The Ethics of GIS

Jeremy Crampton

ABSTRACT: There has so far been little discussion of the ethics of geographic information systems (GIS), yet they are complex and driven by conflicting goals. This paper argues for an ethical analysis of GIS which goes beyond "internalist" judgements of good behavior and adherence to accuracy standards to a contextualized "externalist" one. Only when spatial technologies such as GIS are understood as part of a nexus of relations which includes academia in the commodification of information can GIS practice by fully analyzed. A four-stage sequence of ethical practice is proposed, in which GIS has achieved the second stage. GIS practice and use is a fluctuating, contested area, which, therefore, is not suited to a rigid code of ethics. A better approach is based in the internalist and externalist dialectic.

Introduction

You work for a midsized company located near Washington, D.C. Your job is to produce large-scale maps that show the market potential of a new supermarket. You do this by computing drive times for the surrounding area using a patented algorithm and coupling this data with household income levels. Or you work for a somewhat smaller company in Des Moines, Iowa, where you receive thousands of product warranty cards that have been filled out by consumers eager for rebates and coupons. These you ship to the Far East for data entry into digital files, which you then sell to a company near Washington, D.C. At a supermarket you use your discount card to purchase a favorite brand of soda, and a few days later receive coupons in the mail from a competitor. Or finally, you are a university professor who posts a job advertisement on a national GIS news group for an opening as a GIS programmer in a "life-style marketing" (geodemographics) company near San Diego, California.

Examine these examples—derived from real life situations in my files—and ask yourself whether they are ethical or unethical. Now ask yourself on what basis you decided. Finally, does it matter how ethical these activities are when they continue to occur on a daily basis?

If you found it hard to answer these questions it is probably because there is little or no substantial discussion of ethics in the discipline of geography. Geographic information systems are ethically complex, and often demonstrate "ethically inconsistent" behavior (Curry 1995) due to overlapping and competing goals. Part of this inconsistency is due to a divergence between ways of thinking about geographic information systems and actual practices (Curry 1994). Furthermore, in GIS and cartography ethical behavior has become equated with good conduct, such as adhering to accuracy standards—an internalist judgment rather than an externalist (contextualized) one.

The purpose of this paper is first to understand GIS and ethics from a contextualized point of view that relates the internal practices of spatial technologies[1] to their larger, external contexts—such as "the field of geography, the broader science establishment, the information marketplace, and various levels of government" (Curry 1995, 69). In this view, any academic discipline is bound up with larger societal values such as profit-making or political goals. As McHaffie (1990) has pointed out with reference to cartography:

> ...it is difficult to imagine how cartographers can create ethical standards which do not in some way refer to values created outside the discipline. For example, government cartographers create maps—cartographic information—as part of a larger state apparatus. (1990, 11)

Second, I examine privacy, and geodemographics in particular, to see how it involves ethics, choosing geodemographics because it provides the most visible connection between ethical issues of privacy and GIS. Finally, I discuss some general issues of ethics and spatial technolo-

Jeremy Crampton is a member of the faculty of the Department of Geography, George Mason University, Fairfax, VA 22030.

[1] I generally use the term "spatial technologies" to refer to all means of digital spatial analysis and display—GIS, automated cartography, geographic visualization, etc. In this paper it will refer specifically to GIS.

gies. The difficulties of making decisions about the ethics of situations such as those I began with, and suspicions about unethical practices that are already occurring, suggest a need to understand ethics and spatial technologies more thoroughly. This understanding must go beyond internal factors to include an examination of the assumptions that frame GIS, and that make ethics of central concern to the GIS community.

Understanding Ethics and GIS

My understanding of ethics and GIS is twofold. In the first place, I will adopt a traditional view of ethics—that it involves judgments of what is right, and why—which also takes into account the dialectic between what are here called the local, contingent relations (the "internal" agenda) and the wider forces operating to frame the local (the "external" agenda). I also assume that an important goal of ethics is to promote meritocratic outcomes, and that to the degree that these are not realized is due to "bias." I do not however, suppose that "bias" and "meritocracy" are uncontested terms.

As awareness of ethics increases in a discipline, the notion of ethics it holds can be considered as passing through several stages:

a. ignoring ethics (or rather being unaware of ethical issues),
b. considering ethics from an internal perspective only,
c. considering ethics from both an internal and an external perspective, and
d. establishing a dialectical relationship, which modifies both internal and external perspectives.

