THEME 9

The new affective technologies come to the cultural sector

EMOTION AND FEELING AS TOOLS FOR
COMMUNICATION, EXPERIENCE AND CREATION

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1. SCIENCE FICTION IS NOW JUST SCIENCE: ROBOTICS AND AFFECTIVE COMPUTING

In order to discuss emotions in relation to culture—before going into detail about the subject of this article, the affective technologies—we should have a good idea about what it is that we call "culture", at least in this context, and what is it that we understand as "emotions". There are so many viewpoints and theories regarding both of them—philosophical, dialectical, sociological, anthropological, psychological and even aesthetic, amongst others—that it would be useless to try to offer a summary of the history and evolution of each of these concepts to provide even the most general outline of what they are.

It is important to establish the relation, given that, for example, on the basis of the classic definition of culture in relation to the fine arts, the emotions in their service have been evinced many times when speaking of poetry, theatre and painting. Nonetheless, when we enlarge the scope of what we understand as culture beyond the fine arts, or "high culture", the emotions—once again understood from a commonplace, generalised perspective, without entering into these theories or doctrines—are diluted, we no longer see so clearly the relationship between certain cultural objects and the

obligation to generate a particular emotion. However, they are still there[1]. The so-called "subcultures", underground cultures and, beyond them, "popular culture", outside the aesthetically established, regulated or categorised classes, as well as aspects of culture that have become commercialised in some sense[2], also arouse their share of emotions, such is the diversity of their public, or consumers of what have come to be known as cultural products, rather than culture as such.

Hence, the complexity of describing these two notions in all their full dimensionality forces us to generalise about what is usually understood by these two concepts in order to reach the relationship between culture and technology, culture being understood as being more heterogenous than homogenous. To talk plainly, we could say that the cultural sector provides, practises, offers—either privately or through public bodies—cultural products and services, such as books, stage plays, art, fairs, festivals, etc., ranging from the arts to mass culture. Now, in all this immense spectrum that might span what is known as the cultural sector, new technologies have arrived, which may be used as instruments for various creative acts, as tools to provide services and new experiences and even as arguments or dialogue with the technology itself—either for those responsible for creating, offering or selling these cultural products, or for those who are
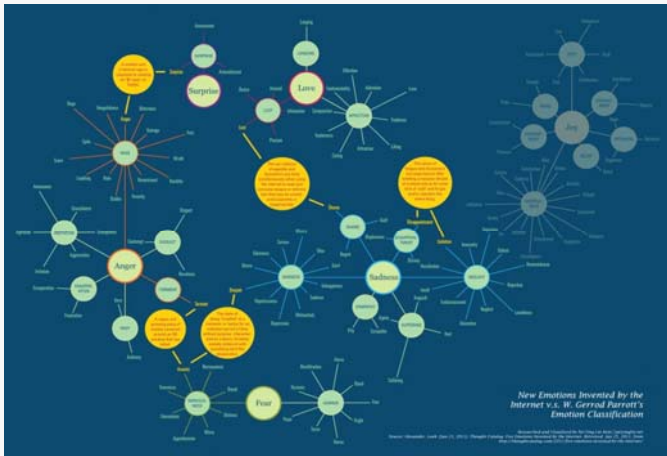
NEW EMOTIONS INVENTED BY THE INTERNET
http://visual.ly/new-emotions-invented-internet-vs-w-gerrod-parrott%E2%80%99s-emotion-classification

going to enjoy them or consume them.

Into this context of the so-called "cultural products", including those that provide access to them or make them, technology has burst in—a technology which in some of its facets may also be considered a part of the culture and a product in itself—in different ways, as I have just observed. From the most complex latest-generation devices to the normal standards of online communication (website design, social networks, mobile apps, etc.), the various technologies available today can—and already do—add a new value to what we understand as cultural products and the cultural sector. One of its most complex phases, although not the latest nor apparently the most novel, is the emotional factor, the affective and sometimes sensorial contribution of these technologies in their various forms.

