Ethics in Computer Science

by

J. Barry DeRoos

Introduction

Computers are one of the core technologies for our times. They are the new paradigm, the new "common sense." In the comparatively short space of forty years, computers have become central to the operations of industrial societies. Without computers and computer networks, much of manufacturing, industry, commerce, transport and distribution, government, the military, health services, education, and research would simply grind to a halt[1]. The academic discipline of computer science has paralleled the increased computer usage with rapid growth and continuous change in its brief existence. The field of computer science often opens possibilities for applications that have not been possible before and professionals in this area develop the programs and the uses made of them. Christian morals and values need to influence the character of the computer science professionals as they make these decisions. As an instructor at Messiah College in computer science, I am in a position to influence the Christian values of computer science students. This is one of the important ways the Christian faith can be integrated into the field of computer science. Hasker states :

"When ever one is concerned with practice, with action, then ethics and values must play a role. And so the Christian educator, the "trainer" in an applied discipline, must ask himself, What am I offering to my students by way of ethical guidance concerning the practice into which I an initiating them? The assumption, common to secular education, that one simply equips students with neutral tools or skill which are to be used purely according to their personal whims and desires, is just not acceptable in a Christian education. One can't guarantee that guidance will be accepted and followed, but it is irresponsible not to offer it."[Hasker2]

The ethical behavior of a person grows out of his/her belief system and as an instructor of computer science, I can help focus this behavior with respect to computer science. "Ethics " has been defined as the code or the set of principles by which people live. It is what a person considers to be right and what is considered to be wrong. When people make ethical judgements, they are making perspective or normative statements about what ought to be done, not descriptive statements about what is being done[3]. In the past, ethics have been based upon our Judeo-Christian tradition and rather commonly accepted in areas of business and law.

Ethics and Computer Science

In today's world computer professionals often get mixed ethical messages from teachers, managers and even leading researchers in the computer science field. Many of the ethical questions seem to revolve around ownership of intellectual property and the copying and unauthorized use of software. The messages vary from "Don't copy that floppy" , to "make a copy of that software if you need to use it". Some of the statements are based upon the principle of "maximizing profit and minimizing costs". Software is a growing portion of the company budget and an effective way of minimizing this expense is to copy software. Since one can purchase a single copy of the software and make copies of it for only the cost of the disk medium, it is spectacularly cost effective with minimal chances of getting caught[4].

The piracy of software is not a trivial issue because it effects large corporations, small business, Messiah College faculty, staff and students. The rapid increase in the capabilities of microcomputers and

the availability of useful software has greatly expanded the possible uses of the microcomputer. This has increased the productivity of users and offices but there have been some rather serious side-effects. One of the side effects is the common practice of "pirating" software that is neither site licensed nor in the public domain.

Ken Walsh of the U.S. Software Publishers Association said,

"Industry's loss on a global bases is staggering." The unauthorized copying of computer programs by American businesses alone deprived software publishers of $1.6 billion last year, a figure that swells to nearly $7.5 billion when overseas markets are included.[5]

The copying of software has other serious effects on the ethical character of the person as outlined in the quote below :

"Perhaps the greatest cost of software piracy is the effect of such actions on members' appreciation of the need of ethical behavior. Taking the property of another without offering just compensation is stealing. An individual who makes an unauthorized copy of a software package is in fact taking another's property, albeit intellectual instead of physical property. Unfortunately, this is not a widely recognized form of property, as is shown by two recent studies. Vitell and Davis (1990) found software copying to be one of the most acceptable of 27 questionable consumer practices[6], while Solomon & O'Brien(1991) reported over half of the students surveyed admitted making unauthorized copies[7].

Such an attitude may lead to feelings that other forms of "victimless" stealing also are acceptable. Similarly, pirating software is an "economic short-cut" in that a good is acquired without cost to the user or apparent harm to the original owner. If the organization's culture condones this practice, then other such "harmless short-cuts" also may be taken, At what point is the line to be drawn between ethical and unethical behavior."[8]

The piracy of software according to these authors produces an ethical softness toward other unethical behavior. A recent publication by Strickwerda and Ross suggests that piracy of software is an area that many individuals and corporations have decided that the usual rules against stealing of property can be ignored.

