

# Seeking the Highest View

The E-Sense of technology

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*There was a small village located in the centre of a large jungle. Over time, the people decided that they would like to voyage out of the forest and to make their way to the sea, which they knew was close by. To do this they consulted the wise people in the village, notably the scientist, the engineer and the philosopher. The scientist and engineer, quickly took the lead in the project. The scientist made cutting tools like machetes that could cut easily through the dense undergrowth, and the engineer organised the villagers in small working teams. Over time an efficient system was evolved, the scientist made the best and sharpest tools and the engineer streamlined their application. Soon the village was making steady progress through the jungle. The philosopher, who sat in the trees all day long, seemed to make little contribution and people wondered what his value was.*

*One day the group came upon a particularly high tree. It stood out as the highest tree in the jungle. The workers quickly bypassed it as they efficiently made progress, but the philosopher stayed behind and climbed to the top of the tree. From the top he had a fantastic view of the whole jungle. He could see the villagers, cutting like a snake through the jungle and in the far off distance he could even see the sea. Then to his horror, he noticed that the villagers were not heading towards the sea, but in fact were moving in the opposite direction, towards a large hidden chasm. If they continued on the same course, many of the villagers would fall to their death. Alarmed, he climbed down the tree and he rushed over to the scientist and engineer leading the group.*

*‘We are heading the wrong way, we are headed towards disaster’ he shouted  
‘Shut up’ the engineer and scientist replied in unison ‘we are making great progress’.*

Technology and the use of tools has characterised the evolution of humans and is one of the key differences between us and the rest of the animal kingdom. From the first humans who used axes to cut down trees for fuel or to hunt and prepare food, to modern day humans who use deep sea oil excavation to find fuel and microwave ovens to cook, people have always used tools and technology to further their goals. Technology, however, is simply a tool: It has potential to take us efficiently, comfortably, and speedily in the direction of our goals, but it has also the potential (as the story suggests) to take us in the opposite direction, away from our individual and collective goals, and potentially towards disaster. Technology, needs to be tempered by wisdom, foresight and reflection, if it is to truly be an aid to us individually and collectively. We need to take a broader and higher view of the role of technology in our lives, if we are to harness its positive potential and to make it a good servant rather than a slavish master.

Media Lab Europe is a research institute concerned with the development of new technologies that enhance and expand human potential. Our concern is to be at the forefront in the innovation of ‘cutting edge’ technologies, but also to provide a space

for critical reflection on how these technologies can contribute to the evolution of humanity. The aim is not to be 'caught up' in a race for new technology simply for its own sake, but also to stimulate discussion and reflection on the broader implications of technology and its role in peoples lives. Human values are central in this process and the aim is to make technology sensitive to our individual and collective needs as people. One of the metaphors that have evolved in discussions at Media Lab Europe, has been conception of future technology as potentially providing us with a 'new sense' in the world. The emergence of this 'E-Sense' is about providing us with access to new data and information (like a new physical sense) while also helping us make sense of and interpret this data. In addition, just as the human senses are universal, we believe this 'E-Sense' should be universal and accessible by all people. This way we can ensure technology is open to all and centred on our individual and collective goals as people.

In this chapter we explore the evolution of technology as an 'E-Sense', illustrating the ideas with concrete examples from the MindGames and Therapeutic Technologies teams at Media Lab Europe. Lets first consider the wider impact of technology in our lives.

### ***The technological age***

We live in a truly technological age. We have grown so accustomed to regular scientific and technological breakthroughs that we expect them to happen at an ever quicker rate. We want ever smaller and more powerful computers, more instant and accessible communication. We are fascinated by technology and the almost magical things it is capable of , whether this is cloning a person, making space travel possible or creating microscopic computing. In our personal lives, we are enthralled by the newest technological gadgets, whether this is mobile phones that play music, wrist watches that act as palm pilots. Last year's model is not good enough, we want the newest one, the most technologically advanced. As John Naisbitt (2001), states, this fascination has become an obsession in our lives, so that we have become intoxicated by it, to the extent that we accept its progress without question and lose the ability to step back from it and to choose its role in our lives. As he states:

And we are intoxicated by its [technology] overpowering excitement. We talk of little else. Listen to any ordinary conversation. We rant and rave about the technology with which we surround ourselves. We love technology when it works. We hate it when it looms like an owners manual that we are never going to read. We love technology when it feels like a brand new toy, but hate it when it breaks. P 10

As James Gleick (2000) comments, though much of technology has been about providing us with labour saving devices, whether this is motor cars, microwave cookers washing machines, faster computers or whatever, ironically, technology has accelerated many aspects of our lives and put more pressure on people to do and produce more. We are now flooded with hundreds of emails that clamour for attention; we are instantly at the beck and call or our mobile phones and pagers; and we are driven by our ever faster computers to be more productive. As a result, in our technological age, people can find that they have less time in the day and are under more pressure, meaning that many of the most valuable things in day to day life get

squeezed. We now have 'one minute bedtime and birthday stories' for very busy parents to read to their children, and people are spending less time talking to their partners. Though most people rate sex as their favourite and most life affirming activity (surprisingly way ahead of working and watching television!), people actually are spending less and less time being intimate with their partners. As Gleick notes, in America this is now down to an average of four minutes a day, the same average time spent filling in government and tax forms, and way ahead of the hours we spend watching TV or on the internet!

Throughout history, our ability to communicate has been speeded up by advances in technology. In Roman times, it could take up to three months for important news like the death of an emperor to travel the width of the empire. Five years ago, most business was done by postal correspondence (taking one day nationally and several days internationally). Now with the email and internet revolution this communication is almost instantaneous. If we want information about a company, we no longer have to write a letter asking for a brochure (with the frustrating delays of folding paper into an envelope and licking a stamp!), we can now immediately log onto their website. If we want to consult an academic journal, we no longer have to make a physical journey to a library (and sometimes wait weeks for an inter-library loan) we can simply register with an online catalogue, email the author directly or even consult the author's personal website! We never have to be distanced from a news story receiving online feeds of information to our phones or PDAs.

While such advances have potentially increased the diversity of information at our disposal, in many ways the overall information content have been narrowed. A globalisation and standardisation of the information highway has occurred. Information feedback loops cause certain stories spread like wildfire, ensuring that we are swamped by much of the same information over and over again. One only has to think of how hysterical news stories such as OJ Simpson or Monica Lewinsky can take a grip on international news. The more people hear about sensational news item, the more they want to hear. This 'take over' of certain stories and pieces of information causes glut on the world wide channels of communications and means that other stories and other voices are just not heard at all. Do we really want this 'mono-cultural' or single global focus? Take for example, the phenomenal popularity of the Harry Potter books, which are the most successful children books of all time, accounting for a huge percentage of the total world market. While this is commendable to the author, the success has no doubt been helped by the mass and rapid communication about the books. The speed of world-wide communication, ensures that success begets success. But there is another side to all this, the fact that the Harry Potter books took so much of the market, meant that countless other author's books were not sold. Our information highway can flood us with certain information and thus repress the flow of alternative information, leading to potentially less diversity and creativity.

Technology has revolutionised our ability to communicate personally to one another. With the advent of email, internet relay and voice chat we have the world-wide web at our disposal and have increased exponentially the number of people we can instantaneously talk to. It is now possible to develop and maintain relationships with people thousands of miles away. But has this led to a real increase in human connectedness? Instead of meeting friends or sitting talking to parents teenagers are

now more likely to spend hours on the internet relating to strangers. In families in the evenings, we have parents exhausted from long working hours and commuting times, collapsed in front of the television as a passive recipient of this 'old' technology, while their partner watches a separate TV in another room and their teenage son taps away at his keyboard in his bedroom talking to internet friend. Is this an increase in human connectedness? John Seely Brown and Paul Duguid (2000) argue that recent technologies have often missed many of the human components of communication. As they state:

Generations of confident videophones, conferencing tools, and technologies for tele-presence are still far from capturing the essence of a firm handshake or a straight look in the eye. (p4)

Technology has also had a substantial impact on the human body. With the advent of advanced artificial limbs, Cochlear implants that facilitate hearing. 'machines' have been integrated into our very person. Donna Haraway (1991) argues that our relationships with machines have already become intimate and intertwined, not only in physical terms (the way our skeletal body adapts to the fact that we hours daily in a car, or the recent evidence that people have developed extra agility in their thumb movements due the explosion of text messaging), but also in terms of identities as humans. Our existence is dependent on tools and our evolving human identity is defined by them.