Having reached this point, we can define the emotions rather generically as those affective states that emerge as a subjective reaction to certain stimuli, whether objects, memories, sensations, acts or occurrences and the experience arising from them. Physiologically these emotions may be expressed as gestures, particular facial expressions, tone of voice, etc. Behaviourally it might influence our relations with others. In psychology, according to a classification by Carroll Izard, emotions may be classified as positive (interest, happiness), negative (fear, loathing, distress, contempt, guilt) and neutral (surprise). Fine distinctions are subjective in nature

and may escape rigid classification. In fact, there are those who assert that the Internet and online communication are bringing with them new emotions—or rather new ways of experiencing established emotions—such as the worry experienced when someone fails to answer an e-mail, infuriation at being disconnected, the tenseness caused by sitting all day at the computer, etc.

The worlds of art and culture are highly familiar with the emotions: those they can arouse, those that they can transmit. In spite of the fact that, as we were saying, the issue of human emotions has been the object of study by philosophers from the ancient Greeks until our own day, it was not until the end of the 20th century that it emerged as a fundamental, open, element of human knowledge. So-called "emotional intelligence" (about which the appropriate warnings are now issued about education and the control of these emotions, given that such control may be translated into an opportunity for manipulation) opened up a field in which to cultivate all manner of values in education, personality, work, etc., in relation to the emotions. The neo-classical man's hiding of the emotions has given way to the demonstration of the most violent emotions and passions, together with the go-with-the-flow attitude of twentieth-century man to today, the era of knowledge, education and control of the emotions.

> **Some of the new technologies that are appearing have affective, and sometimes sensorial, aspects**

But how is it that technology establishes relations with humans? Undoubtedly this relationship may exist on different planes, as I suggested at the beginning. Man, in his search for knowledge of his own nature, and the will to overcome it, has developed the idea of the "other" like himself, the Doppelgänger, also in various forms and representations. It is this conception of the double that the emotions have been evolving together with
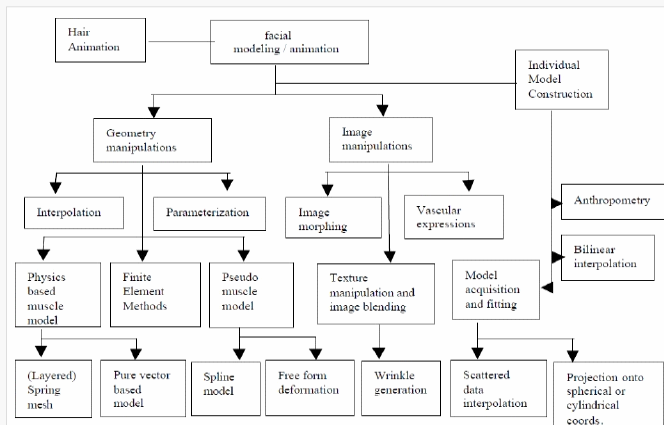
FACIAL MODELING AND ANIMATION TECHNIQUES
http://ow.ly/tyZkL

growing interest in them. From automata to robots with human emotions is a long and varied journey. And it is precisely at this point where science, technology, art and, indeed, culture, begin a relationship from the real to the fictional, or the fictional to the real. Fiction, science fiction, has sought to anticipate scientific and technical achievements, in which technology acquires a vital role in the attainment of these futuristic aims. Meanwhile, technology and science attempt this anticipation as a measure for prevention (of diseases) and now also of services and experiences (tastes, desires, searches, emotions).

Hence, science, technology and cultural products come together in this search for this latest recreation of the nature of man. A clear example is robotics, where all three have found a common argument to develop their work in this field. Artificial intelligence, affective computing and the semantic Web are three approaches to the question of humanoids or computers with emotions. An approximation to the creation of a "real" person that is no longer like Kleist's puppets in his essay "On puppet theatre": here there is an attempt to recreate in detail what we know about what we are, without ironic distance, including our emotions.

