DESIGN AND COGNITION:

CONTRIBUTION TO A DESIGN THEORY

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(1988) Article: "Architectural, Design, and Space Semiotics in Argentina" in The Semiotic Web 1987. A yearbook of Semiotics by T. A. Sebeok and J. Umiker-Sebeok (eds.), pp. 389-419. Berlín: Mouton de Gruyter. ISBN 3-11-011711-8

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Abstract: *The traditional* graphic languages *used for designing,* orthogonal projective geometry *and* perspective, *account for only quantifying or qualifying space. They do not allow for conceptualizing or specifically working with* pure design, *the morphological and aesthetic aspects in the practicing of design.* TSD *is a new* graphic language *that systemizes necessary and sufficient* morphic *and* tactic dimensions *of planar and volumetric forms, allowing all possible* relationships *of* selection *and* combination, *basic operations of* pure design. *Symmetry is a property of high isotopic synthesis and, therefore, affords an effective cognitive strategy in the practice of design that is widely employed in it, whether obvious or hidden in a design's final outcome.*

1. INTRODUCTION

Although there is no certainty, sedentarism, durability of constructions and *geometric thinking* emerged at the same time. In his famous *History of Architecture*, Fletcher (1896 [1956]: 1) claimed that *Architecture, with all its varying phases and complex developments, must have had a simple origin in the primitive efforts of mankind to provide protection against inclement weather, wild beasts, and human enemies*. This explanation about the origin and also most writings about architecture stress function, highlighting construction as an inhabiting-protective device. The time has come to change the discourse and analyze the *pure form* related aspects, "art", "the artistic side", "the esthetic concern", etc. from the angle of the prefiguring possibilities that enables the design operations through the available graphic languages in the framework of an incipient "G*rammar*" or *Theory of Design*

Architecture was born at a very complex crossroad. Architecture results from the application of design to the formal elaboration of constructions mankind builds to inhabit the world. Architecture is both the use of built space and the delimitation of inhabited space. On the other hand, Design is creation, delimitation, and articulation of form, articulation of form to take under control the construction and dwelling necessities. As autonomous knowledge—from construction and dwelling—Design enables, —through a project—modifying the first anthropoid's monotonous and utilitarian constructions. (Jannello 1983: unpublished).

Geometry was probably the first development in human thinking about the world that had not emerged directly from sensory experience. Geometry belongs to the world of forms, and its application to inhabitable constructions allowed for its exact formal determination. The history of architecture, as one kind of *applied design*, has produced in five thousand millenniums a vast typological repertoire of combined shapes with their own syntax. Not much has been said about this syntax or combination.

One of the first problems is to understand that Geometry was not conceived for purposes of Design, although since ancient times some of its intuitive and non-systematic properties and techniques have been used, such as geometrical *tracings* (Ghyka 1927: 221-322; Naumann 1930; Lawlor 1982 [1992]: 23-64). These still are and have always been the quintessence for appreciating the value of symmetry operations, generally hidden in constructions but present in *tracings*. Even though Geometry deals with forms only from an entitative viewpoint, geometrical *tracings* were generally used to explain the structure of symmetry. Designers, however, have conceptual and practical needs: to compare and establish relationships between forms and to select and combine them.

Graphic languages, such as Monge System (orthogonal projections) and Perspective (conic projections), traditionally used for designing, account 'only' for quantifying or qualifying space, respectively space of construction or dwelling space. They do not allow for conceptualising or working with pure design (Jannello 1980; Guerri 1988: 394) understood as selection and combination of forms without pertaining to an object. Because of Jannello's original research context —Argentina 1950-1985, pure design is some how related to the Bauhaus's Formlehre and basic design (Huff 1990: 76-85).

