Section 1: A Brief Introduction to CAD#

1.5 CAD and GIS#

Geographic Information Systems (GIS) have some similarities with CAD programs in that they represent spatial objects that are linked to data held in tables. GIS software was developed for geographers, cartographers and others working with maps and, of course, maps have some similarities with architectural plans. While GIS can incorporate scanned paper maps or digitised vector maps, early versions in particular offered only limited drawing facilities. CAD programs are much more sophisticated in this respect and, as a result, they are often used to create maps that are subsequently imported into GIS. These factors have encouraged confusion about the differences between CAD and GIS programs. Despite that confusion, they are very different in terms of their aims, offer different features and have very different internal data structures.

CAD systems were developed for representing geometric objects. These objects can be described in more detail by tabular data that is attached to the CAD model. For example, it is possible to attach an element in a CAD model to the data in an external data table (see Section 1.3.4). However, the aim is descriptive: the data simply augment the geometric representation of objects with additional information beyond that which is implied by its shape, position and layer designation in the model. For example, an artefact in an excavation may be shown in a CAD model and linked to additional data that describe its material, surface treatment and so on. Essentially, CAD is limited to representing geometric space and, unlike a GIS, does not include tools for cartographic projection.

GIS can incorporate a series of different maps (vector and raster) linked to data and overlying one another in layers or coverages. GIS emphasises the link between a graphic object (a feature such as a point or defined area on a map) drawn on a layer or coverage and associated data. The graphic object and data can be taken together as parts of a set on which the GIS can perform mathematical and other functions. GIS offers considerable powers of analysis both within and between sets. For example, a GIS could find all settlement areas that were associated with a particular type of sherd. These results could then be compared to another set to find which of those settlements were located on a particular type of soil. In addition, GIS includes many features that allow interpretations of and calculations based on terrain, such as calculations of the steepness of a hill or of the areas that can be seen from a specific vantage point.

In short, the connection between spatial information and tabular data is more robust and more central to the functions of GIS than CAD; the resulting analytic possibilities are therefore much greater. However, GIS cannot be used to model complex three-dimensional objects adequately, such as buildings or excavation trenches. Although height data can be recorded in GIS, no point can have more than a single elevation and at best 2.5-D effects can be produced.

Many projects can benefit from the use of both CAD and GIS, although the distinction between the two can be expected to disappear as CAD features are increasingly added to GIS software and GIS features are added to CAD software, driven by commercial interests. In the meantime, the Symon's Castle case study illustrates the use of both CAD and GIS, emphasising where GIS departs from CAD.