This sequence is by no means uncontested and gets progressively less inevitable. I suggest that the GIS community has reached stage **b**. By the "internal" perspective I refer to the questions of scientific inquiry, the day-to-day technical questions of a discipline. When considering ethical practices, an internal perspective would identify "good" science—that which follows established standards. This includes hypothesis generation, proofs, logical reasoning, and the proper use of statistics, i.e., the paradigm of contemporary "normal science." In GIS, good work has meant work that "accurately" maps the environment, that solves problems in a rational manner by compiling sufficient data, and that applies a cost-benefit analysis structure. This approach arises from an Enlightenment conception of rationality—by compiling enough data it is possible to solve problems; this approach is also markedly empiricist in nature (Edney 1993; Crampton 1994). This is why Pickles says that GIS represents a "reemergence of positivist epistemology and instrumental rationality" (1991, 81) after the latter had sustained much critique during the previous two decades.

By contrast, an external perspective deals with a contextual, ideological framework. It is "metatheoretical" and surrounds the internal, technical agenda. According to the sequence above, the most developed notion of ethics would see the internal and external agendas engaged in a dialectic of mutual modification. Ideologies adopted in the external agenda, which make normative statements about the role of GIS (e.g., that it is for increasing democratic practice in regional planning), will affect judgments in the internal arena. If geographic information systems were assumed to be "for" increasing local democratic practices by letting people make locally contingent decisions, a GIS that did not enable this (e.g., by being too commodified or dependent on elitist technical expertise) would be inadequate. Conversely, by representing the environment as a series of exploitable resources, geographic information systems might force a highly automobile-dependent society to think about non-renewable and renewable resource usage (an example of how internal practices influence external perspectives).

The terms "internal" and "external" perspectives as used here are derived from the later work of Brian Harley (1990, 1991, 1992), who used them to develop a more critical and ethically aware theory of cartography (but see also Taylor 1991 for similar usage, and Livingstone 1992 for a disciplinary history emphasizing contingency). Harley believed that many cartographers were unwilling to accept that maps could have an external, ideological agenda in addition to their role as (neutral) representations of the environment.[1] His project—unfortunately incomplete, due to his death in 1991—has stimulated a number of others to consider the relationship between spatial technology and society (see Pickles 1995), which has led, in part, to the meeting that gave rise to this

[1] I have also used them elsewhere (Crampton, forthcoming) to explain why the Peters projection was so controversial in cartography—that it was because it explicitly embraced an ideological stance, and that by thus pointing to its external agenda it conflicted with the strongly held assumption in cartography that maps should not be politicized. The irony, of course, is that all maps are politicized in some manner; it is just that their politics does not challenge the status quo. The Peters projection controversy does seem to have brought more awareness of this factor.

special issue of *Cartography and Geographic Information Systems*, to a Committee on Social Theory in the International Cartographic Association (Torok 1993), to non-positivist approaches in cartography (Edney 1993), and to efforts to examine the by-play between cartographic production and the labor process (McHaffie 1993). Although Harley did not extend his analyses to include GIS, I think that such a dialectic can be used to understand ethics in GIS, and indeed in science as a whole.

Ethics of Geodemographics and GIS: Commodification and Surveillance

The relationship between GIS and geodemographics has been described from various perspectives; non-critically (Beaumont 1991), critically (Goss 1995), and supportively (Openshaw 1989). The development and methods of geodemographics (also known as target, or lifestyle marketing) have been described in popular books (Burnham 1984; Weiss 1989) and are advertised widely by the industry as an effective means of increasing business (e.g., see CACI 1991; NDL International n.d.; Equifax 1993; and also the advertisements cited by Goss 1995). I will not describe further here the operation of geodemographics, but will examine the ethical issues it has raised. The most convenient point of entry to this discussion is the commodification of information that geodemographics entails.

Geodemographics is an increasingly visible aspect of GIS use, described as the fastest growing segment of the business of GIS, with an estimated market of $200 million a year by 1997 (Tetzeli 1993). Driving the relationship is an increasing commodification of spatial data, which has become important to geodemographic companies because it can be used to "monitor, model, and control consumer behavior, and ultimately because [geodemographic information systems] promise the capability to manipulate the market and consumer identity to enhance profitability" (Goss 1995, 131). This market-driven approach raises serious questions about the influence of geodemographics on geography and GIS. The head of the British Ordnance Survey, a geographer, recently commented that "the most difficult current problem in GIS [is] data as a commodity" (Rhind 1992a, 37). While for Rhind the problem was how to meet the challenge of successfully increasing prices "to what the market will bear," there is a larger concern about the ethics of charging for data, i.e., is it right to concentrate public resources in the hands of those who can afford them?

