

Computer Emotions and Mental Software*

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Whether computers can experience emotions or not is murky matter that I will leave to others willing to brave the darkness at the intersection of epistemology and consciousness. Whether computers have special states that correspond functionally to emotions in organisms is, however, an important and tractable question. Asking it in the light of evolutionary theory can help us to understand the functions and dysfunctions of human emotions.

To meet the challenges of different tasks, many machines must assume different states, one corresponding to each task. A combination telescope/microscope that has just been used to examine an insect must be adjusted before it can focus on a distant bird. A Swiss army knife that has just been used to open a can must have blades folded in and out before it can whittle a branch. As computers developed, people quickly realized that a general purpose calculating machine was not very useful. Computers were, therefore, either built for one purpose (like switching telephone calls) or were designed with the capacity for taking on several states, each of which facilitated carrying out a different task. It now seems natural to use one program for word processing, another for drawing, another for doing statistics, and yet another for communicating. Each program sets the input & vices, the processing and memory characteristics of the machine, and the appearance of the screen, in ways that facilitate carrying out a specific kind of task.

Many of the benefits from the capacity to run different programs come from concentrating limited processing capacity on one task, but even infinite processing resources would not make separate programs obsolete. If a screen displays a spreadsheet grid, it cannot simultaneously provide a blank slate for drawing. If a port is sending data to a printer, it cannot simultaneously access the internet. Each specialized task requires different settings, if only because of the constraints of communication with the operator and other devices.

The human mind is a product of natural selection that controls physiology and behavior in ways that maximize the individual's inclusive Darwinian fitness. Individuals whose brains are wired in ways that help them to cope effectively with various threats and opportunities have a selective advantage, while the genes of other individuals are gradually eliminated. These threats and opportunities are somewhat consistent. Certain situations that contain substantial fitness challenges have occurred so often in the course of evolution that natural selection has shaped specialized states that adjust various aspects of the organism to cope especially well with these challenges.

Some of these states are routine. Lack of nutrition arouses hunger, excess heat, sweating; cold, shivering; and tissue damage, pain. Other states are more complex and involve a whole suite of adaptations; we call these states emotions. For instance, attack by a predator arouses the emotion of panic. In this state rapid heart beat, sweating, and fast breathing facilitate flight, aversive anxiety motivates the wish to flee, and cognitive pre-occupation with escape plots a route. After successful escape, specialized learning motivates avoidance of the situation in which the attack took place.

While escape from a predator is an exemplar for anxiety, we humans have faced many other dangers, some of which have shaped other subtypes of anxiety. A potential loss of status or friends arouses social anxiety. Stranger anxiety is useful, especially for children. The dangers posed by wasps and snakes are avoided, thanks to phobic fear. The dangers our children face are mitigated by our fears for their safety. Internal wishes to do something that violates a social or internal norm arouses a more insidious anxiety that deters us from actions that would threaten valuable relationships. Other situations have shaped aversive emotions different from anxiety. Loss of a loved one causes grief. A threat to a mate's fidelity arouses sexual jealousy. Efforts that are not paying off arouse frustration. Lack of opportunity causes boredom. The very aversiveness of these emotions is part of their utility.

Fortunately, our ancestors also experienced opportunities, so we also have capacities for positive emotions. Encountering a food bonanza, finding a better shelter, winning a competition, completing a task, having sex, watching a child succeed—such events arouse positive feelings of joy, pride, satisfaction and pleasure. Why do we have capacities for more aversive than positive emotions? It is because our environment has contained more kinds of threats than opportunities. There are no neutral emotions because natural selection shaped special states only to cope with threats or opportunities.

Our emotions are pleasurable or aversive, but a computer has no preference for which program it runs. Why not? Leaving aside the problem of self-awareness, the computer is fundamentally different from the mind in that the computer only carries out tasks specified by the designer, while the mind has been shaped to carry out many specialized tasks in the service of another larger goal, maximizing the individual's inclusive fitness. Computers cannot reproduce, so this saves them from the competitions that cause most human pleasure and suffering. It is conceivable, however, to imagine a computer that would "prefer" some tasks to others. Imagine a computer with something like a governor, a device that monitors the temperature of its CPU and balks when ever the excess workload might shorten its lifespan. If computers were shaped by selection for those models with long life-spans, such a device might evolve and might provide a crude analog of the aversive character of some human emotions. Most likely, however, no computer would

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have such a characteristic. The decrement in performance at crucial times would be unacceptable. Designers would demand higher performance, despite the shortened life of the computer, so the governor would be eliminated. Sadly, this is exactly why we humans and other organisms age and die. Our bodies could be made to go on and on, but the competition for reproduction shapes mechanisms that give slight advantages now, despite inevitable costs later. There are no perfect machines, mechanical or biological, just bundles of compromises.

This brings us to emotional disorders. If a variety of different situations arouse emotions that adjust our minds and bodies to cope with various challenges, then much emotional discomfort is normal and useful. Thus, using drugs to interfere with these bad feelings might well compromise the individual's ability to cope (although a signal detection analysis shows that inexpensive emotions will often be amused by false alarms, even by a normal regulation system). Evolutionarily novel circumstances can arouse emotions in situations where they are useless or harmful. Pornography, for instance, arouses desires that make people dissatisfied with their daily lives. Riding in an airplane arouses anxiety for many people, but the anxiety does nothing to increase safety.

In my practice of psychiatry, patients often say, "My emotions are so conflicted!" I used to think that there was some single core to an individual's emotions, some central truth that, if discovered, would resolve such conflicts. Sometimes there is. And people often experience distortions of their emotions that psychotherapy can set straight. In many cases, however, the original statement is exactly right--conflicting emotions are being aroused simultaneously. She loves him, but also fears him. He wants to make her happy, but becomes jealous whenever she is with another man. She wants the new job but she also wants to continue the friendship with her coworker. He experiences desire and guilt. She wants to live up to her ideals, but she also would like to kill- the person who hurt her child.

Many such conflicts are exactly what they seem--different urges competing in our minds as we squirm and suffer. Sometimes such conflicts become so extreme that the whole system crashes. Excess and conflicting demands cycle into an positive feedback loop of arousal or a state of frozen despair. Novel aspects of our environment are especially prone to push the system into abnormal states. These states are mediated by neurochemical changes, but those changes are, in many cases, secondary manifestations of higher level conflicts. Our minds fail just as computers do because of software problems, hardware problems, or complex interactions between the two. While cybernetic ideas were first applied to psychiatric problems decades ago, the link with evolution was not yet made. Now that we have a rudimentary sense of what the emotions are for and how they evolved, we have a new opportunity to better understand emotions and emotional disorders.

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