One of the first scientific approaches to the recreation of human emotions in a machine was that made by Fred Parke in 1972. This computer science graduate from the university of Utah unveiled the _first human face with computer graphics_, made in 1974 for his doctoral thesis. Parke was trying to

artificially recreate, in 3D and with the maximum possible detail, the movements of a human face, to which end he included a recital of a poem by Emily Dickinson, "How Happy is the Little Stone" (1881). I do not know whether the choice of a poem with this title had a similar intention. It was an exceptionally complex product for its time since it combined programming code with analogue systems of sound recording in order to reproduce in video these pioneering faces with 3-D animation, with the consequent need for a laborious process of synchronisation. The study of human facial expressions has a much longer history than that, of course, but the articulation of such expressions did not take shape until these first attempts that would soon give way to research into the gestural recreation of emotions.

Since then, the creation of animated interfaces has evolved to attain the standards we all now know, and which we can see in video games and films. Virtual robotics can animate the protagonists of a film that is not necessarily itself an animation. Work is going on in the University of Cambridge on a line of research similar to Parke's with the Zoe prototype, which according to its creators sets out to be "the most expressive avatar yet made, replicating human emotions with unprecedented realism". It is a project based on voice recognition and the capture of visual data. This results in the adjustments of speech that reveal different states of mind. The idea is to develop such virtual faces to turn them into the interactive interfaces of the near future through which humans will be able to relate to computers and digital intelligence of all sorts. But beyond the recreation of the emotions, others are attempting to fully integrate emotion into robots and computers.

> **Artificial intelligence, affective computing and the semantic Web are three approaches to the question of humanoids**

In 2011, _Eva_, a highly emotive film by the director Kike Maíllo, told the story of a researcher at the University of Robotics in the field of cybernetic

engineering who is working on the creation of a robot with the feelings, emotions and relationships of a child of about ten. As well as the ideal robot he is working on, the researcher also has a robot assistant. It is spontaneous and energetic, to the point at which the protagonist asks it to what level it has been programmed and the robot assistant says "8". "Reduce it to 6", responds the researcher. "We are not used to such emotive levels". Possibility does not automatically bring acceptance. We are all accustomed, when working with technology, to the need for a period of adaptation, of becoming familiar with it. How much more time would we need to get used to interacting with robots that reproduce our emotions as though they were theirs?

The next step from the example we have seen at the University of Cambridge comes from the same university and is intended to demonstrate precisely how the emotions can be used to improve interaction between humans and computers. In this case, furthermore, taking from the interface and the computer screen—"robotising", as it were—the researcher himself in the form of an android bust. A bust that reproduces voice, movements, facial expressions with the aid of 24 motors in the artificial face to attain the highest possible degree of expressiveness—still very much at a beta stage, it must be said. In Japan there are models incredibly more similar to humans, although I do not know how much research as gone into emotions for them; it must not be forgotten that they have been developed in Japan, where there is a tendency to hide or control emotions in public, focussing them instead on attention to tones of voice when speaking.

2. THE ALGORITHM REVOLUTION: FROM LABORATORY TO POCKET

Although it might not seem so, this whole gamut of scientific and technological research is beginning to be useful beyond the sphere of cybernetics and artificial intelligence. At a level of commercial use or

private analysis, the expressiveness of the face can now be measured using technologies that scan such expressions using cameras that may already be built into almost any device. One of the many companies that are developing this sort of technology is Affectiva's Affdex, based on work by MIT Media. It has a great variety of applications, ranging from advertising and marketing campaigns to measure the customer's degree of satisfaction, surprise, interest, etc., to election campaigns. Using this technology in the stages prior to the premiere of a film, for example, could provide interesting data on how it will go down with the public. Just a camera is needed to gather data on the sensations and effects caused by an event, listen to an on-line concert, a press showing, a work of art, etc.