In turn, going to the geometry-symmetry relationship, we must acknowledge that a *geometric figure* as a whole, as an entity, as a problem of simple selection of differentiated recognition, lacks symmetry. Symmetry implies parts, which are in symmetry. It could be the parts of a figure or several figures. When there is symmetry, there must be a combination of parts. According to Nicolle (1950: 16), *ce qui nous frappe, c'est donc une certaine répétition, soit d'un objet, soit d'éléments qui le constituent*. A geometric figure considered as a whole has no parts. Its entitative consideration would not allow for a symmetrical approach. The only way of finding symmetry in a figure is to consider partial, syntactic, or combining aspects based on subdivision criteria But Geometry does not refer to comparisons among figures, nor to combination aspects between figures—either flat or volumetric—in relation to constant and comparable *dimensions* (Jannello 1984, Guerri 1988: 399). Geometry was not "created" specifically for designers.

2. GRAPHIC LANGUAGES

The traditional graphic systems, such as *orthogonal* and *conic projections*, were developed as methods of execution. They were never conceived as *ideological systems* implicit in any language, either graphic or verbal.

The first graphic system explicitly defined as such is the graphic language TSD. TSD is the acronym for Theory of Spatial Delimitation used in honour of its first proponent César Jannello (1918-1985). This graphic language systematizes all possibilities of selection and combination of flat and volumetric figures. It establishes necessary and sufficient morphic and tactic dimensions to account for all possible relationships of selection and combination, the pure design operations.

The morphic dimensions are Formatrix, Size and Saturation (Jannello 1984; Guerri 1988: 406-408). These three dimensions can be justified to be necessary and sufficient conditions from a geometrical point of view: they determine a point in space, in the infinitely high semi-cone of morphic selection possibilities (Guerri 1988: 398), and from a logical-semiotic (Peircean) point of view, because they are firstness, secondness, and thirdness respectively (Peirce CP 2.235-2.241). The tactic dimensions are Tactrix, Separation—in two or three directions, and Attitude (Guerri 1988: 409).

TSD systematizes the execution of tracings and subsequent description in hierarchical tree structures of corresponding complex configurations of pure design. (Guerri 1988: 389-419). Thus, insofar as each graphic language supposes different types of analogies, each of them has its specificity: Perspective to speak about quality of space, Monge System to state the quantity of matter present in that space, and TSD to account for the relationships in which matter and space abide.

Regarding Symmetry, a variety of conclusions may be drawn from the TSD proposal and its use through CA-TSD—Computer Aided TSD—as a specialized-graphic software:

1. Although Geometry is taken as its foundation, given morphic and tactic dimensions, considered necessary and sufficient for both flat and volumetric figures; what is considered a figure and a simple configuration for this graphic system is thus redefined. For example: a rhomboid and a trapezium are no longer figures for the system and will be considered as design configurations. A simple configuration is the combination of at least two figures. The tactrix of a simple configuration is defined by a description of the morphic relation of the intervening figures.

2. The morphic paradigm generates the figures as a continuous group of substitution possibilities. As to symmetry, figures should be considered on account of their lineal components and of the dimensions proposed by the graphic language TSD itself. For example: Saturation, insofar as it is a qualitative evaluation of figures, implies a problem of constance-variation, which is usually known as proportion—but that, is a concept that cannot be used to compare two irregular figures. Saturation also posits a problem of presence-absence, there will always be some kind of saturation-proportion in any figure, but there may or may not be saturation-symmetry.

3. The tactic paradigm generates simple configuration, as a continuous set of integration possibilities. The set of *morphic* and *tactic paradigms* constitutes theoretically exhaustive systems of all possible—flat and volumetric—*figures* and *configurations*. It demonstrates that symmetry operations are a specific convergence of *morphic* and *tactic dimensions*; and it demonstrates that given any two forms, any *simple* flat or volumetric *configuration,* all derived symmetry variables can be determined *a priori*.

4. For Design, Symmetry is an operation of a higher isotopic synthesis and, as a result, it is one of the most widely used design operations. Since its origin, it has been known as a concept linked to regularity that has been used to keep order, a way to skirt chaos,

monstrosity, and shapelessness History has it that symmetry was patently used or hidden, denied or reconsidered, but has always been present in design processes.

