex design automation. SML incorporates powerful calculation and reporting facilities as well as trigonometric functions, manipulation of character-strings and enhancement features such as colour-shading of TIN triangles according to geometric attributes. Based on the BASIC programming language, it permits direct read/write access to the SMIGS model, to external files and can even execute external programs which analyse and/or generate model data. The language includes access to every on-screen menu function in SMIGS as well as a comprehensive library of subroutines. SMIGS is shipped with working examples of all SML functions and subroutines, many of these Macros provide useful standalone functions in their own right.

CAD Functions SMIGS includes all Computer-Aided Drafting (CAD) functions which are likely to be required by a civil works practitioner. Full support is provided for enhancements such as Fence-based and Attribute-Based manipulation (Colour, Layer, Style, Elevations, Attributes, Report, Delete, Copy, Move, Scale, Rotate). Line-Styles, Hatch and Polygon fill Patterns are all userdefinable. SMIGS directly supports all True-Type Fonts for graphics text.

Multi-Lingual The entire SMIGS system, including graphics text, Menus, system messages and prompts, can run in any 256 character ASCII Language.

Job Management SMIGS includes convention-based functions for job management including Layer management and file-naming conventions, as well as password-controlled Job and Layer access.



DATA INPUT, MODELLING AND MANIPULATION

Survey Input, Manipulation and Documentation The power of SMIGS for Survey data input, model generation and manipulation has long been recognised by surveyors as the best available. Standard features include direct input from survey instruments (including total stations), user-definable digitising table setup to support virtually all digitisers, 3D Coordinate Geometry (COGO) manipulation, traverse adjustments, cartesian coordinate system transformations and survey set-outs.

Conversion of Paper Topographic Maps to 3D Models Maps that are scanned (producing a digital image of the map) and vectorised externally can be used in SMIGS. SMIGS' Contour Enhancement functions enable easy conversion of the simple 2D short-vector files through to full 3D contour models. These can then be triangulated if desired used as existing-surface terrain models for design work (where accuracy permits) or output to other systems such as Geographic Information Systems.

Interactive Editing All data in the SMIGS model can be edited interactively with its unique point-and-click or fence-based and mask-based manipulation capabilities.

High Speed TIN Model SMIGS incorporates the latest high-speed Triangulated Irregular Network (TIN) model generation algorithms. SMIGS' ability to generate multiple-indexed contours and meshes which can incorporate source data such as break-lines enhances the operator's ability to ensure elimination of model errors. The string-based entities used in

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SMIGS models ensure fast model manipulation and create an ideal environment for production of finished designs in the shortest possible time.

Multiple Data Interface/Interchange SMIGS provides data interchange facilities for interfacing to other systems through GENIO and DXF formats. Direct interfaces are available to a number of CADD systems including Intergraph Microstation and PAFEC, and interfaces are available for GEODIS, GENAMAP and the ARC/Info Geographic Information Systems.

DESIGN

Civil Works Design SMIGS Design functions allow the interactive on-screen generation of a complete design from sketch-form horizontal alignment through finalised horizontal and vertical alignments, to full road or rail formation generation and merging with natural surface. Template-based and reference-string based design techniques are supported by SMIGS, as is the generation of master alignments using dynamic element libraries with multiple degrees of freedom. Dynamic vertical and horizontal alignment design is combined with fully automated long and cross-section documentation to provide fast generation of the design formation on screen.

A fully-automated Template design function can generate the complete design formation for any part of a master alignment, including cross-sections, volumetrics and reports from a single menu selection.



Cadastral Design SMIGS includes a range of design functions specific to Cadastral Survey, design and documentation, including automated Land SubDivision (Lot) layout and annotation.

Hydraulics Design The optional add-on SMIGS Hydraulics Module is a comprehensive stormwater drainage design system, capable of design and analysis of both new and existing hydraulic networks.

