Heuristic Methods for Computer Ethics

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Introduction

Procedures are the stock-in-trade of computer professionals. Computer programs are most often written in procedural languages, and very often reduce to collections of procedures. The idea of an effective procedure, or algorithm, clearly remains the single most important concept in the field of computer science. Not surprisingly, then, many computer professionals are adept at procedural thinking. It has become their preferred cognitive style. This suggests that a step-by-step or procedural approach to ethical decision-making could be an especially good fit for computer professionals.

I note, in passing, that this premise would likely be rejected by those, like John Rawls and Jeroen van den Hoven, who have argued that the aim of ethical analysis is not to complete a procedure. Rather, it is to reach a homeostatic cognitive state described by the phrase "wide reflective equilibrium." I differ from them in believing that this state can be incorporated into a procedural approach.

"Procedural ethics" may be a new concept, but it has a cousin in "procedural epistemology," a term apparently coined by John Pollock (Pollock, 1998). He states that one main task of procedural epistemology is to describe procedures such that, if they could be applied without constraint, would lead a rational intellect from input data to reasonable beliefs. By analogy, procedural *ethics*, as *its* first task, would seek to describe procedures that could play a similar role in guiding ethical reflection. In procedural epistemology, once we have described all the useful procedures, Pollack believes we must next develop a "control structure" that will determine when each procedure can be used to best advantage. Procedural *ethics* would need a similar control structure; this would be its second task. This paper is mostly focused on the first task of procedural ethics but, at the end, I will suggest how the second task could be approached.

"Algorithms" for Ethical Analysis

Ethical problems are too complex and too fluid to solve algorithmically in human time. However, if one tried *per impossible* to construct an algorithm for ethical analysis, it might resemble this one:

```
Construct ethical-theory-list
Construct personal-virtue-list
Inspect situation
Construct shared-value-list
```

```
Construct list-of-parties

FOR each party in list-of-parties
|  Construct option-list for this party
|  FOR each option in option-list
|  |  Construct outcome-list for this option
|  |  FOR each outcome in outcome-list
|  |  |  IF probability of this outcome is low
|  |  |     Delete this outcome from outcome-list
|  |  |  ELSE IF moral relevance of this outcome is low
|  |  |     Delete this outcome from outcome-list
|  |  |  ELSE
|  |  |  |  FOR each party in list-of-parties
|  |  |  |  |  IF this party is affected by this outcome
|  |  |  |  |     Add this party to stakeholder-list

FOR each party in list-of-parties
|  Recall option-list for this party
|  FOR each option in option-list
|  |
|  |  Recall shared-value-list
|  |  FOR each value in shared-value-list
|  |  |  IF this option promotes this value
|  |  |     Increase weight of this option in option-list
|  |  |  ELSE IF this option diminishes this value
|  |  |     Decrease weight of this option in option-list
|  |
|  |  Recall personal-virtue-list
|  |  FOR each virtue in personal-virtue-list
|  |  |  IF this option promotes this virtue
|  |  |     Increase weight of this option in option-list
|  |  |  ELSE IF this option diminishes this virtue
|  |  |     Decrease weight of this option in option-list
|  |
|  |  Recall outcome-list for this option
|  |  FOR each outcome in outcome-list
|  |  |  IF benefits exceed risks for this outcome
|  |  |     Increase weight of this option in option-list
|  |  |  ELSE IF risks exceed benefits for this outcome
|  |  |     Decrease weight of this option in option-list
|  |
|  |  Recall stakeholder-list
|  |  FOR each stakeholder in stakeholder-list
|  |  |  Construct list-of-obligations party has to stakeholder
|  |  |  FOR each obligation in list-of-obligations
|  |  |  |  IF option fulfills this obligation
|  |  |  |     Increase weight of this option in option-list
|  |  |  |  ELSE IF option violates this obligation
|  |  |  |     Decrease weight of this option in option-list
|  |
|  |  Recall ethical-theory-list
|  |  FOR each theory in ethical-theory-list
|  |  |  Construct list-of-principles for this theory
|  |  |  FOR each principle in list-of-principles
|  |  |  |  IF option is consistent with this principle
|  |  |  |     Increase weight of this option in option-list
|  |  |  |  ELSE IF option is inconsistent with this principle
```

```
|  |  |  |     Decrease weight of this option in option-list
|
|  Sort option-list by weight
|  IF option-list[1] > option-list[2]
|     best-course-of-action = option-list[1]
|  ELSE
|     best-course-of-action = Break-tie( option-list )
|  Print party
|  Print best-course-of-action
```

Does this pseudo-coded procedure supply at least a promising beginning for a complete, computable, effective procedure? No, not from a computational standpoint, not from an ethical standpoint, and not even from a structural standpoint.

A computer scientist would notice the omission of important programmatic elements from this “program”:

- It makes no provision for asserting or withdrawing assumptions.
- It makes no provision for asserting or withdrawing facts.
- It makes no provision for asserting or withdrawing hypotheses (“what-if” analysis).
- It makes no provision for backtracking from dead ends.
- It makes no provision for calculating the values used to adjust the weights in the option-list.
- It makes no provision for exiting early if an overriding or pivotal consideration emerges.
- It makes no provision for exiting early when further analysis would be a waste of time.
- It makes no provision for simplification except in the case of deleting outcomes.

A philosopher would notice that the “algorithm” omits important techniques commonly used in ethical analysis:

- It makes no provision for reasoning by example, including the posing and evaluation of counter-examples.
- It makes no provision for case-based reasoning, omitting even a simple appeal to precedent.
- It makes no provision for conflict resolution except naively, in the case of numerical ties.
- It makes no provision for moral intuition.
- It makes no provision for semantic or conceptual analysis.
- It makes no provision for the elaboration or testing of moral analogies.
- It makes no provision for the elaboration or testing of moral arguments.