Whatever the questions about technology and its role in our lives, one thing is sure: technology has a compelling hold on humanity and we have an instinctive drive to push it forward. Collectively, we are not about to unplug, give it up and head for the simple life. Just like people ten years refused to turn off the TV, now there is no way they can do without email and the internet and this constant connectedness this apparently brings. So 'negative' voices calling for the elimination of technology or at least its halt are a minority, and unlikely to be listened to (just like the philosopher in the story at the beginning) So what is the compromise? How can we integrate technology into our lives in a way that is balanced, that gives us choices, is self-reflective (rather than gullible) and which furthers our personal and collective development as people? How can we develop the positive aspects of technology and protect ourselves from its excesses or its darker side?

The answer is that we need a new understanding or a new sense of technology. This is where the metaphor of E-Sense has value, both reflecting the positive aspects of technology as potentially providing a new sense for humanity, but also as a metaphor for a wise and reflective understanding about its role – literally to help us make sense of the world in which we find ourselves. Before we elaborate what E-Sense exactly means and how such a metaphor could guide and unify research over the next few years, while firmly placing such research in a human-centred context, let us first explore just what a human sense is, and how the five existing senses determine the individual's subjective and objective experiences of the world.

### ***What is a human sense?***

As a physical scientist it is easy to simply conceive of the five senses as ways human beings gather 'objective data' about the world, much like the way physical scanners,

such as X-Ray or Magnetic Resonance Imaging machine, gather 'objective' information about the mass of moving particles and atoms that constitute the world. But this is an over-simplified view. The human senses are much more complex and multi-layered, operating on three levels notably 1) sensation 2) perception and 3) understanding.

#### Sensation

Sensation is the physiological sensing of the world. All five senses work by converting the impact of the physical world on our bodies into electrical signals that are sent to our brain for processing. Our sense of sight converts the energy of the visible light, the sense of hearing does the same with waves of vibrating air molecules impacting on our ears and the sense of touch converts patterns of heat and pressure on our skin and elsewhere in our body. The interwoven 'chemical senses' of smell and touch are stimulated by the presence of certain chemicals in the nose and the mouth, and like the other senses communicate this via electrical signals to the brain. The biochemical and biophysical processes that underpin the five senses are complicated and elaborate and beyond the scope of this article. An excellent introduction is in (Goldstein, 1999).

#### Perception

The important psychological act of perception is much more relevant to this article. Perception is a layer of automatic processing that occurs before reasoning, a sort of pre-ordering we put on sensory data, without conscious awareness. Perception is the way we cope with the overwhelming amount of data that impacts on our senses in a way that is manageable. Perception screens the data that comes from the senses, meaning that we tend to see the world in defined patterns that are central to our concerns as people. For example, when we see the minimal data of a circle with two dots in the upper third and a curved line in the bottom third – we perceive a face – one of the first interpretations the human baby maybe makes about the world.

Perception is influenced both by the structure of the human brain and the sum total of past experiences and learnings that we have as we grow up, and reflects very clever pre-processing, calculations and adjustments made by our brain. We automatically and with ease, perceive the distance, height and the relative movement of objects without conscious effort. Our perception allows us to adjust to different contexts and inputs. Our eye automatically adjusts to changing levels and types of light to maintain a quality picture. Our ears can pre-select certain sounds that we want to hear. For example, when talking across someone at a party, our ears can tune into the person we are talking to, and tune out of the speech of another person, even though they might be physically nearer to us. In addition, our flexible perception allows us to have complex sensory experiences. At different times when listening to a piece of orchestra music, we can tune into the melody or the harmony, we can perceive the sounds of the individual instruments or concentrate on the holistic sense of all the instruments playing together.