3. SYMMETRY

In Western architecture, order is construed in an agitated dialectics between historical periods –taken as concrete units- and the general structure of architectural design since its origin, up to current times. Thus, the concept of order in design (style) is not a constant concept but the manifestation of structured fluctuations. In this history of fluctuations, of permanence and change, the concept of Symmetry follows its own development, and will be considered by Western thought as a concept of regularity.

In architecture, symmetry has been one of the pillars for design—to the extent that all epochs have been ordered around it. Thus, symmetry anchors an abstract practice of design in a concrete design operation. As stated, it becomes the first design algorithm.

In Greece, symmetry is ostensible, generally, mirror and twofold rotation. The Renaissance continued making it ostensible, but in a more complex way: there was a tendency toward higher degrees of rotation; Villa Rotonda, with fourfold rotation; Bramante's San Pietro in Montorio with multi-fold rotation. At the break of the XXth. Century, Modernism meant a significant change in the application of symmetry, insofar as it was not concretely built into the constructed object. This rupture in ostensible symmetry lead to the development of hidden symmetry in subjacent design operations, never shown on plans or in buildings Post-modern architecture attempts to establish a new order completely different from the modern order: it counters functional and constructive principles that, in their discourse, backed the basic principles of Modernism, and once again welcomes symmetry; but symmetry becomes a reference and a parody of other symmetries. In post-modern architecture, there is a transposition, and designed or built symmetry is a reflex or reference to some historical symmetry.

The history of architecture reveals that, as in any human aspect, there are no laws, but rather a series of different rules that have been diachronically occurring over time.

CONCLUSIONS

TSD is presented as a temporary improvement regarding control over *pure design* operations. Within *pure design* operations, the possibilities of symmetry, in any configuration, are predetermined *a priori* by the *tactic paradigm*.

As shown in the computerized and transparency examples, the use of TSD for analyzing architectural design—Palladio, Le Corbusier, graphic design—El Lissitzky—or pictorial design—Velázquez, Malevich—allows for systematizing one's approach to aesthetic values, thus contributing to the understanding of both historical practices as well as new design possibilities.

Putting aside the problems of *perception*, TSD implies a new code of graphically *representing* the problem of Symmetry; and thus, it is also a new *cognitive* approach

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On the next pages are parts of Prof Guerri's Power Point presentation.

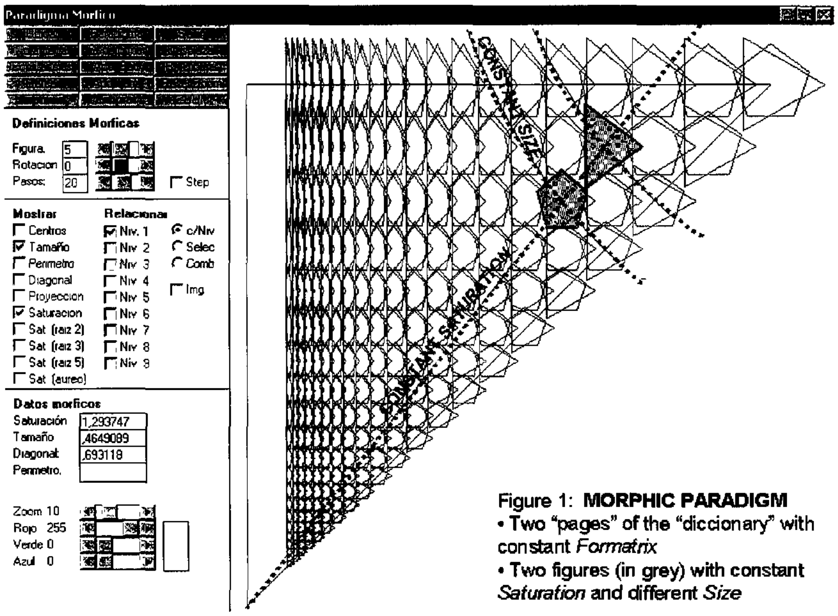

Figure 1: **MORPHIC PARADIGM**
• Two "pages" of the "diccionary" with constant *Formatrix*
• Two figures (in grey) with constant *Saturation* and different *Size*