This question affects academic researchers as well as those in the private sector. Late twentieth century academia has been penetrated significantly by commodification, one of the most important results of which is to collect increasing amounts of information while limiting access to that information through cost, copyright, or patents.[1] Yapa (1995) has identified academia as part of a "nexus" of relations that are associated with the production of goods and information. New ideas and innovations are biased toward one or more elements of this nexus, which also includes technical, social, cultural, and ecological realms of endeavor. In Yapa's account, therefore, academia is interrelated with other parts of the nexus because, for example, technical innovation is often achieved at the behest of companies or the military, leading to a continuing "impact of private industry and the military on the research agenda of universities" (1995, n. p.).

Apart from the commodification of information, one of the strongest critiques of the GIS-geodemographic structure is that it encourages a "surveillance society" (Pickles 1991, 1995; Lyon 1994), which threatens peoples' data privacy. The concept of a surveillance society in this sense was first used in the mid-1980s to refer to the collection, storage, and processing of personal information by computers belonging to corporations and government. However, social scientists have paid attention to surveillance from a variety of perspectives, ever since Marx and Weber (see Lyon 1994, chapter 1 for a general introduction). Given that geodemographics is market-driven and so heavily based on spatial technologies originally developed for other purposes (e.g., census tabulation, planning, resource allocation; see Coppock and Rhind 1991) it is not surprising to discover that it has privacy implications.

[1] The huge potential of the census in western countries for marketing purposes provides one example of such commodification. One company, CACI Marketing Systems, which has offices in the U.S. and the U.K., has been particularly involved with the national census. In the UK for example, CACI has published a booklet aimed at potential clients of its services, which begins with the chapter title "The Census Means Business" (CACI 1991). The cost of the census itself (in digital format) is not insignificant; a single-user license of the complete U.K. 1991 census costs £37,700 (plus 17.5% tax) or £335,000 for a site license (plus tax). Subsets of this information are available however; e.g., a "topic pack" of, for instance, population or age would cost about £3,000 plus tax for a single user (figures as of July 1993 from The Data Consultancy company of Reading, England).

It is difficult to appreciate the degree to which personal lives in western capitalist countries have been subject to surveillant data collection (space reasons preclude a consideration of surveillance at work). For instance, Donnelley Marketing has over 87 million, or about 95%, of United States households in its Donnelly Quality Index (DQI) files, as well as 140 million individuals (Linowes 1989, 144; Goss 1995). Other companies claim equally impressive datasets; NDL has 30 million consumer names, and Equifax's Microvision clustering system combines various financial and credit records with census data for every ZIP+4 (5-15 households) in the United States (Goss 1995). There now seems little doubt that capitalist societies of the late twentieth century are the most heavily surveilled in history, and that the generating force for this is information as commodity.

Those who are critical of such surveillance describe it as an infringement of personal data privacy, and argue that geodemographics has the propensity to represent multidimensional individuals solely as consumers. These authors generally are aware of the issues in the *external* agenda framing the use of GIS and geodemographics, though it remains to be seen how the GIS community will respond to their critique.

Goss (1995) provides a compelling explication of the "strategic" metaphor underlying geodemographics; an "instrumentalist logic" (Sheppard 1995 (this issue)) which has begun to colonize people as "object[s] which can be represented within and manipulated by the new technology" (Goss 1995, 141). According to Goss this strategic mentality consists of a technocratic and instrumentalist logic of "interiority" or isolation from the everyday world (compare my statements about internal and external arenas), of panoptic surveillance, and of categorizing individuals by consumer profiles. Geodemographics thus promotes a representation of people as observable consumers, justifying surveillance as a normative activity. However, since a large part of the purpose of geodemographic surveillance is to control or administer by applying power, this raises the question of whether geodemographics is—or could be—ethical.

The ethical questions of commodification and surveillance belong to the external agenda. Within geography and GIS, as I have stated, ethics so far has received a more internal consideration, and meritocratic outcomes are often cited as being due to good professional conduct and adherence to accepted standards. For instance, Brunn (1989) answers the question of how to be an ethical academic by discussing proper article refereeing and suggests it may be time to adopt a code of professional ethics. For spatial technologies, Dobson (1990) argues that ethical behavior ought to consist of following standards in mapmaking, such as doing a scrupulous and accurate job to the best of your abilities. GIS discussion has revolved around due payment for work through copyrights versus making digital information freely available (Epstein and McLaughlin 1990; Rhind 1992b).