Beyond this, there are severe structural problems:

- The steps should be logically independent but clearly are not. An action taken by one party may introduce or eliminate stakeholders. Similarly, an action taken by one party may limit or expand the options available to another party.
- The procedure makes the dubious assumption that moral evaluations are scalable and, in fact, that evaluations of diverse origins can be directly compared on a common scale.

Despite this abundance of glosses and omissions, this "algorithm" still seems to *over-specify* the process of ethical analysis, at least from a human standpoint. If there were only five items to consider in each major list, then there would be 5^4 sub-cases to process at three points, and 5^3 sub-cases to process at four points, for a grand total of 2,375 sub-cases. Maybe a computer could help; I will return to that thought later.

Heuristics for Ethical Analysis

Technically, an algorithm is an *effective* procedure, which means that it will unfailingly produce the intended result in a finite number of steps *if* it receives sufficient valid input. Algorithms can be contrasted with *heuristics*, which are stepwise procedures that will *tend* to produce the intended result when they get the right input. If I have misplaced my keys, a useful heuristic would be to examine my immediate environment on the assumption that the item is more likely to be nearby. An algorithm, by contrast, would require an examination of all environments that I have encountered since I first acquired the keys.

I believe that the procedures proposed for guiding ethical analysis can be valuable heuristically even when they are inadequate as algorithms.

The search for useful analytical heuristics has been a common theme in applied ethics for many years. Over sixty procedures are detailed on the web pages created to support this paper: `http://csweb.cs.bgsu.edu/maner/heuristics`. Within computer ethics, heuristics have been of early and continuous interest.

Although human beings make moral judgments from a very young age, heuristics may be needed

- to take this process to a higher level
- to guard it against omissions
- to make it more teachable, or
- to ensure that an effective process, once found, can be repeated and refined.

Accordingly, heuristics have been invented to direct case studies, to focus ethical scenarios, and to frame solutions for moral dilemmas. Professional organizations have published heuristics to raise professional awareness and to transmit professional culture. Ethical codes sometimes include heuristics as a proof that the code *does* translate into practice. At a higher level, heuristics have emerged as a by-product of attempts to apply,

or even to validate, specific ethical theories. In short, heuristic methods supply part of the core meaning for “applied” ethics.

Organization of the Paper

From the five dozen procedures I have collected and studied, I will present twelve that exhibit a variety of approaches. Then I will show how individual steps, collected from all these many procedures, can be mapped into a uniform set of stages. Next I will show how steps that map into a *particular* stage could be reformulated more usefully as “checkpoints.” I will then identify faults common to many of the procedures I have collected. Next I will suggest how my stage-by-stage decision-making model could be re-purposed, adapted, filtered or downsized for use in specific circumstances. Finally, I will explain what makes the procedural approach to ethical decision-making different when used in the field of computer ethics.

A Sampling of Representative Procedures

> *NOTE. Most of these procedures contain both steps and sub-steps, but all the sub-steps have been omitted here to achieve a more compact presentation. Complete versions can be found at the web address given earlier.*

The Practicum Method (Maner, 1981)

1. Form an "ethics committee" of at least five persons.
2. Frame a specific question that creates the desired ethical dilemma.
3. Construct a scenario (ethical story or vignette) of about 150 words that will evoke the dilemma.
4. Construct at least three persuasive arguments on each side of the question (yes and no).
5. Raise objections to these arguments.
6. Make replies to the objections.
7. Make counter-replies to these replies.
8. Take a stand on the issue. Reach a "verdict of one."

This procedure requires 75 steps in its complete form, but the condensed version shown above is sufficient to exhibit the distinctive elements of the approach, which include

- the creation of an issue as a *first* step, followed by the construction of a matching scenario,
- a strong “committee” or collaborative emphasis in all but the last step, and
- an attempt to explore the issue through the vehicle of structured debate.

The main constraint on the use of this method is the requirement that participants be experienced in philosophical argumentation and debate.

A Strategy for Solving Moral Problems (McLaren, 1989)

1. Formulate the problem.
2. Propose a hypothetical solution.
3. Explain what means and consequences will be involved in accepting the hypothesis.
4. State every important reason for accepting the hypothesis and those for rejecting it.
5. Decide by weighing the importance and certainty of the reasons.

At the top level, this method is generic enough to be useful in almost any problem-solving activity, including problems outside of ethics. I conclude from this that McLaren views ethical decision-making as a specialization, or refinement, of the general process of rational decision-making. While his method includes some consequentialist elements, it mostly follows the "good reasons" approach to morality advocated by Stephen Toulmin, Kurt Baier and, more recently, by James Rachels. Users of this method must be skilled in the discovery, elaboration, and comparative evaluation of moral reasons.

Canadian Psychological Association (1991)

1. Identification of ethically relevant issues and practices.
2. Development of alternative courses of action.
3. Analysis of likely short-term, ongoing, and long-term risks and benefits of each course of action on the individual(s)/group(s) involved or likely to be affected.
4. Choice of course of action after conscientious application of existing principles, values, and standards.
5. Action, with a commitment to assume responsibility for the consequences of the action.
6. Evaluation of the results of the course of action.
7. Assumption of responsibility for consequences of action, including correction of negative consequences, if any, or re-engaging in the decision-making process if the ethical issue is not resolved.

Most codes of ethics include sections on principles and professional practices. The CPA Code of Ethics includes these predictable elements, but it also includes a decision-making model designed to put these principles and practices into action. The recommended procedure is remarkable for giving nearly equal weight to steps required before and *after* a decision has been rendered. The *post*-decision process includes

- the explicit assumption of personal responsibility for the decision and its consequences,
- the monitoring of the results with an eye toward mitigation of negative consequences, and
- an unusual requirement to re-engage the decision-making process if the ethical issue is not resolved.

Those who adopt this approach cannot dismiss past decisions, even carefully rendered ones, as "water under the bridge"; with his method, the bridge moves with the water.