#### Understanding

Understanding is the mental act of 'making sense' or reasoning based on how we have perceived the data of the senses. Through this understanding meaning is applied to the

sensory data transforming it into a human experience. This is the difference between the objective understanding of the smell of a rose as simply a certain combination of chemicals and the utterly subjective experience of the scent of rose replete with so much meaning and pleasure. Or it is the difference between seeing a stranger in a room and recognising a loved one that we have not seen in many weeks.

This understanding is both a subjective and collective human experience. It is a subjective and private experience in that can we really know what someone else experiences by the colour blue or the smell of a rose? The experience is private to the individual determined by past associations and memories and present expectations. This understanding is also, however, a collective human experience. Though there are differences, we do have an appreciation of what another person experiences by the sight of the colour blue or the sensation of an ice-cold shower or a lovers embrace etc. In addition, there is a collective cultural determination of the meaning of sensory data. This includes both long term collective meanings such as the association of red with anger or green with envy and short term meanings such as what colours are considered in fashion and what tastes are considered the finest ones.

Our individual understanding (and indeed perception) evolves over many years and is subject to training and learning. Our brain has been programmed in a certain way, giving rise to preferred pathways and connections in the neural networks of the brain. This 'programming' causes us to screen and order the data of our senses so we perceive and understand things in certain defined ways. A useful metaphor to understand this process is one put forward by Edward de Bono (1990), when he likened the development of the neural connections to the development of the complex system of natural waterways in a country. Before rain, there were no rivers or streams, but with millennia of rain falling on the mountains hills and valleys, a complex system of streams, rivers, lakes evolved that channelled all the water into the ocean. Once this system is established it does not change drastically (apart from the odd flood). Even if the level or location of the rainfall changes, generally it is same 'old' water system that carries the water to the ocean. It takes substantial human intervention through the building of canals, or dams to drastically change the water system of a country.

Understanding and perception can be conceived in the same way; we channel the data from our senses down the 'old' neural connections that have evolved over time. Like a water system, it takes great conscious effort (through retraining and focused attention) to alter how we channel the data and to learn new things and to change how we perceive world. Put another way, there are no quick routes to new learning which is an ongoing experience throughout the human life. Unlike digital machines, we cannot simply re-programme the human mind in an instant. Instead we engage in a process of new learning, which involves reflection, analysis and experimentation. The resulting knowledge is always be a composite of the knowledge that has gone before, the learning process and any new information.

To summarise, the human sensory experience is a three-layered experience of sensation, perception and understanding. Sensation can be conceived as a 'bottom – up' process where by data collected at the sense receptors is channelled upwards as electrical signals towards the brain. Perception and understanding can be conceived as 'top-down' processes driven by expectations, familiarity, past experience and learning, individual and collective understanding and meaning. Anyone who doubts

the power of the 'top-down' process should consider the effects of hypnosis: In deep states of hypnosis, individuals can over-ride completely the data of their senses. For example, it is possible to convince a person under hypnosis that he is eating an apple as he eats into an onion, so much so that he actually sees the apple in his hand and tastes it in his mouth!

### ***E-sense: A new sense of technology***

Following the division of the human sensory experience into sensation, perception and understanding, lets now look at how technology has affected the human senses. Then we will consider how the metaphor of 'E-Sense' can guide future innovations, illustrating this with descriptions of some of the concrete research directions that are been explored within the MindGames and Therapeutic Technologies teams in Media Lab Europe.

#### ***Technology and Sensation***

Technology has been used successfully to expand the range of the human senses. For example, though we can only see visible light we can wear night-vision goggles that allow us to 'see infrared' and thus be able to see at night. With the aid of X-Rays and MRI we are assisted in being able to 'see' through solids and with aid of a microscope we can examine small objects way below the distinguishing size of our unaided eyes. Similarly, with radar we can detect moving objects that are far away and with telescopes we can discern terrestrial bodies beyond our field of vision.

In addition, technology allows us to sense events that are distant from us, whether this is live TV or an internet broadcast, or the 'old' technology of a telephone. We can also re-experience events that occurred at another point in time, whether this is listening to a CD of a rock concert or watching a DVD of a movie.