In relation to infringements of privacy by spatial data collection, a commonly made counterargument is that despite the wide availability of personal information in databases, people's privacy cannot be infringed if analysis is at the aggregate (census block or neighborhood) level. It is argued that this ensures no personal information is ever made available, and that individuals are unaffected by aggregated data. For example, Openshaw and Goddard (1987) state that the British Inland Revenue could "generate small area statistics of disposable income on an annual basis and still protect the confidentiality of individuals" (p. 1425), while Rhind (1992b) asserts that government-collected data could be sold off "and avoid problems over privacy through the sensitive use of geographical aggregation and the application of confidentiality-preserving rules long pioneered by census agencies" (p. 19). In a study of AIDS, Gould contrasts data acquisition needs to privacy needs, finally concluding that "aggregation to geographic units to protect individual people *can* be achieved depending on the geographic distribution and density of the population involved" (1993, 177, emphasis added).

How convincing are these arguments? Geographers and cartographers are becoming aware that ethical problems are not restricted to the collection or mapping of data at the personal level. Even though personal records of individuals may not be stored in databases, but rather at spatially aggregated scales, these data are often used to make decisions about people *within* those geographic units. This can lead to inaccurate conclusions, a consequence of the ecological fallacy. For example, using a map of AIDS at the block level, insurance companies may charge higher preimiums to people from blocks with high rates of AIDS. Note that individuals from one of these blocks are *not* the basis for this decision, but nevertheless, through their bad luck in being in that block, they are personally affected by aggregated data. It is also likely that individuals would not know that they are subject to this policy. One must also be skeptical of the ability of the census to protect privacy following criticism during the last United Kingdom census that the small area statistics of about 200 households on average sometimes dips to as few as 16, and that these easily

can be cross-matched with names and addresses from the electoral register, which cost only £2.50 per 1,000 names from the local government authority (Connor 1991).

Issues of professional conduct, of adherence to accepted standards, of copyright, and of the ecological fallacy are obviously of ethical concern. But because they are located within the internal agenda of the day-to-day technical problems they do not raise the wider issues that information commodification and surveillance do. Both internal and external issues are needed for a full consideration of ethics in GIS.

The Broader Ethics of GIS and Society

This paper has attempted to outline ethical issues of the new spatial technologies, particularly GIS. In considering ethical behavior, brief examples from both the external (commodification, surveillance) and internal (copyright, data matching) realms were given. The role of GIS in society (e.g., for resource allocation or empowering local communities) as well as ways that society is represented in GIS (e.g., in "strategic" terms) are both crucial ethical issues. Part of the difficulty in assessing the ethical impacts of geographic information systems is that there is often a divergence between the image people have of a system and its actual practices (Curry 1994). Although there is compelling evidence to conclude that the majority of GIS practice so far has operated from a positivist mentality, there are occasional reminders that it can have non-positivist humanist uses such as enabling local decision-making (Harris et al. 1995, Yapa 1991). Furthermore, although data cross-matching can have the privacy-infringements described above, the actual concept of linking data, especially in an interactive medium, can have incredibly useful and exciting possibilities—as the explosion of interest in hypertext on the World Wide Web (WWW) demonstrates.

We certainly would like to know more about the ethics of GIS and its highly visible practices such as geodemographics. Perhaps the most pressing question is whether GIS is *inherently* instrumentalist and positivist. Are geographic information systems bad tools? Or are they not tools at all, but ways of thinking that are gaining ground in geography? Thinking of ethics as bias from meritocratic outcomes is only useful as long as it is recognized that "bias" and "meritocracy" are highly contested terms, often based on different frames of reference (e.g., "GIS is a tool" versus "GIS is a positivist epistemology"). These alternative frames of reference mean that GIS users and non-users often talk past one another, and there is a real danger of responsibility for GIS slipping through the cracks.

Certainly even this short paper makes it obvious that the ethics of GIS involves many complex issues and it is difficult to know how to respond to them. But I would suggest that "nailing down" an ethical code or standards of practice (e.g., creating "accurate" maps) is not the solution, despite being a commonly suggested one. Michael Curry—who perhaps has done most to help our thinking about GIS and ethics—has cautioned that the solutions to ethical problems are sometimes as bad as the problems themselves. Instituting legal sets of ethical codes "may create the illusion of order, but it is more likely merely to promote rule-according behaviour, behaviour that is unlikely to instill much confidence in the motivations of the actors involved, and which will therefore seem just as unacceptable [as the ethical problems]" (1991, 144). It is therefore undesirable to aim for absolute conclusions that bypass the contingencies of GIS practice and use. Approaching ethical issues from an internalist and externalist dialectic (as in stage "d" above) may be the better approach because it would enable us to use geographic information systems in a critically informed manner.

ACKNOWLEDGMENT

An earlier version of this paper was written for the National Center for Geographic Information and Analysis (NCGIA) conference on "Geographic Information and Society," held at Friday Harbor, Washington on November 11-14, 1993.

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