The Paramedic Method (Collins and Miller, 1995)

1. Gather data systematically about the parties.
2. Analyze the data systematically for the alternatives.
3. Try to negotiate a social contract agreement in an imaginary meeting where all parties are represented.
4. Judge each of the alternatives according to ethical theories.

For Steps 1 and 2, "systematically" may be an understatement. Although not apparent in this condensed version, the Paramedic Method requires *meticulous* attention to detail. Like the "algorithm" for ethical analysis that I constructed earlier, this procedure iterates computer-like over

- each involved party,
- each pair of involved parties,
- each linkage of rights with corresponding duties for each pair of involved parties,
- each course of action open to each party,
- each risk and benefit for each action for each party, and
- each ethical theory that may bear on each action of each party.

Together these tightly knit iterations seem to impose a discipline that demands, of the user, a degree of precision and thoroughness usually reserved for the construction of mathematical proofs. However, in the give and take of the imaginary negotiation done in Step 3, the problem may reduce to a smaller set of critical considerations. If not, users will need a bookkeeping system to track all the decision elements that come into active play.

Nine Checkpoints for Ethical Decision-making (Kidder, 1995)

1. Recognize that there is a moral issue.
2. Whose issue is it?
3. Gather the relevant facts.
4. Test for right-versus-wrong issues.
5. Test for right-versus-right paradigms. What sort of dilemma is this?
6. Apply the resolution principles.

7. Investigate the "trilemma" options.
8. Make the decision.
9. Revisit and reflect on the decision.

Rushworth Kidder's approach is notable for distinguishing between unconflicted decisions ("right versus wrong") and the more problematic *conflicted* decisions ("right versus right"). The resolution of right versus wrong conflicts is trivial, but right versus right conflicts are inherently difficult because they can pit

- justice against mercy,
- freedom against security,
- short-term consequences against long-term,
- the individual against the community, or
- truth against loyalty.

To resolve this second, more difficult type of conflict, Kidder applies ethical principles and, where that doesn't produce a complete resolution, he tries to find a "creative middle ground" that will convert the dilemma into a "trilemma." Kidder's book is called *How Good People Make Tough Choices*. Highly recommended.

Worksheet for Ethical Decision-making (Bivins, 1996)

1. What is the ethical issue or problem?
2. What immediate facts have the most bearing on the ethical decision you must render in this case?
3. Who are the claimants in this issue and in what way are you obligated to each of them?
4. What do you think each of these claimants would prefer that you do regarding this issue?
5. List at least 3 alternative courses of action.
6. Are any of your alternatives supported or rejected by ethical guidelines?
7. Determine a course of action based on your analysis.
8. Defend your decision in the form of a letter addressed to your most adamant detractor.

This procedure includes an "in their shoes" or empathy step that requires the decision-maker to examine possible outcomes through the eyes of each stakeholder. This clearly requires creativity, imagination, a fair grasp of human nature, and the ability to project oneself into the lives of other people. The same qualities are needed again in the last step, where the decision-maker tries to address the concerns of an imaginary detractor.

Risk/Benefit Model (Hiskes, 1996)

1. Identify the problem and basic policy objectives.
2. Formulate alternative courses of action.

3. Identify relative consequences of each alternative.
4. Assign a probability to each relevant consequence.
5. Assign a value, i.e., a numerical cost or benefit, to each consequence.
6. Combine the information obtained in steps 3-5 and select the best alternative.

Various decision-making procedures require rankings, which is an elementary form of enumeration, but none of the methods I examined is as bold with numbers as Hiskes. With this particular approach, likelihoods are quantified along with costs and benefits, and then all these numbers are "combined" using some unspecified formula. Any person using Hiskes' method would have to be comfortable taking a thoroughly quantitative approach. Numerics have the best chance to work within a consequentialist framework, which Hiskes clearly favors.

Ethical Decision-making Model (Waldfogel, 1996)

1. Identify stakeholders.
2. Identify values: ethical and non-ethical.
3. Ethical values trump non-ethical values.
4. If two ethical values conflict, the one that produces the greatest good for the greatest number wins.

These four steps are a *complete* listing of the procedure recommended by the Josephson Institute for use by school-age youth in their teen years. Although clearly minimalist in its content, the procedure still manages to include *two* provisions for conflict resolution. It is difficult to imagine how a defensible ethical decision could be made using a procedure any simpler than this one. For the intended audience, the procedure should work provided its users have been taught to distinguish between ethical and non-ethical values.

The Five-step Process of Ethical Analysis (Rahanu, Davies and Rogerson, 1996)

1. Analyze the case.
2. Apply formal guidelines.
3. Apply ethical theories.
4. Apply relevant laws.
5. Apply informal guidelines.

It is interesting that informal guidelines are used at the very *end* of this procedure, after the hard work is complete and a tentative course of action has been determined. As the critical moment approaches, just in case the high-powered machinery of ethical analysis may somehow have blundered, a last-ditch battery of commonsense tests are applied:

- The *Mother Test*:
  Would you tell her? Would she be proud or ashamed?

- The *TV Test*:
  Would you tell a nationwide audience of your actions?
- The *Smell Test*:
  Do you feel "in your bones" that there is a problem?
- The *Other Person's Shoe Test*:
  What if the roles were reversed?
- The *Market Test*:
  Could you advertise the act to give yourself a marketing edge?

If the contemplated action is confirmed by these last tests, that may be a sign that the decision-maker has reached the desirable state of "wide reflective equilibrium" important to some moral philosophers.

Ethical Decision-making (Gregoire, 1997)

1. What are the facts?
2. What ethical principles should be applied?
3. Who should decide?
4. Who should benefit from the decision?
5. How should the decision be made (implemented)?
6. What steps should be taken to prevent this issue from occurring again?