Despite the expansion and 'extra sensory' input that technology has afforded the human senses, this is all done at a distance. Technology is perceived as something distinct and not integrated, unified or tailored to the person. Our interface with technology is via the tedious mechanisms of keyboards and screens, based on what suits the machine than what suits people. The interfaces often require a great deal of knowledge to use and can be rigid and limiting and is not streamlined to the individual person like a human sense.

#### ***E-Sense and Sensation***

Future innovations in technology and sensing will include the development of sensors that are more integrated with the human person, involving interfaces that 'disappear' or at least are more accessible and in tune with the needs of people. In Media Lab Europe (in particular in the MindGames team), we are interested in developing wearable computers, that resemble ordinary clothing and accessories such as wrist watches, glasses, belts etc. These computers will contain non-intrusive sensors that can read a range of biometric signals from the body such as, temperature, heartbeat, skin conductance, brainwaves and even information about gestures and facial expressions (via sensors that track movement and cameras that can analyse facial expression). This integrated system will be able to provide individuals with feedback and give them a better sense of their internal state and keep track of their health. For example, the biometric sensors could record over time a person's heart rate, temperature and blood pressure, providing an early warning system for disease and health problems. Such information would be invaluable, when consulting medical

doctors as they will have access to a download of their patients' biometric data over the last few days or even weeks and months. It is conceivable that such information could be communicated in real time via the internet to allow for remote diagnosis and monitoring of people's health.

This integrated system could also provide feedback about a person's mood, emotional state and attention level. People often are not aware of their own mood. For example, a person under stress could become irritable and not realise the cause. The sensor system, could provide early feedback on a person's emotional state, so as to empower him/her to take corrective action. Such systems could communicate wirelessly with those of other people and thus could be used to help people get a sense of each other's emotional state. For example, people could use this 'E-Sense' to gain a sense of whether their partner or children have had a good day at work or school. Or a lecturer could use it to gain an early sense of the attention level of their audience and adjust their speech accordingly (rather than relying on the visual cues of them 'nodding off' which is usually too late!)

In addition, to increasing the range and quality of information, the interface to these wearable computers will become more innovative, creative and tailored to the person. One possible interface is a pair of glasses (or a minute projector unit concealed somewhere else on a person) that unobtrusively superimposes information on his/her field of vision. For example, a red dot could appear in peripheral vision as a person becomes over-stressed. (Of course, this feedback would be tailored to individual preferences; some people might prefer an auditory cue such as a beep, or a more relaxing image, such as a cascading waterfall, to motivate them to take action!) Such interfaces have a range of possible applications. For example, most people have the experience of meeting someone they already know at a party, but struggling to remember their name. What if a wearable computer takes a picture of the person, scans a database of for a match and then presents them with the name (and whatever other information they require such as where they met them, their occupation or partner's name) in an image in your field of vision that only they can see. Such devices would definitely be useful.

Finally, as the technology of biometric sensors advance, it is conceivable that the wearable computers will be able to make a direct connection with peoples' minds. In the MindGames team we are able to detect via brainwaves, whether someone is thinking 'left' or 'right'. Conceivably in the future, this could be used as a means of helping someone communicate directly via their thoughts with a computer. For example, someone with minimum motor control due to disability (or perhaps if they were in a coma), could communicate via this sensor system. At minimum level they could communicate, yes or no, by either thinking 'yes' or 'no'. In the future, it is conceivable that we will be able to discern more complex thoughts and communications in this way.

### ***Technology and Perception***

As discussed earlier, human perception provides a remarkable system to order sensory data that deletes the irrelevant and redundant, ensuring that what we perceive is based on our goals and concerns. Technological advances have not matched (or come close to) human perception. Indeed, rather than technology ordering information relevant to

our concerns, we can have the experience of it over-whelming us with too much information, and interrupting us and distracting us from what is important. When we do a search on the internet the search machine brings us back three million references rather than the three we wanted to access. Or we are constantly at the beck and call of pagers and mobile phones vying for our attention. As Ken Haase (2002) notes much of our experience of technology is not characterised by artificial intelligence, but rather artificial stupidity! Unlike human perception, that learns and can adapt to new contexts and situations, computers are characterised by isolation, rigidity and inflexibility. As yet, they do not appreciate subtle changes in context and simply crash if their input changes drastically.