"Some people do not care about doing the morally correct thing in any area of life. These people are not our concern. However, other people who would not think of shoplifting a book from a bookstore readily make illegal copies of software. How do people who sleep well at night turn into software thieves by day?"[9]

This paper suggests that there are two possible reasons for this clearly illegal activity : 1) problems with moral vision and 2)rationalization of the problem. Education and awareness can help people arrive at clearer moral vision on the subject. Since much of personal ethics is learned in childhood, and respecting intellectual property is not something we learned from parents or teachers while in grade school, this becomes a blind spot in our moral behavior and needs to be addressed first by education and awareness.

Some of the rationalizations that users often make for copying software are illustrated by the following letters to the editor of Time magazine[10].

"In response to your article on the unauthorized copying of computer programs [Technology, June 13], I would like to note that we will finally nab the "pirates of cyberspace" when software companies stop charging $500 and more for software packages that consist of little more than a few floppy disks and a soft cover manual or two in a cardboard box. ... Issues such as intellectual property, copyright infringement, and fraud might fall by the wayside if software manufactures and publishers started charging a fair price for their products. They just might find themselves selling many more copies of their software products to a much bigger marketplace."

Kent Daniel Bentkowski
Angola New York

and

> *"I have a job in software retail. Like most retail employees, my co-workers and I get employee discounts and benefits. The surprise came when one software publisher offered us a fully packaged product for $30 that we were retailing for $450. In other words, the break-even price for the company is $30; it gets an additional $200 selling to us, and we in turn make about $220 retailing it to consumers. Software is so expensive today that it is no wonder people choose to copy programs or buy them bootlegged, When the prices are high, companies deserve losses to pirates."*

Ernesto Gluecksmann
Silver Spring, Maryland

In these two letters, the writers justify unauthorized software duplication by the rationalization that software companies are over charging customers and that copying the software is a protest over pricing. In fact, it may be just a rationalization to justify themselves. The injustice of the software company somehow then justifies my illegal actions. This type of reasoning sends a mixed message regarding ethics : illegal acts are ok if it is done in protest. "The end justifies the means." However, under some circumstances it might be okay to copy software. It is clear that the piracy of software is an ethical issue in which many people have made the decision that they have sufficient justification for violating the principle of stealing property that is not theirs.

It is clear from the information above that software piracy is a significant ethical problem in computer science and that students at Messiah College need to be educated about the moral aspects of this issue and given examples of a clear ethical message based upon Christian principles.

Christian Basis of Ethics

Christian ethics are based upon a definite set of moral principles that are summarized in the Old Testament's "Ten Commandments" [11] and the example of Christ in the New Testament. Although these principles are general and were given to a culture that is foreign to our experience, we need to interpret them in our current culture. Specifically, we need to see and understand how these Christian moral principles apply to the rapidly changing world of computer science. We have all learned many of the moral principles and their applications in our families growing up. These involve honesty and integrity of character, but we have had no experience in the application of these principles in the field of computer science. In the past some of these values have been a part of the American culture; however, this situation is changing rapidly and it can no longer be assumed that Christian principles are common to most members of our society.

In the practice of computer science, a person's moral and ethical values are critical to the relationships developed with fellow workers, the types of applications that are developed, the quality of the work done, and the general honesty and integrity of the person. Persons who have relative values will often see relationships with other persons as an avenue to further themselves. Their intellectual honesty is often open to question because using another person's property will be okay as long as it gets the job done and furthers that person's objectives. On the other hand, persons who have Christian moral values that are consistently put into practice are known for their integrity, honesty, and the character of their work. A person's values do make a difference in the character of a computer professional. These values need to be developed and modeled during the time that they are students here at Messiah College. One of the goals I have as a Messiah College faculty member is to help develop in students an awareness of Christian ethics and their application to computer science.

First of all, I have to be certain that my own life exemplifies these values and then the values need explained and modeled for students.