This procedure pushes to the very top level questions that are mostly ignored by other approaches. Instead of applying a fixed set of ethical principles to every situation, this procedure makes a context-dependent selection. This could be a first step toward the "control structure" I mentioned earlier. Gregoire's procedure is also interesting because, instead of ignoring implementation details, it considers implementation as a moral issue in its own right, and aims to achieve due process for all involved parties. Finally, there is a healthy emphasis on prevention not found in other ethical decision-making models.

Quick Tests for Ethical Congruence (Ethics Resource Center, 1998)

1. How does your stomach feel?
2. Are you bothered or upset by the decision you are about to make?
3. Do you have doubts?
4. Do you wish you didn't have to choose?
5. Is it frustrating to have to select one option over the others?
6. How would you feel if your Mother were looking over your shoulder?
7. How would you advise your own child to act in this same set of circumstances?
8. Could you accept public review of the tradeoffs and compromises you made?
9. Could you accept review by friends, neighbors and family?

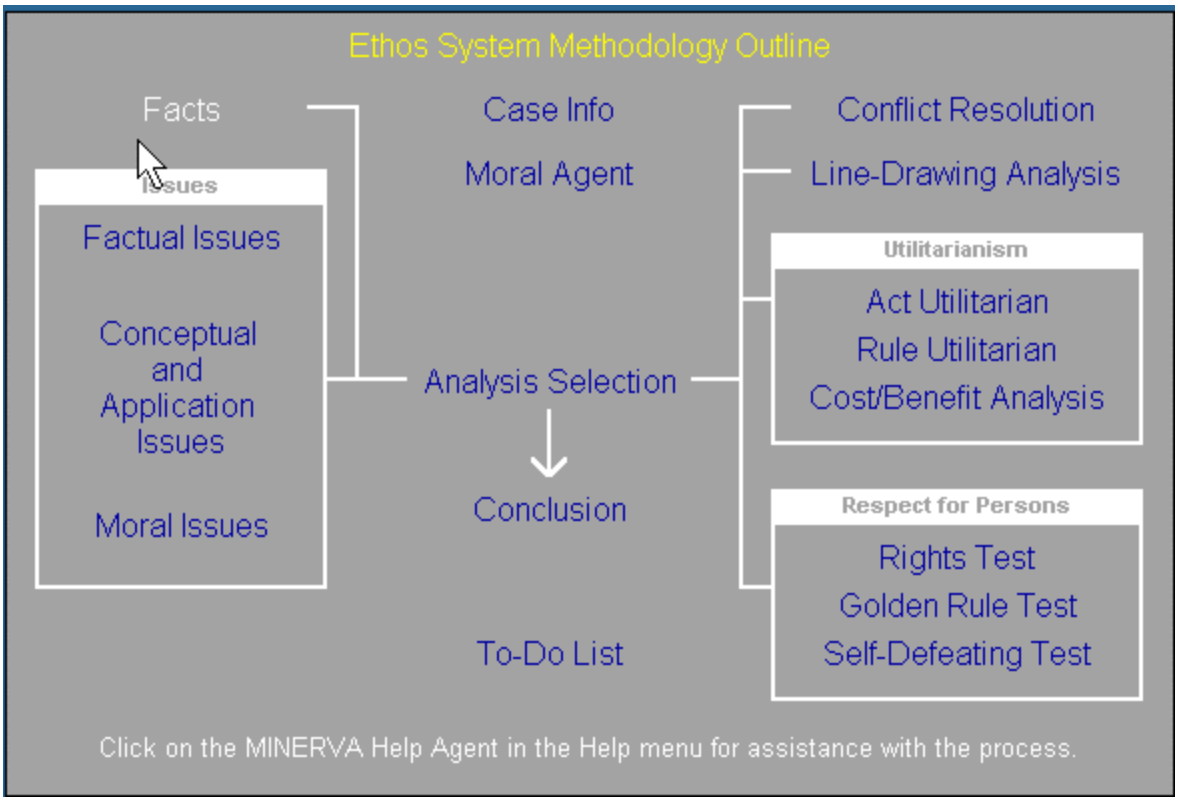
In my view, these tests address two very different circumstances, one that comes after a long period of analysis and another that comes when no analysis is possible. When a person comes to the end of a difficult and conflicted process of ethical deliberation, when the only remaining step is to put the decision into action, what can the

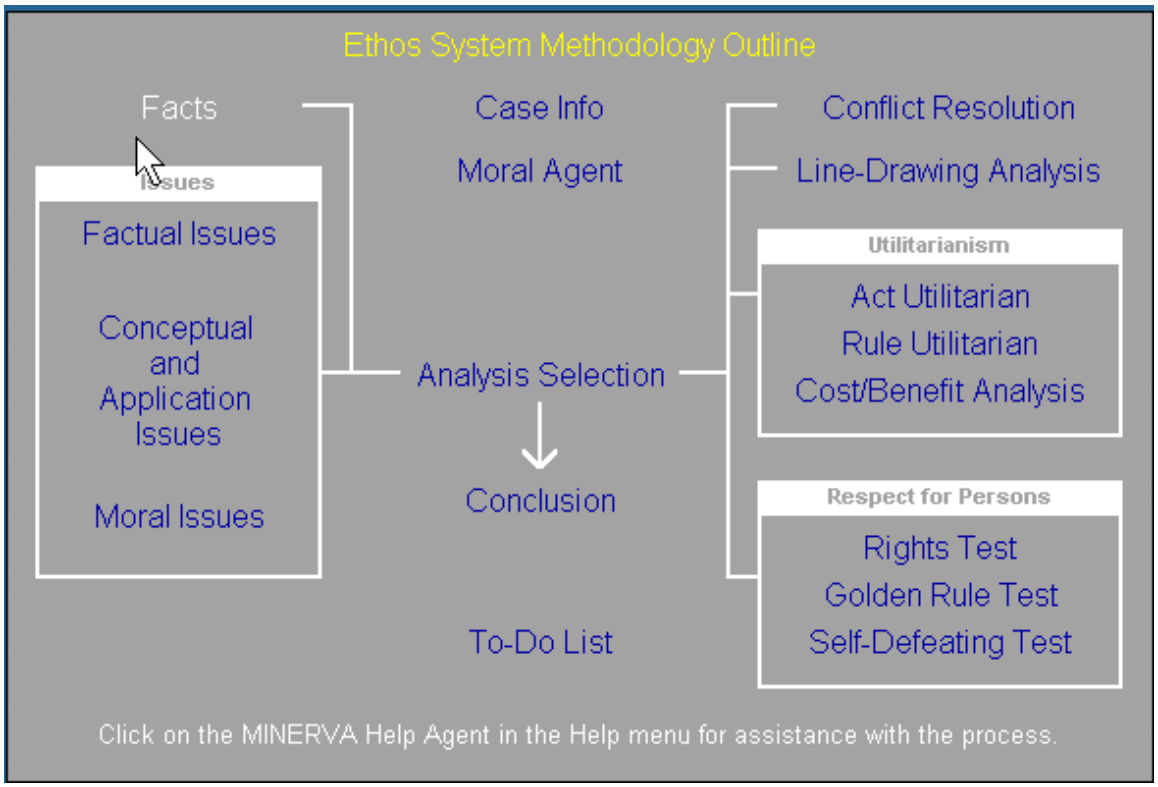
decision-maker do to confirm the choice? Questions 1 through 5 may provide an answer. On the other hand, when an immediate decision is required, when there is no lead-time for normal ethical deliberation, what can the decision-maker do to reduce the risk of error? Questions 6 through 9 may provide an answer.