### ***E-Sense and Perception***

Innovations in the future, will involve making computers more flexible, adaptive and centred on human goals. For example, personal search engines will be developed that are centred on our unique priorities and goals. Rather than returning three million possibilities to a simple search, the engine will be able to sift through the mass and select the six most relevant and meaningful to our concerns at that time.

In the MindGames team we have coined the term ‘Affective Feedback’, to reflect an increasingly intelligent sensor system that will be able to learn about the unique characteristics, emotional state and preferences of an individual person. Rather than a one size fits all approach, the system will ‘get to know’ you as an individual person and provide uniquely tailored feedback and information that takes into account your preferences and goals as well as your current emotional state. For example, you could pre-programme the system to give you information, only when you are not attending or busy with something else and thus not to be a distraction. In this way, the computer becomes more like an intelligent butler, rather than an annoying pager or mobile phone.

Future innovations in interfaces will also reflect an increasing perceptual sophistication. We all have the frustrating experience of trying to learn a new piece of software to be confronted by a ‘help system’ that never really answers our question, either providing us with either far too low or high-level information. Future computers will be marked by an increasing level of sensitivity to the level of concern of the user. Like good teachers, they will know how much information *you need to know at any given point*. Thus you will be able to get an overview to get you started and more detailed information as you wish to explore more complex tasks.

### ***Technology and Understanding***

One of the dangers of the computer revolution and the explosion of ‘information technology’ is that human understanding and knowledge could be simply seen as a quest for information or data finding rather than involving creative thinking, judgement and action. In this an ‘information view’ of human knowledge, answers to human dilemmas are thought to lie at the end of a search engine, and we seek instant and easy answers to every question, becoming passive recipients rather than active participants in knowledge creation. This misses a central aspect of human knowledge, that combines both an ability to think creatively (analysis, reflection, generation of new ideas) and to act creatively (constructing things, experimenting etc.) Human development and knowledge is a process that takes time. It takes eighteen years of

training (and often much more) to create an adult human. As yet there is no instant download or a way to short circuit this process!

Aside from being an unrealistic model, the information view of human knowledge can have many dangers. Michael Robinson (2002) talks about the creativity – technology gap that occurs when humans no longer think creatively about technology and how it can enhance human life, and technological progress becomes unchecked driven by its own exigencies to be smaller, faster, and more efficient. Robinson conceived of the dangers that could occur as this gap expands, with the possibility that machines lead humanity rather than the other way around.

### ***E-Sense and Understanding***

*You can bring a child to a computer, but that will not make him think*

Human senses are intrinsically linked to human judgement, reflection and action. Our senses have evolved to help us make sense of the world, and to make correct and meaningful decisions. If technology in general and computers in specific, are truly to become like a new sense to people, then they must provide more than simply information and contribute to human creativity and understanding. In the Therapeutic Technologies group in Media Lab Europe, we are interested in how technology can aid our ability as humans to think and critically reflect about our lives, and thus helps us advance our individual and collective goals. Let's consider a simple example of how this happens.

Much of psychotherapy is about helping people reflect critically about their lives and to discover new personal resources, with which to solve problems. Media and technology is often used in this process. For example, when working with families of young children diagnosed with serious behaviour, emotional and developmental problems, using the Parents Plus Preschool Programme (Sharry, in press), the therapist makes a video of the parents interacting with their children, and then reviews this with them. During the review the therapist focuses mainly on what is working well and the times parent and child are relating in a successful way. In this way, the parents are helped identify and reflect about their own skills and strengths, thus discovering how to best help their children. The video feedback provides a 'constructive mirror' to the parents, inviting them to reflect about and see themselves differently. This simple technology, acts like a new sense, giving parents access to new and richer data (an actual video recording) that provides a new perspective (third party), and is richer in detail than memory alone.