Although it is not a face recognition technology, the application Dumbstruck makes use of facial expression, reactions, and in some sense emotions to perform its function. It is a messaging application by means of which, when a user sends an image message, the reaction of the sender is automatically recorded in a little video by the smartphone's camera. Once the recording is made, the sender receives an alert so that he can see his friend's reaction to the picture he has just sent. Like many other apps and tools that were devised for use by ordinary people (not to mention Twitter or Facebook, as well as Instagram, Vine, Pinterest and many others), it might soon be used by cultural entities of all types to interact with their followers, readers, visitors, spectators, etc. That is to say, there is just one step from games amongst friends to viral marketing, interactive and personalised. Reactions to promotional campaigns, the cover of a book or disk, a poster, a photo of the author, an actor, etc. Later we shall look in greater detail at how the emotional factor is taking root precisely in the field of online communication.

Another technology related to the monitoring of facial expression, which we have already mentioned in connection with robotics research, is voice recognition. As in the case of cameras, all that is needed is a microphone and the integration of the necessary technology, whether as stand-alone

software or as a mobile app, for example, to obtain the desired results. A company of Mexican origin, EmoSpeech, develops software applications based on emotion recognition with voice as its interface. Basically what this technology does is to recognise frame of mind by means of the voice, that is, the software interprets the emotions, which for the purposes of an enterprise can be converted into data on its users. The idea emerged at the Laboratorio de Tecnologías del Lenguaje de la Coordinación de Ciencias Computacionales at the Instituto Nacional de Astrofísica, Óptica y Electrónica, in Mexico City. Its uses, of course, will go beyond the call-centres where it has started to be deployed.

Many of these complex technologies are eventually integrated into applications or resources for mobile devices,

> **Research is being directed towards recognising emotional expressions to detect the state of mind and determine how to respond properly**

including smartphones and tablets. Their various features and characteristics may serve as tools or resources for the applications themselves such as data collection: the voice, the camera and the GPS are being used to investigate the anticipation of decisions or searches by users of these devices. Research on the voice may supply many data, particularly from the point of view of affective analysis. It is well known that emotion causes changes in breathing, phonation and articulation, which in their turn affect the acoustic signal. The emotional tone of the voice or prosody take in a number of acoustic parameters such as temporal structure, intensity and frequency. The emotion expressed by a speaker is characterised in all cultures by the universal properties of these parameters.

According to a recent study[3], adult listeners can quickly and reliably recognise different emotions on the basis of different vocal signals. Furthermore, it shows that emotional prosody is not processed voluntarily, and the specific acoustic patterns observed in human beings in response to certain

emotions are very similar to those observed in other primates. Recognising emotional expressions during social interaction allows us to detect the state or the emotional reactions of another, and may give clues as to how to respond properly in different circumstances. It is this type of response that is the subject of current work on emotional intelligence projects. The time will come when mobile technology will also decipher the reading of these universal parameters and know how to react. That is to say, it is very possible that thanks to the voice, mobile phones in their most "intelligent" version will "understand" their owners, and, who knows, take decisions for them.

Often this sort of technology is much closer and more commonplace in our environment than we notice or are aware of. Anyone who has an Apple smartphone or tablet running the latest operating system will have a voice application called Siri. This app processes the user's language to respond to his or her commands during navigation without he or she needing to use their hands. It can also give usage tips because, according to its creators, it gradually adapts itself to the needs of each user. In other words, it personalises its service. As is often the case, with successive updates of the application, its success rate gets much better. It is not hard to find amusing anecdotes on the Web about users who ask Siri more or less compromising questions and the surprising answers they may get. For example, if you ask, "Would you marry me?", the application might answer, amongst other possibilities, "I sure have been receiving a lot of marriage proposals recently". It must not be forgotten that it is an application to provide a real service while using Apple's platforms, but as can be seen, it in turn tries to humanise itself and to give a coherent response to the more or less joking or utilitarian queries made by more chatty users.