ANALYSIS

Volumetrics SMIGS Volumetrics includes the ability to calculate and report upon volumes between surfaces, along a reference string and to a reference datum. Volumes are calculated by either "End-Area" or "Prismoidal" methods. Enhanced features include lead and mass-haulage calculations.

Vehicle Turning Path Analysis The optional add-on SMIGS VEHICLE/PATH provides fully integrated analysis of the swept paths of turning vehicles, ensuring site access problems are detected.

Reporting & Documentation Set-Out SMIGS can automatically generate fully annotated cadastral sub-division layouts, cross-section sheets, long-sections and combinations of plans and sections as well as perspective views. Full Set-Out and Construction Tables can be generated. Comprehensive textual report generation is provided where appropriate, for instance in the Volumetrics and Hydraulics modules.

Enquiry Facilities The SMIGS user may enquire upon any entity within the SMIGS model, to retrieve graphical and non-graphical attributes of that entity. Modelwide reports may be generated about entities based upon current filter settings.

Fully-Rendered Model Fly-through On Silicon Graphics workstations, the SMIGS package includes SMIGScam, a program which permits the user in Real Time, to "fly through" a fully rendered and shaded model of any SMIGS data set.

FINAL QUALITY PROJECT DOCUMENTATION

Plans, Details, Tables, Cross-Sections and Long-Sections There is no need to transfer out of SMIGS for finished project documentation. SMIGS users can generate all required documentation with final quality. Included among SMIGS' extensive CADD functions is direct support for True-Type Fonts

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and fully symbolic model-to-model referencing. User-definable line-styles, area-hatch patterns and polygon-fill patterns are standard features. Graphics are plotted in a number of languages including Hewlett-Packard Graphics Language (HPGL).

Reports Every stage of SMIGS operation generates a comprehensive report of work carried out. These may be assembled automatically by appending to the default report at each stage or written to unique documents. Text written in any report from SMIGS can be imported into a model for inclusion as tabulated or notified information within a plan, detail or section sheet.

Presentation Graphics SMIGS users may produce perspective colour rendered and/or wire-frame views of proposed civil works at any time: these are useful not only as design aids but can help in client presentations.

LEARNING AIDS

On-Line Help SMIGS includes a full on-line Help facility which is accessible at any time. An Oops! function permits retraction of last function activated. SMIGS can also keep a journal of all activities undertaken, enabling playback of previous design sessions.

Documentation The SMIGS package includes complete documentation comprised of a detailed Reference Manual, Macro Language Manual and Tutorial materials.

Tutorial SMIGS is shipped complete with a step-by-step tutorial developed by Australia's leading Civil Design Educators. This introduces many of the SMIGS functions, using supplied data sets from real applications.

APPLICATIONS

The wide-reaching applications of SMIGS extend to the great diversity of projects in which surveyors, site developers and engineering designers are involved with on a day-to-day basis. SMIGS is used extensively in the following industries and applications:

Mining & Natural Resources

- Open-cut overburden/ore extract analysis
- Stockpile analysis and management

Engineering Consulting

- Road, rail, airport and dam design
- Re-design and re-sheeting
- Civil hydraulics - drainage design
- Subdivision design and set-out
- Detailed project documentation

Road, Rail & Airport Authorities

- Feasibility studies
- Survey and model preparation
- Project visualisation
- Dynamic real-time fly-through
- Design and management
- Design consultant supervision
- Analysis of vehicle turning paths

Local Government

- Direct survey input
- Urban road design
- Road infrastructure re-development
- Complete project documentation
- Links to geographic information systems
- Drainage design

Survey Consulting

- Direct EDM input
- Adjustments and transformations
- Final survey documentation

Data Capture Bureaux

- Converting topographic maps to DTMs
- GIS data capture
- Data adjustment and rectification
- Visualisation studies
- System-to-system conversion
- Naval hydrology/bathymetry

Site Development

- Feasibility Studies
- Land Subdivision design
- Drainage Design
- Waste Area reclamations
- Landscape Architecture
- Environmental Impact Studies
- Visibility Analysis