Registering visual permeability in architecture: Isovists and occlusion maps in AutoLISP
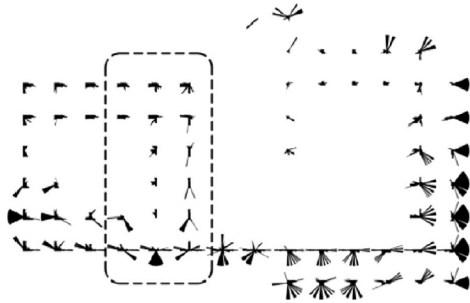
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Fig. 1.Occlusion map of Le Corbusier's main gallery floor at the National Museum of Western Art, Tokyo after the 1979 addition.

Introduction

Benedikt (1979) proposed the isovist as a means of quantifying perception of environments as distinct from objects. Simply expressed, the isovist is the set of all points in an environment visible from a fixed station point. Defined in this way the isovist can be understood as equivalent to the viewshed (Turner et al, 2001). In his major papers on the subject, Benedikt largely restricted his commentary to plan isovists, or two-dimensional (2D) sections through three-dimensional (3D) sets of points, similar to Porter's spatial boundary diagram (Porter, 1979). Benedikt and later researchers tend to use the word isovist to refer to these 2D diagrams rather than to their 3D counterparts. By focusing on 2D isovists, Benedikt was able to define measurable properties such as isovist area or isovist perimeter as these properties varied across an environment (Benedikt, 1979; Davis and Benedikt, 1979). He used the term isovist field to refer to a graph of these properties. Despite Benedikt's interest in measuring and mapping properties of isovists distributed over an environ-

ment, he did not provide an illustration of isovists deployed in an environment [such as figure 2(b) later in this paper]. Instead, Benedikt's illustrations are limited primarily to two types: illustrations of individual isovists and illustrations of isovist fields. Furthermore, the idea of preparing an illustration of isovists deployed in an environment appears to have been largely overlooked by subsequent researchers, in favor of illustrations of other properties of isovists and associated isovist fields (Batty, 2001; Turner and Penn, 1999; Turner et al, 2001). In this paper I explore the possibility of mapping isovists deployed within an architectural environment and identifying potentials which this mapping has for the study of that environment. To develop this possibility I devised a simple AutoLISP routine for preparing plan isovists. The case of an addition to an existing building is presented as a test case.

From individual isovists to deployed isovists

For researchers two questions are persistently relevant in making a shift from individual to multiple isovists. The first question concerns the spatial disposition of isovists within an environment (eg by path, by discrete space, or by uniform grid). The second question concerns the limits of the environment (eg equated with a discrete interior space). These questions are relevant whether the focus of research is an isovist field (Benedikt, 1979) or a map of deployed isovists, as discussed in this paper.

Benedikt's initial interest in formulating the iso-