I cannot fail to mention here another example from the cinema regarding the interpretation these technologies are making of themselves, in this case something very similar to the instance we have just seen with Siri, but perhaps taken to the extreme. I am referring to Her, a film by Spike Jonze featuring

Joaquin Phoenix and Scarlett Johansson, in which the latter's part is played by the voice only. In this story, the protagonist downloads an operating system that behaves intuitively and in a personalised way for the user who has downloaded it. Communication is oral, and the operating system—known to the protagonist as Samantha—with its attractive voice and infinite capacity to store data about its user, can manage everything that the user thinks of, although Samantha is also able to anticipate, choose, revise, propose, etc. The operating system, which gradually grows as data accumulates and as it connects to other systems and computers to which it has access, acquires more and more personality, to the point where it feels emotions and desires. Human and system fall in love. When the human's ex-wife discovers the relationship with Samantha, she even reproaches it for not being able to control its emotions.

Early in the film we see how the protagonist relates to his telephone through a sort of slightly more advanced Siri. He asks for melancholy music, to read his e-mail or the news. Nothing much that cannot be done today with a smartphone. Who can assert that the extremes reached in the film could only happen in science fiction? Samantha, the system, trembles as it speaks. The semantic/emotional metadata that accumulate with its "experiences" (data) gradually form its personality, an artificial personality, nonetheless. It obtains feedback from all possible information, and can recognise the emotions of its user/"lover". We could say that it is the product of a great organic algorithm of "nature", that is, that it thinks and acts for itself thanks to all the millions of fresh bits of data that it accumulates as the seconds go by. Data that enable it not only to relate to other systems and converse with them as it learns, but also to write poems or compose symphonies that reflect its emotional state.

Yet more science fiction? Regarding communication between computers, technology already exists that makes it possible for robots to share experiences (data) in order to learn new tasks. Communication between them via the Internet has given rise to the first programs devoted exclusively to

communication between machines, as in the Robo Earth project. As for the possibility of a computer acquiring the capacity for being creative, I think one of the most surprising examples is the project by David Cope and his work on musical intelligence. David Cope is a writer, composer, scientist, professor of music and researcher into artificial intelligence in relation to music. While going through a creative dry spell as a composer, he conceived a program that—naturally—through complex algorithms would be able to analyse music to discover patterns in the musical structure.

The result of his research was at first called Emy and later Emily Howell, a program able to compose pieces of music in the style of different composers: Mozart, Strauss, Bartok or Bach, including chorales similar to those by the latter. In an updated version, Emily was also able to compose haikus. The key to all this lies, first of all, in data and adaptability, and then in the possibility of modifying the ability to respond. The instructions are interpreted and the results are these incredible compositions that some experts in classical music have not been able to recognise as creations by an artificial intelligence nor even distinguish them from work by the original composers who inspired each piece. This, of course, poses many questions, some of them uncomfortable ones, regarding the creative ability of humankind, which—until now?—has been distinguished from that of other living things: "If beauty is present, it is present. I hope I can continue to create notes and that these notes will have beauty for some others". These words are by Emily Howell.

> **Technology already exists that makes it possible for robots to share experiences (data) in order to learn new tasks**

Algorithms. A few months ago, researchers at the University of Granada (Pedro Ángel Castillo Valdivieso, Juan Julián Merelo Guervós and Antonio Miguel Mora García, together with the company Trevenque) announced that they had created a tool called PreTEL which, on the basis of networks of

artificial neurons, can predict whether a book will sell well or not. Its mathematical model is able, they state, to make estimates using multiple variables, such as price, points of sale, publisher, etc., together with the economic situation at the time the book is launched, the author's name, literary fashions at the time, etc. This system also grows with the accumulation of data together with its ability to learn and adapt to new data. Its creators say that the margin of error is barely 18%. I do not know whether any publisher has so far used these services.