The HARPS Methodology (Searing, 1998)

1. Collect information.
2. Select a moral agent.
3. List known relevant facts.
4. Make factual assumptions.
5. List conceptual issues.
6. Define these concepts.
7. List moral issues.
8. Select one or more methods of analysis.
9. Negotiate a conclusion based on the solutions provided by the methods of analysis.

The 53-step HARPS Methodology is one of the most comprehensive approaches to ethical decision-making ever devised. It is so thorough that it comes with its own 50-page user manual. In fact, it is probably too complete a method for reliable use by ordinary human beings. Not to worry. HARPS has been incorporated in the Ethos System, a computer program that guides the user through the labyrinth one step at a time:





Main Navigation Screen for the Ethos System

HARPS and Ethos together offer a good fit in the situation where the decision-maker has time for extended deliberation, particularly where stakes are high and the deliberation must be conducted with maximum thoroughness. It also offers a good fit where decisions must be accompanied by a complete written justification, one that shows in detail exactly how and why the decision was made. With the Ethos System, this is as simple as choosing Print from the program menu.

The HARPS methodology emerged from the Engineering Ethics program at Texas A and M University, and is based on the work of Charles E. Harris, Michael S. Pritchard and Michael J. Rabins. I highly recommend their book, *Engineering Ethics: Concepts and Cases*.

A Uniform Set of Stages

I concede that the best minds in applied ethics will never agree on a uniform set of steps and sub-steps for their heuristic decision-making procedures. We all have our creative differences, we all build our procedures for different audiences, and we all use our methods to address the different problems and issues. However, at a higher level of abstraction, it may be possible to reach consensus on a uniform set of *stages*. As a step in that direction, I propose the following:

1. **The Preparing Stage**.
   During this earliest stage, we cultivate moral awareness and sensitivity, clarify our value system and worldview, observe human nature, engage in ethical behavior ourselves, learn some ethical theory, and prepare to avoid ethical traps.

2. **The Inspecting Stage**.
   We now face a possible problem situation, so we attempt to define the problem by noting facts, participants, groups, roles, relationships, events and actions. At this stage, we make no effort to determine what is *morally* relevant, only what is *factually* relevant, and we try to produce a list of uncontroverted facts that would be acceptable to all parties. Finally, we determine whether the situation is truly a problem, one that requires further attention and action.

3. **The Elucidating Stage.**
   Here we identify facts that are missing, and either develop these new facts or make assumptions to cover them. We clarify technical, ambiguous or vague concepts, and we try to eliminate biased and emotionally charged language. We isolate key factors in the situation, including especially factors that set this situation apart from otherwise similar cases. We identify the difficulties and obstacles that may hinder analysis. We do epistemological legwork, trying to assess the reliability of our sources and the validity of our information. We try to determine the immediate antecedents of the problem, how the situation came to be. We discriminate between primary and secondary participants, and we determine which parties are affected by actions of other parties. Potentially, these affected parties are the stakeholders, but we do not make that association until the Focusing Stage.

   We consider all the lists we have made, and eliminate from these lists any items that do not meet some minimum threshold for significance. Given all this, we try to estimate whether this is a short-term problem that can be resolved quickly, or a long-term problem that requires sustained effort. Finally, in a very preliminary way, we begin to frame possible issues: "Is it true that X should do Y assuming Z?"

4. **The Ascribing Stage**.
   We begin to infer and specify the values, goals, ideals, interests, ideologies, priorities and motives that are most likely responsible for creating the dynamics of the problem. We ascribe these biases, tendencies and proclivities to various participants or to ourselves.

5. **The Optioning Stage**.
   We brainstorm to list all possible courses of action that are (or were) available to the participants. This list may include actions that are ill-advised and actions that are contingent on other actions.

   Once we know the full range of alternatives, we try to eliminate from the list those actions that are clearly not feasible or that fail to meet some threshold for relevance. We do not exclude an option because we think it is wrong.

6. **The Predicting Stage**.
   For each remaining option, we list potential consequences, including consequences that would result if no action were taken. We discriminate between short- and long-term effects, between likely and unlikely consequences, and between results that are intended and unintended. We associate these consequences with specific participants or with ourselves, either as a risk or as a benefit.