Observations from Senior Seminar

An awareness of the need to specifically emphasize ethical principles came to my attention in 1987, when I taught Senior Seminar for the first time. As the seminar progressed I learned that most students had not, even as seniors, considered the issue of software piracy in the context of their Christian values. The comments of several seniors indicated that they did not realize that the copying of software could be a form of stealing the intellectual property of others. In fact, several of the students had illegal copies of popular PC software packages and had little realization that this was an illegal practice(moral insensitivity and blindness). Another student related that his pastor had asked him to copy software for the pastor's use. The question this student raised was , "How could this possibly be wrong? The pastor asked me to make the copy." Other students commented that they had very little money for software and that the large software companies were ripping off the small users by over-charging for software. This made it okay to copy the expensive software(rationalization). After this discussion, I began to realize that this issue had not been raised in the previous computer science courses taken by the students. As a result, the connection between this ethical issue and their Christian moral principles had never been made. This was a blind spot toward integrating Christian faith and the discipline of computer science.

I began to realize that because software piracy was a common behavior of my students, it was an ideal topic to integrate into computer science courses and provide a Christian perspective on this ethical issue.

ACM Statement

Software piracy is an issue that is of concern to the national professional organization of computer professionals , the Association of Computing Machinery (ACM). The subject has been addressed by the society in a Code of Ethical Conduct. It is interesting to note that the first ACM Code of Professional Conduct developed in 1972 made no mention of the copying of software or the intellectual property rights for software [12]. The revised 1992 ACM Code of Ethics and Professional Conduct[13] now includes a section on piracy :

Section 1.5 "Honor property rights including the copyrights and patents."

"Violation of copyrights, patents, and the terms of license agreements is prohibited by law in most circumstances. Even when not so protected, such violations are contrary to professional behavior. Copies of software should be made only with proper authorization. Unauthorized duplication of materials must not be condoned."

This section provides a strong statement about software duplication and indicates that the ACM society regards this as a major moral imperative. The duplication of software is a behavior that is detrimental to both the person who copies the software and the owner whose rights are violated. It is a form of behavior that must not be condoned[14]. Computer professionals need to be made aware of the serious nature of unauthorized software duplication. The 1991 ACM report on computing curricula recommends that social and ethical principles be included at several levels of the recommended courses[15].

Christian Basis

As Christians, we have clear moral statements in the Scriptures that provide a basis for making ethical decisions. The Scripture's statement on "stealing" is stronger that of the ACM . In the Ten Commandments, it simply says "Do not steal." The dictionary defines stealing as "to take and carry away without right or permission." Copying software is an application of this principle since it takes the code or intellectual property of another person or company to use without their permission.

Ethical behavior for Christians requires that they should only possess and use software that they have a valid license to use. The situation is not always so clear cut because different software companies have different types of licenses. Some require the purchase of one copy of the software for each computer it is used on; others have site licenses that allow unlimited use at the site; and still others have rules for determining the number of licenses required. There is also "shareware" which is software that is allowed to be copied and used but must be purchased to be used permanently. Although, there may be many varieties of licenses for software, it is clear from a Christian perspective that a person or company must always purchase software used and abide by the license agreement as closely as possible. The Christian principles forbid a person to copy software outside of these agreements.

Messiah College Software Policy

Ethical behavior is often taught by consistent moral example. It is important that Messiah College as a Christian institution made up of Christian individuals, carefully follows the ethical principle outlined above. Mixed ethical messages undermine the effectiveness of the ethical values we must teach. Christian principles need to be carefully followed by the school's Computing Services as well as the individual instructors.

The College, under the direction of the director of Computing Services, has a brief but strong statement on software piracy[16] . The following quotes illustrate the intent of the policy :

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"Because electronic information is volatile and easily reproduced, respect for the work and personal expression of others is especially critical in computer environments. Violations of authorial integrity, including plagiarism, invasion of privacy, unauthorized access, and trade secret and copyright violations constitute grounds for sanctions against members of the college community."