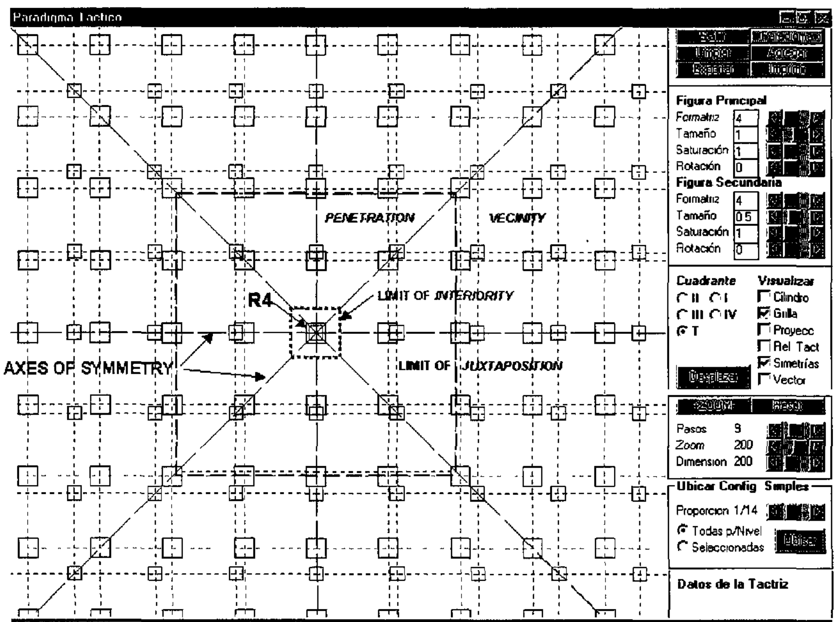

Figure 2: **TACTIC PARADIGM** Radial section with constant Attitude

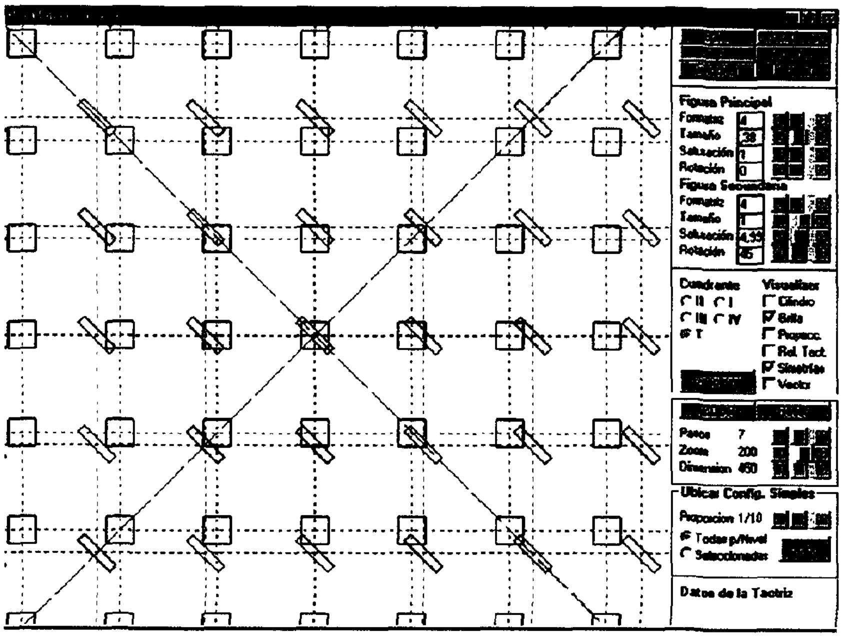

Figure 3: **TACTIC PARADIGM** Radial section with constant Attitude

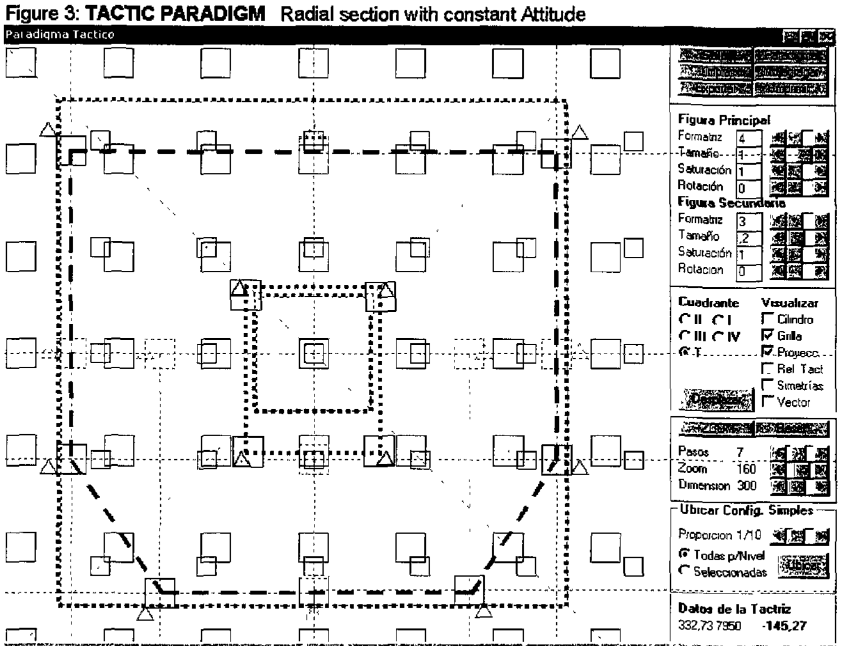