7. **The Focusing Stage**.
   We consider all affected parties and identify those who are sufficiently affected to be elevated to stakeholder status. We note the rights that are claimed, or could be claimed, and we identify the responsibilities or duties that correspond to those rights. We determine which facts are morally relevant, which actions have moral consequences, which values are moral values, which questions are moral questions, and which issues are moral issues. We take special note of virtues, values, rights, priorities and ideals that appear to be at risk, or that appear to be in conflict. We eliminate all factors that are morally irrelevant or insufficiently relevant. Based on all this analysis, we identify and define the core ethical issue, which is often expressed as a dilemma: "Should X do or not do Y assuming Z?"

8. **The Calculating Stage**.
   Some decision-making procedures attempt to quantify risks, costs, benefits, burdens, impact, likelihoods and even relevance. These weights and numbers, if required, are generated at this stage. Later, at least in theory, it will be easy to determine which option produces the most probable morally relevant benefit, with the least probable morally relevant risk.

9. **The Applying Stage**.
   This is the stage where most of the critical work of applied ethics is done. Ideally, each possible stakeholder/action pair is considered separately and sympathetically.

   Reasons for and against particular actions are cataloged, then ranked. Morally required actions are distinguished from those that are morally permitted but not required. Values are weighed against other values. Sometimes entire value systems are weighed against competing systems. Short-term benefits are weighed against long-term risks. In similar fashion, long-term benefits are weighed against short-term risks. Various ethical theories may come into full play -- and into full conflict. Like and unlike cases are considered and compared. We construct moral analogies and dis-analogies, examples and counter-examples. Best- and worst-case scenarios are elaborated. Diverse ethical principles are applied, and we note whether their advice is conflicting or convergent. Options are evaluated according to the virtues they promote, or the rights they respect, or the obligations they satisfy, or the values they maximize, or the principles they obey. Philosophical arguments are constructed, deconstructed and evaluated. Laws, policies, ethical codes, and professional literature are reviewed for parallels. Associates, supervisors, mentors, trusted friends, advisors and stakeholders (if willing and available) give the decision-maker the benefit of their

opinions.

Results may be convergent but typically are conflicting, contradictory or inconsistent. Since conflicts are so common, special strategies are invoked to resolve them. When the dust settles, we hope the problem has been reduced to a coherent set of pivotal considerations. If this happens, the long list of options produced in Stage 5 can be shrunk to a much shorter list of promising options. For these remaining options, full justifications are prepared.

10. **The Selecting Stage**.
    An option is chosen, and that decision is confirmed by applying a series of informal, commonsense ethical tests (e.g., the Reversed Roles Test or the Public Scrutiny Test). As a double-check, we may perform a "sensitivity analysis" to identify those situational factors that, if altered, would greatly alter our decision. We would then revisit our analysis of those factors.

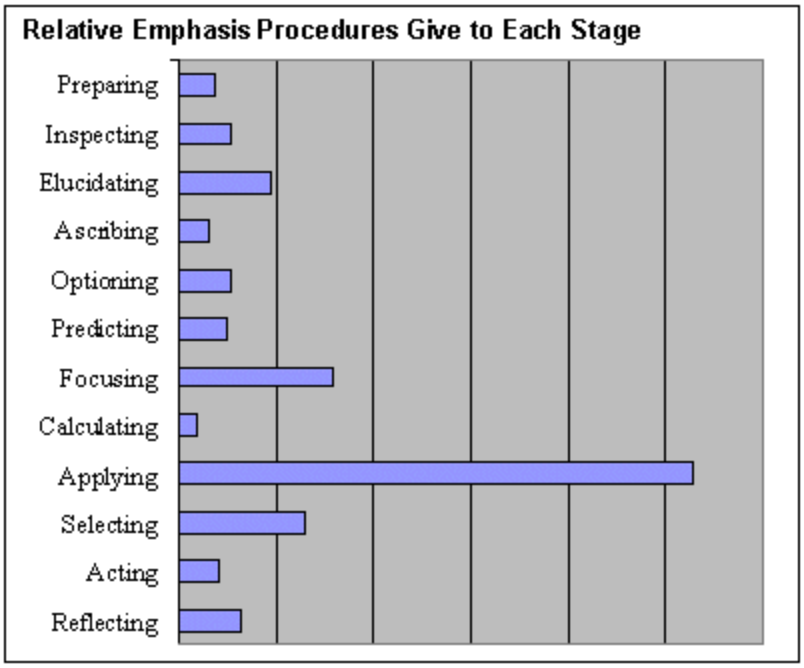
    All things considered, we may not be 100% comfortable with our decision. Even so, we should reach a settled state of "wide reflective equilibrium." If not, we may decide to re-start the analysis at an earlier stage, time permitting.

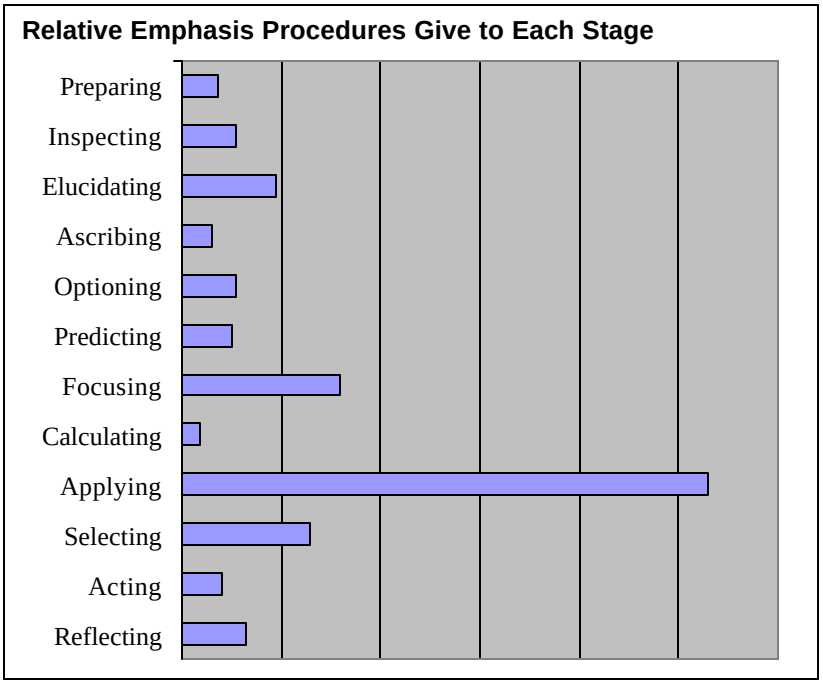
11. **The Acting Stage**.
    We plan exactly what is to be done step by step, and who is to do it. We try to ensure due process for all stakeholders. We may construct a timeline to sequence individual actions. We identify the means to be employed. We gather the necessary resources. We develop indicators of success and failure, including some early indicators. Finally we take action, and we take responsibility for the consequences.