"*Unauthorized copying of software is illegal--copyright law protects authors and publishers of software."*

"The unauthorized copying of any software owned by the College will be viewed as an act of theft and a violation of the appropriate copyright protection provided for under the law. "

"The installation of any unauthorized software on any storage medium owned by the college, or the running of unauthorized software on computing equipment owned by the college will be viewed as a violation of the appropriate copyright protection provided for under the law. " [17]

These statements clearly state that any unauthorized copying of software owned by the college is theft and will be treated as such. The installation of unauthorized software on the college equipment is also prohibited. It will be viewed as a copyright violation and the college will not knowingly participate in the action of using pirated software. The college does not want to look in the other direction while some are using pirated software. The policies are used to guide the purchase and use of college software and they are read to students in computer science courses with the emphasis that members of computing services will enforce them. The college has a policy to legally license all software used on college computers. The software licenses are purchased for all software provided on college computers and the network software is licensed with the number of users on the network limited to the number of copies that have been purchased. Software is purchased only through computing services and no exceptions are made. Individual persons may load their own software on the college computers but they are responsible for having a legal license for the software.

The rules and policies used by Computing Services are clear statements to the college community that the college intends to respect the software rights of others and practice honesty in software ownership and use. This is an example of putting Christian moral values into practice.

My Software Rules

It is also important for me as an instructor to support and reinforce the college position on software piracy by example that is consistent with my Christian commitment. First, I am committed to be honest, fair and direct in all of my dealings with students. I treat them as important individuals. Second, I need to consistently model a Christian striving to integrate my faith with the practice of computer science, examining the ethical issues and applying Christian principles to them. This is particularly important in modeling the responsible acquisition and use of software. The software that I use must be properly licensed and paid for in order to demonstrate that I consistently follow through with the principles that I teach. I need to apply the same standard of ethics for unauthorized copying of software to myself as the standard applied by the school to the students.

Since I have a computer system at home, the ethics of legal software has to apply to that system also. In examining the software that is on that system, I found that it was necessary for me to remove several programs that I did not have a legal license to use. To me this is an important issue because I need to be a consistent example to others -- the same rules apply to me that apply to others.

Teaching Ethics in Computer Science

From my experience in Senior Seminar , I decided that it was of critical importance to systematically add discussions of ethical questions to my courses in computer science. Since students are already familiar with the pressures to copy software, this issue makes a good starting point to discuss ethics from a Christian perspective and this can be done early in the student's career.

In the normal programming courses (Programming I ,II, and Data Structures), I have introduced the question of license and ownership of software as a topic that is discussed. These courses also provide the opportunity to illustrate to the students the importance of reliable bug free software and the ethical obligations of the programmer to provide code that meets these criteria to the best of their ability. Another important question that is discussed is, "Who owns the software?". If the programmer is working for a company, the software is not the property of the programmer but the property of the company and subject to all of the restrictions that the company wants to put on its use. These ethical issues make the students aware of the programmers obligation in the future.

The most important change to the curriculum that I have made is to include ethical issues in the Introduction to Computer Science Course (CSC 194). This course, first taught in J-Term 1990 , is designed to give Freshman computer science majors an over view of the profession of computer science and to expose them to topics that are not introduced until the junior and senior years.

Since the course is project oriented and taught in a seminar format, it was natural to add a project and seminar on ethical issues. The discussion is initiated with students being asked to react to a short editorial by Ezra Shapiro titled Piracy as Policy. This author argues that the piracy of software might well be the most cost effective way for a company to acquire software and if software companies do not change their policies this can be come a real possibility. I have tried to present a clear picture of the Christian principles drawn from the commandment, "Do not Steal". Explaining how software is a form of intellectual property and the duplication of that property is a form of stealing. Since the principle applies to all licensed software, unauthorized duplication of software must be judged to be wrong. It is also an opportunity to make the students aware of the ethical standards that are used at Messiah College and how that applies to them as students. I also explain that these principles are important for me to apply to my personal use of software. I relate to students how I try to always purchase any software that I use on my system. However, that has not always been the case and a discussion like this has helped me to see that it was necessary to remove unlicensed software from my system. Usually a good discussion on ethical

practices and software follows.