Figure 4: **TACTIC PARADIGM.** Radial section with constant Attitude.
Limits of *Interiority* and *Juxtaposition* for two different *Tactrix*.

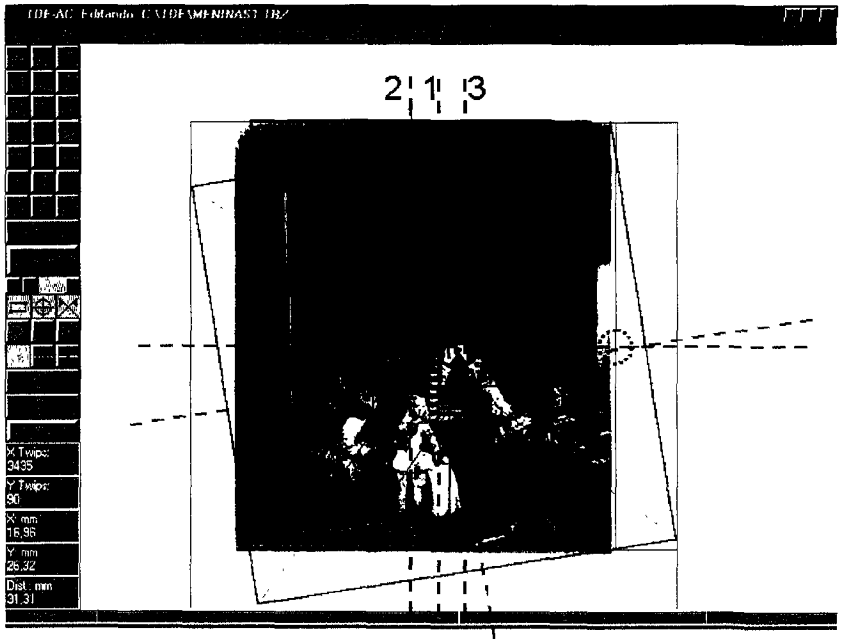

Figure 5: **TRACINGS** on Velázquez's *Las Meninas*.