Nonetheless, the creators of another algorithm state that they have found the key to predicting whether a book will be successful based on "statistical stylometry", that is, a statistical analysis of the literary styles of various genres that identify those characteristic stylistic elements which are most common in best sellers in comparison with those that fail to achieve this status. The research[4] is based on 44,500 books in the public domain published by the Gutenberg project. The researchers counted as bestsellers those which had been a critical success and had been downloaded a large number of times from the Gutenberg Project website. In addition they included others such as *A Tale of Two Cities,* by Dickens, *The Old Man and the Sea,* by Hemingway, *The Lost Symbol,* by Dan Brown, and the latest Pulitzer prize-winners together with some "super sellers" at Amazon. The algorithm analyses parts of sentences and the use of grammatical rules together with another type of semantic analysis.

Some striking data emerge from the report, such as that bestsellers make more frequent use of conjunctions and prepositions in comparison with books that are less successful. Also, the research found a higher percentage of nouns and adjectives in bestsellers than that found in less successful books, which depend more on verbs and adverbs to describe the action of the plot, and more negative

> **Algorithms to predict publishing successes or to analyse millions of words in literary works with emotional density**

language in reference both to actions and to descriptions, for example, of parts of the body. On the other hand, it seems that, according to this algorithm, bestsellers base their language more on verbs that describe processes of thought (remember, recognise) rather than actions and emotions. The report gives a number of grammatical formulae, verbs and nouns that appear to be most used in works of this type. In fact, novelists who write in a more journalistic style have greater literary success. It is not the only study. Another study[5] claims to have found an "emotional algorithm" able to analyse millions of words with emotional density in literary series—the test is based on the works of Shakespeare and the brothers Grimm—but is also applicable to any tool for textual communication, including the Web and social media.

The analysis of language already has commercial applications, as in the case of Luminoso, which understands and analyses different languages semantically in real time. What it basically does is to analyse language to determine whether a particular product or service has really brought satisfaction so as to be able to recommend other services or products with a similar level of real satisfaction. By understanding the data it has about users, it can create a recommendation system that goes beyond just the sales made. A cultural entity, for example, can find out what people really say about its work or what it is that users really want. The technology can even distinguish from the semantic context whether it is a book or a film that is being discussed in those cases where a film has been made of the book with the same title, and whether people liked it or not. Its algorithm, which is fed daily, adds all kinds of terminology, slang, metaphors and whatever may be the figures of speech and linguistic registers used on the Web to gradually refine understanding of what is being said and people's feelings and opinions. What underlies the words is the real answer from consumers or users, which is shown in a graphic interface that looks like a cloud of complex tags in several semantic layers. There are those who assert that, on the basis of these algorithms, it will be possible one day for computers to write novels,

even bestsellers. Samantha and Emily, fiction and reality, have already obtained similar successes, or even greater ones.

Let us return to *Her* and to the user's field of action. I have described how the protagonist asks his smartphone to put sad music on. It is true that there is an application called Stereomood that is heading in this direction, except that instead of using voice recognition it still requires the participation of the user in order to gather data, and so further refine its results, that is, in its service of discovering and recommending new content. This application offers a varied musical repertoire according to the mood the user says he or she is in. As a way to discover new music and groups it turns out to be a very accurate tool and quite addictive in a way. Furthermore, it performs one of the basic functions of these new tools, namely to find out about new content that might really interest the user.

Algorithms that analyse language to determine the level of product satisfaction and make recommendations

From the examples we have been seeing it is clear that "affective computing" is going to decisively change the way we humans relate with machines. Companies of all sorts are taking more and more notice of these technologies, given that emotion is the driving force behind the way the consumer relates to products and services. In the fields of searching and algorithms that are familiar to us, Web search engines are still evolving along the lines of the Semantic Web, although the ever more frequent use of mobile devices for queries of all sorts has added a possibility of interaction that desk-top machines cannot attain. Mobile technology is becoming more and more in tune with wearable technologies. That is, technology that can be worn, whether in the clothing or as part of apparatus or accessories that is already being applied in fields such as sport and health, but soon it will spread to other levels and industries, including culture. Google Glass is a well known and very typical example. In fact, Google, Samsung and Apple amongst many

others, are putting all their efforts into developing technologies of this type.