This is the first step of informing students of the ethical issues and the standards used at the college. Following this discussion the students are assigned several articles on ethics in computer science to read and discuss. Next, they are asked to write a two page paper in which they describe how their Christian faith effects the character of a computer scientist. The paper gives the students a chance to begin to develop their own view on how their Christian values are worked out in ethical behavior.

A summary of some of the student papers is instructive in observing the development of the person's ethical awareness. Often they comment that they were unaware of the fact that copying software was a form of stealing and that this is an area that they are now going to change. Others want to argue that software duplication is necessary because of their financial condition or circumstance. Some students agree with the article presented that software companies are unfair and duplication of software may be a way of protest against this practice.

The comments above fit into the categories of moral blindness and rationalization that are given by Strickwerda and Hodge. Those not aware of the character of software piracy is moral blindness and the other comments are some form of rationalization.

I think that this approach has been very successful in teaching ethical values to our students. Some of the results are evident in Senior Seminar. This year(Spring 94), I again taught the senior seminar and the students in that class were the first students who had taken the Introduction to Computer Science (CSC 194) course as Freshman. It was evident in the discussion of ethics in computer science that students had carefully thought about the ethics of copying software and in several cases made some significant changes. A couple of examples will illustrate this. One student related that on coming to Messiah, he had copies of a large number of popular PC programs all of which had been obtained illegally. After being informed of the nature of software piracy in the Freshman class he slowly grew to be convinced to remove all of the unlicensed software. He made this choice even though peers strongly pressured him to make copies of one of the packages that he owned. He indicated that he understood why the copies were illegal and his conscience would not let him continue. This same student wrote in a paper on the relation of his faith to computer science that he had a negative reaction to the discussion that we had in the CSC 194 course about software piracy. The examples that he saw in the school policies and in the instructors convinced him of the importance of being honest. This is a very significant change in a students ethics.

In another example from the senior seminar class, a student shared that he had access to many valuable software programs at the store where he was currently employed part-time. In the past he had made illegal copies of most of that software for his own machine. After the discussion of the ethics of software piracy that we had in CSC 194, he decided that having that software was not right. However, he did not immediately remove it. Instead he erased the most important parts of the software gradually over the three year period and purchased copies of the software that he was using. Another real change in ethical behavior as a result of being exposed to these principles in classes and from personal contact.

I am sure that there are examples of students who have not responded to any of the effort that I have made or the example of others but the classes have the effect of heightening the awareness of the fact that our behavior in computer science is closely related to our Christian faith.

Appendix A

Messiah College Software Piracy Policy

Recognizing the following:

- Respect for intellectual labor and creativity is vital to academic discourse and enterprise. This

principle applies to works of all authors and publishers in all media. It encompasses respect for the right to acknowledgment, right to privacy, and right to determine the form, manner, and terms of publication and distribution.

- Because electronic information is volatile and easily reproduced, respect for the work and personal expression of others is especially critical in computer environments. Violations of authorial integrity, including plagiarism, invasion of privacy, unauthorized access, and trade secret and copyright violations constitute grounds for sanctions against members of the college community.

- Unauthorized copying of software is illegal--copyright law protects authors and publishers of software.

- Unauthorized copying of software by individuals can harm the entire college community. The institution may incur a legal liability for condoning such activity, and it could become more difficult to negotiate agreements that make software more widely and inexpensively available .

- Unauthorized copying of software deprives developers of a fair return for their Work. Prices become inflated, levels of support and enhancement decrease, and development of new products is inhibited.

Messiah College affirms the following policy:

- The unauthorized copying of any software owned by the College will be viewed as an act of theft and a violation of the appropriate copyright protection provided for under the law.

- The installation of any unauthorized software on any storage medium owned by the college, or the running of unauthorized software on computing equipment owned by the college will be viewed as a violation of the appropriate copyright protection provided for under the law.

- Infractions related to the unauthorized use of software will result in one or both of the following actions:

  - referral to the appropriate offices, committees, boards or individuals for determination of guilt, level of culpability and appropriate disciplinary action as provided for in the ethos statement of the college and in the personnel and student handbooks;

  - referral to the civil authorities or the software vendor for possible legal action.