12. **The Reflecting Stage**.
    In this final stage, we monitor the decision as it is implemented with special attention to the effects it is having on stakeholders. We assess the results as they unfold using the indicators developed in the previous stage. If, by those early indicators, the decision is failing, we may re-implement the decision, and if that also fails, we may abort and start over, circumstances permitting. Otherwise we live with the decision and learn from it.

    When finished monitoring, we may recommend new policies to address particular issues. We may review and evaluate the decision procedure itself with an eye toward process improvement. Did the procedure work as intended? Were the steps in the correct order? Finally, we may consider what could have been done in the first place to prevent the problem and, where appropriate, take steps to prevent recurrence.

Time and other resources permitting, a complete decision-making procedure should conduct us through at least 11 of these 12 stages, possibly omitting the Calculating Stage. Do the available procedures provide good coverage of these stages? Apparently not. The 60+ decision-making procedures I studied give very uneven emphasis:





Most concentrate on the Applying Stage, where the critical work of applied ethics is done. Nearly all omit one or two stages, and half omit three or more.

Reformulating Stages as Checkpoints

Can we consolidate all of the available procedures into one omnibus all-purpose ethical decision-making procedure? Probably not, but it might be possible to convert them into sets of "checkpoints," one set for each of the twelve stages. Unlike the serialized steps included in true procedures, checkpoints are compromised by the fact that they are weakly ordered. To illustrate what may be possible, I offer a consolidated set of checkpoints for Stage 1:

CONSOLIDATED CHECKPOINTS FOR THE PREPARING STAGE

Advance Preparations

1. Become aware of beliefs that can create ethical traps, including
   - the belief you can reach objectivity without consulting others,
   - the belief that there are no right or wrong answers, and
   - the belief that personal values can trump ethical principles or professional standards.
2. Build the ego strength necessary to maintain your personal integrity in the face of external pressures.
3. Cultivate personal virtues such as integrity, honesty, fidelity, charity, responsibility, and self-discipline.
4. Define your personal worldview, including your concept of an ideal and just society.
5. Develop a circle of advisors.
6. Engage in ethical behavior and profit from your mistakes.
7. Learn some ethical theory.
8. Learn to recognize the moral dimension present in *ordinary* human experience. (Most everyone sees the big issues.)
9. Listen to your conscience or spiritual center.
10. Observe the causes and consequences of human behavior.
11. Practice being the "devil's advocate" or engage in other forms of ethical role-playing.
12. Review ethical codes.
13. Take advantage of opportunities to educate and elevate your moral sensitivities.
14. Take inventory of your personal values, with special attention to ethical values.
15. Test your ethical ruminations by exposing them to trusted friends and mentors.

Last-minute Preparations

1. Decide how best to channel your immediate, intuitive, pre-reflective responses.
2. Estimate how much time can safely be spent in analysis before the decision comes due.
3. If very little time is available, consider restructuring the situation to allow more time for deliberation.
4. Formulate a goal that captures the desired outcome for the entire decision-making process.

Faults Common to Many Ethical Procedures

Most of the procedures I studied were designed to meet specific needs for specific persons in specific kinds of situations. They were not offered as exhaustive or universal formulas. Still, for the sake of process improvement, it is useful to consider their limitations.

These appear to be the most serious limitations:

- Many cannot deal with situations that change rapidly while they are under analysis.
- Many define the ethical issue too early in the process.
- Many do not degrade gracefully under pressure of time.
- Many do not recognize destructive interactions between steps (e.g., when later steps invalidate earlier steps).
- Many expand to several thousands of small steps when used in complex situations.
- Many implement only one approach to ethics (e.g., utilitarianism).
- Many make no provision for regression (backtracking) or for re-doing a step.
- Many need elimination, simplification or other types of problem-reduction steps.
- Many require a high level of situational ethical awareness in the very first step.
- Many try to determine moral relevance too early in the process.

The remaining limitations are less serious:

- Many cause conflicts and ambiguities to surface but offer no effective way to deal with these problems.
- Many could benefit from doing certain steps in parallel.
- Many do not allow a fact or an assumption to be withdrawn once it has been introduced.
- Many expect (or force) the issue to break into a dilemma, with exactly two basic alternatives.
- Many fail to offer a quick resolution once a pivotal consideration has emerged.
- Many have steps that appear to be out of order, in violation of apparent prerequisites.
- Many provide no way, in later stages, to update information developed at earlier stages.
- Many require special training or knowledge.
- Many weigh or rank considerations without telling us how the weighing or ranking is to be done.

- Many were designed for academic or training settings, and would not be appropriate for use in the field.

Adapting the Stage-by-stage Model

Imagine that we have complete sets of checkpoints for all twelve stages, possibly containing several hundred individual checkpoints. Should every person in every situation consider every checkpoint? Clearly not. Situations differ, time pressures vary, and decision-makers bring widely different backgrounds to the task. Pollack is right. There must be a "control strategy" that re-purposes, adapts, filters, and downsizes these checkpoints for use in specific circumstances.