Future innovations, will make this technology more integrated to the person and more 'intelligent' in its feedback. For example, supposing the camera was a discrete wearable one, that was linked to biometric and other sensors. A person working on a particular goal (e.g. defeating depression, learning good interpersonal communication etc.) could programme this into the system. The camera and other sensors, could then be activated at certain times during the day, either automatically by the sensors (e.g. when the person's mood is higher) or consciously by the person (when a good event has happened). These 'snippets' of experience could then be recorded for later analysis and reflection. For example, a depressed person could review the times he feels an elevated mood, and analyse how this comes about, with a view to repeating such events in their lives. Or a parent could review a happy family event or an example of successful communication with a child or partner and reflect about what was going on and how this could be repeated. This integrated technology,

becomes a new 'E-Sense' that assists reflection and thinking, providing richer and different data than memory alone. Used in this way it has the potential to help people become self-aware, to envision personal and learning goals, and to experiment with creative options for making progress.

The work of 'Still Life' is another example of technology as providing a new 'sense' to aid understanding and learning. In this game, the computer can sense a person's movement via a camera, their state of relaxation, via heart-rate monitors, and their pattern of breathing via an EMG sensor. By providing rewarding feedback in images and music, the person can potentially learn how to perform a complex movement such as a Tai Chi form, gaining feedback about their relaxation, level of attention and breathing. Thus the computer becomes an 'intelligent coach' to a person learning a complex skill, that requires much practice and dedication.

### ***E-sense as the sixth sense***

*Sixth Sense - The power to discern the true nature of a person or situation: insight, instinct, intuition, intuitiveness, penetration. (Roget's Thesaurus)*

People with the mythical sixth sense are thought to have a special ability to perceive things that other people can't perceive and to be able to discern and intuit the true nature of a situation. This special ability goes beyond just having extra sensory data at hand, it is about knowing what data is essential and how to order it so the best possible meaning is discerned. This is similar to the concept of wisdom. Wisdom is the ability to simplify the vast quantity of information that is at hand; it is about getting to the heart of the matter and picking the best decision that reflects not just pressing or immediate needs but which has a cognisance about wider issues and contexts.

In this chapter, we have talked about E-Sense, meaning the evolution of new technologies that are more tailored to and integrated with the human person. To be a true innovation, this E-Sense needs to help people make sense of the world rather than overwhelming them with information; it needs to assist self-reflection and participation, rather increasing passivity or exclusion. In addition, if this E-Sense is to be a 'wise sixth sense' it needs to link people to broader and collective societal aims, to give people a sense of the big picture rather than simply the resolution of specific or individual concerns. Just as we opened, let us finish with another analogy, that indicates the potential of a 'collective E-Sense'.

### ***E-Sense as a collective sense?***

*Unlike humans, dolphins have a sonar sense that tells them what is in front of them and where they are going. They use this sense by sending out pulses of signals and then monitoring the reflections of these signals as they return. As intelligent social creatures, dolphins belong to families and herds (called pods) and often travel in groups. As a result they detect not only the reflections of their own sonar, but also the residue of the sonar of all the other dolphins in the group (as well as the sonar of dolphins who could be miles away). This means that each individual dolphin not only gains a sense of his own direction and intention, but also a background sense of the direction and intention of the whole group.*

The collective experience of dolphins' sonar sense gives us a metaphor for how E-Sense could be a collective human sense. Imagine if technology could not only help us become aware of our own individual intentions and goals, but if it could also help us be aware of the goals and intentions of others. Imagine if the new E-Sense was universal and accessible by all and thus could help us develop a collective awareness as people and thus be able to chart out a shared vision for the future. With such a sense, maybe we could become more sensitive and respectful of one another and to be able to share in our collective, knowledge, wisdom and resources. This 'sense' would be more powerful than the 'sense' given to the philosopher who climbed to the highest tree (in the story at the beginning of the chapter), as his view was not accessed by the other people and he could not persuade the engineer and the scientist of the value of his information and insight. Rather with a universal and collective E-Sense, we could develop a collective awareness of the important issues facing humanity at the same time. It may then be possible for us to work together to creatively address many of the difficult issues that face us on a global scale, such as world poverty, environmental destruction, disease and war.

Lets hope technology does bring us in this direction.

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