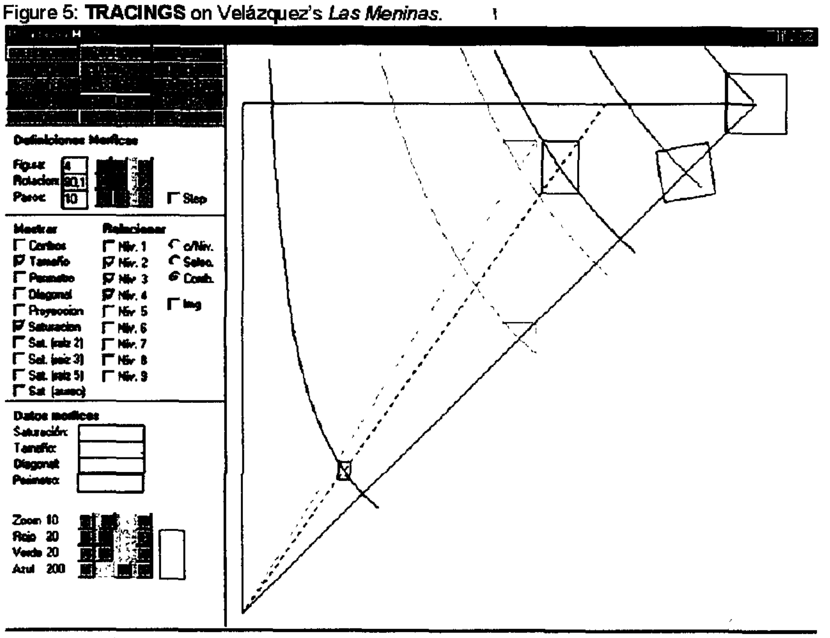

Figure 6: MORFIC PARADIGM, all *figures* used in Velázquez's "Las Meninas" *complex configuracion*

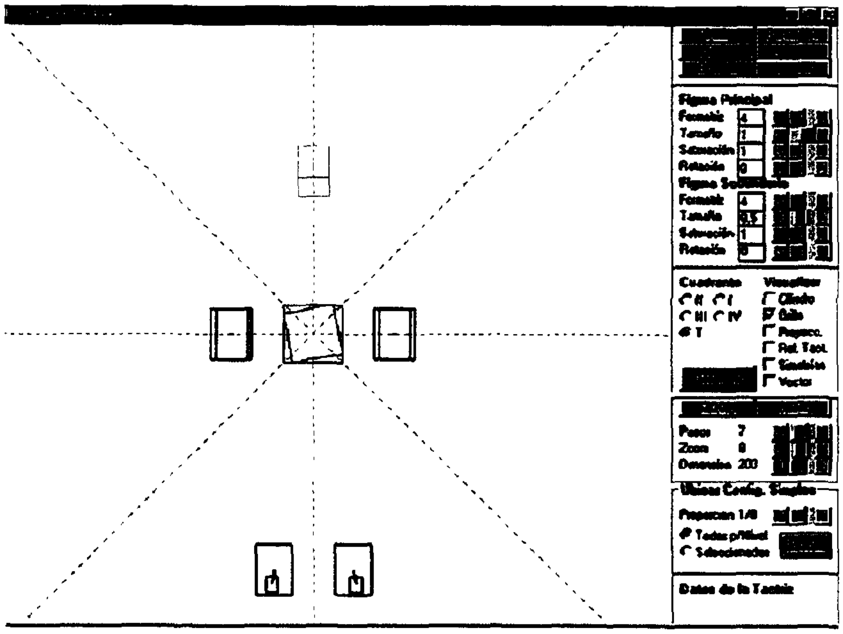

Figure 7: TACTIC PARADIGM, all *simple configurations* used in Velázquez's "Las Meninas" *complex configuracion*