Presumably, to make this possible, we would follow these steps. First, we would specify exactly which checkpoints are usable under which constraints. For example, a particular checkpoint might not be usable by someone with no knowledge of ethical theory. Second, we would identify the specific constraints under which the user must operate. Finally, we would apply the user's constraints to the full sets of checkpoints, filtering out elements that violate those constraints. If this user had no knowledge of ethical theory, then any checkpoint requiring such knowledge would be eliminated.

In computer science terms, this would require constructing a constraint propagation network, one where each node is an individual checkpoint and clusters of nodes represent decision-making stages. Feasible, but very complicated. Gathering constraints would be simpler. We could use a web page to survey users:

I need to make a decision (check one)
( ) right now
( ) within a few hours
( ) today
( ) within a few days

I do <u>not</u> want to consider (check all that apply)
[ ] advice from others
[ ] corporate codes of conduct
[ ] corporate policies
[ ] ethical theory X
[ ] ethical theory Y
[ ] ethical theory Z
[ ] formal ethical principles (e.g., universalizability)
[ ] ideals and goals
[ ] informal tests of ethical convergence (e.g., the Mom Test)
[ ] laws and legal precedents
[ ] long-term consequences
[ ] moral analogies (examples and counter-examples)

[ ] motives and intentions
[ ] professional codes of conduct
[ ] rights and responsibilities
[ ] short-term consequences
[ ] values and value systems
[ ] virtues

I want to <u>avoid</u> (check all that apply)
[ ] applying general ethical principles
[ ] constructing philosophical arguments
[ ] debating the issues (making objections and replies)
[ ] doing semantic or conceptual analysis
[ ] predicting consequences
[ ] ranking consequences
[ ] ranking rights or responsibilities
[ ] ranking values or value systems
[ ] ranking virtues
[ ] steps that generate confusion, ambiguity or conflict
[ ] surmising intent
[ ] using case-based, precedent-based or example-based reasoning
[ ] using numeric and quasi-numeric methods

In the present situation, I have <u>no</u> access to (check all that apply)
[ ] advisors, consultants, mentors or role-players
[ ] fact-finding or investigative resources
[ ] participants or stakeholders

I would describe this situation as one that requires (check all that apply)
[ ] a comprehensive defense or formal justification
[ ] a decision to be implemented (not just a training exercise)
[ ] a model decision that can serve as a precedent for future decisions
[ ] a procedure that can adjust to circumstances as they change
[ ] consensus or participatory decision-making
[ ] extreme care (very high stakes)

Properly programmed, a computer could use this information to custom-build a procedure that both meets the needs of the user and fits the characteristics of the situation. This made-to-order procedure may not be structured for optimum results, especially if multiply constrained, but it could still produce situationally useful results. *For a heuristic procedure, this is enough.*

Procedural Computer Ethics

I have argued elsewhere (Maner, 1996) that the field of computer ethics is driven by unique issues that derive from properties that make computers unique. Does this mean that *procedural* computer ethics will be unique as well?

There are some unique elements but they come into play at the middle and lower levels of analysis. At the top level, decision-making procedures useful in computer ethics are not much different from procedures useful in other areas of applied ethics. And these, in turn, are not much different from generic procedures that could be used in areas outside of ethics. So what are the unique decisional factors in computer ethics?

Computers may exacerbate a decision-making problem. The infusion of computer technology often makes the problem worse. Consider, for example, issues of copyright infringement. It is clearly wrong for me to copy a protected image to my web site without getting permission from the copyright holder. Suppose, however, I do not copy it but merely *link* to it, so that when my web page is rendered, the protected image pops into place within "my space." This benefits me, not the copyright holder. Am I morally entitled to this benefit?

Computers may multiply the number and location of consequences. Because computer processors execute their instructions so fast, they can produce many thousands of local consequences in the space of a few seconds. With only a little more time, computers can exploit network connections to reproduce these consequences at many thousands of remote locations. Computer viruses wreak havoc locally because computers are fast, then wreak havoc globally because computers are connected.

Computers may multiply the number of affected parties. If computers multiply consequences, then it is likely that these consequences will affect more people. Consider, for example, those database management systems that hold our personal records. One unauthorized query run against a large database can affect millions of persons.

Computers may be required to implement a decision. Computer-driven problems may need computer-driven solutions. If, in a particular situation, we decide that we are morally obligated to provide better privacy protection for medical records, then computers may be required to provide the necessary encryption, authentication and access control.

Computers may make some consequences more difficult to predict. Suppose, for example, that we willingly surrender several pieces personal information for two very different business purposes. The data collected for these different uses is mostly different. In each case, we carefully avoid disclosing enough information to expose our identity. So far, so good. But if this data, separately harmless, finds its way into databases that share information, then the *merged* information may lead directly to us. For most people, this consequence is difficult to envision, let alone to predict.

In general, the behavior of computers is difficult to predict because there can be a disproportionate and discontinuous connection between cause and effect. A satellite may fail to deploy because, buried in a half-million lines of code, one instruction contains one bad character. Failures can be extremely generalized for problems that are extremely localized. This is a special problem for consequentialists since they must be able to predict short- and long-term effects.

Computer-related concepts may be more technical or more difficult to elucidate. I observe with some sadness that my profession seems adrift in a shifting sea of technical jargon. We mostly have ourselves to blame but, in all fairness, I must say that some concepts are inherently obscure. Consider, for example, the concept of a parity bit or an IP address or a digital watermark or a public key or a mutable virus. These concepts are not difficult because of jargonizing; they are difficult because they were born difficult.

Finally, computers may increase the attention given to certain types of rights. What rights receive extra attention? In an information-centric discipline like computer ethics, they are

- the right to access information,
- the right to block access to information (privacy), and
- the right to own and manage information (intellectual property).

For medical ethics, *life* is the primary good. For computer ethics, the primary good is *information*.

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