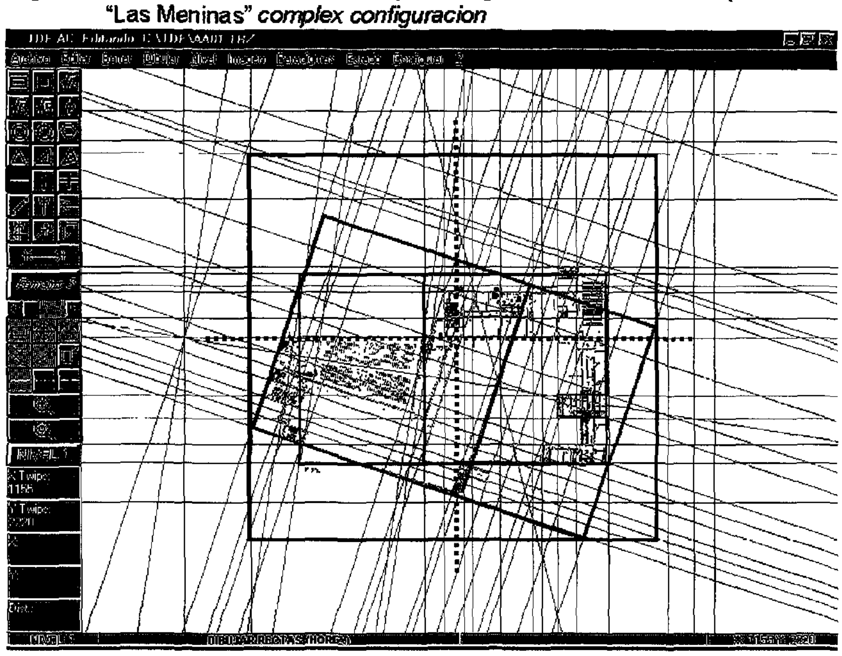

Figure 8: TRACINGS on Alvar Aalto's Parochial Church, Seinäjoki, 1958-60.

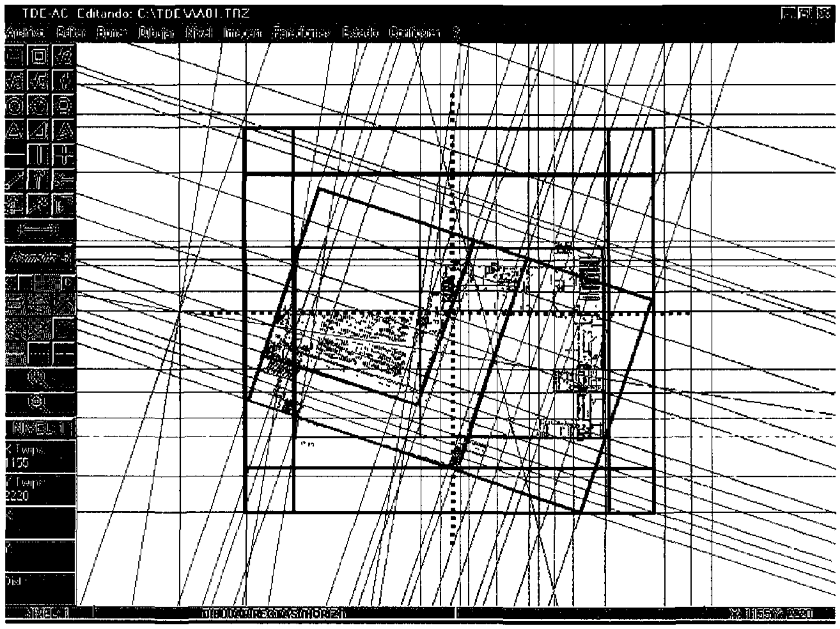

Figure 9: TRACINGS on Alvar Aalto's Parochial Church, Seinäjoki, 1958-60.