At the University of Cambridge again, an application has been developed called EmotionSense[6], which tries to determine its user's mood, degree of satisfaction or happiness, combining certain data also collected during smartphone browsing. Thanks to the collection of such information together with another set of data provided by the user, the app gives a report on its users emotional state. As we have already seen in the case of Stereomood, emotional technology of this sort may have a number of uses in our daily lives, such as constantly improving the accuracy of our searches and purchases, even making the process of discovering them entertaining. An interactive resource with which, for example, we can choose something to read, buy a theatre ticket, or go to a concert or exhibition depending on how these technologies read us in order to offer us different possibilities according to this interpretation.

The speed being attained by this technology, together with this tremendous capacity to combine data of all sorts, means that, beyond affective computing, we are entering in parallel with what has been called "contextual computing", which brings together our interests, behaviour, social relationships, reactions together with all sorts of personal data to give us all the possible and necessary information.

3. COMMUNICATION AND EMOTIONAL DESIGN: THE ATTRACTION OF THE INSTANT

We have seen a few examples of these technologies that are already available, above all on mobile devices, that are based in cutting-edge scientific research. However, at a simpler level of communication, there is also this factor that we call emotional with which we want to transmit how our
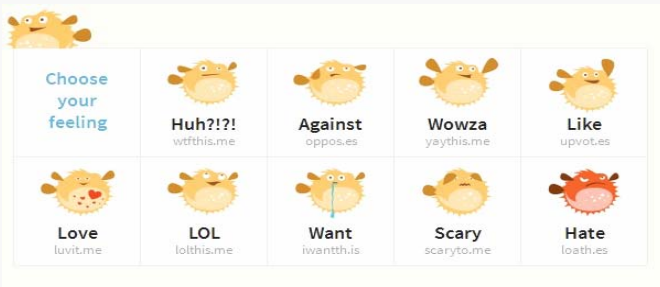
BITLY FOR FEELINGS WEB APPLICATION
https://bitly.com/a/feelings

emotions are to be interpreted. Such as the emoticons that, far from going out of fashion, are becoming ever more precise and more complex. There is the case of Facebook, which has developed, together with Berkeley University and Pixar, more complex forms of this sort of communication that reflect certain feelings, emotions, moods or simply situations through emoticons. Researchers at Samsung are working on software that could assess a user's mood by the way they write their tweets on the smartphone. It would work by analysing the speed with which the user writes, how much the telephone is moved in the process, the frequency of errors or self-corrections and the number of emoticons used. In this way, it would be able to tell if the user is angry, surprised, happy, sad, depressed or frightened. Several marketing 2.0 studies have observed that the use of icons in the pages of social media sites such as Facebook help to empathise with followers. In fact, many of the uses of these affective technologies are within the field of marketing and communication and, indeed, in the field of personalisation and service that are demanded these days.

For example, Bitly.com, the Web service to shorten URLs, has developed a Web application Bitly for feelings, in which they invite users to express what they are feeling together with the content they share on social media tools such as Twitter. These commentaries may refer to a book, a review, a film, a stage play, an exhibition, etc. The methodology consists of making use of the "shorts" that signify feelings or reactions that demonstrate that users are enjoying certain content (luvit.me), are amused (lolthis.me), dislike the content or find it frightening—not necessarily something related to horror (news about the economy may these days

lead to the use of the short scaryto.me), are saddened (sadto.me) or also who express some desire (iwanth.is), amongst other options. The search for these shorteners may provide very useful information for all sorts of cultural entities.

On the other hand, the emotional factor may be induced. That is, the entities themselves may provoke an emotional response from their users (through their website, for example) and empathise with them. It is known that people's habits of buying, searching or pastimes are driven by unconscious as well as conscious processes. Our acts and choices are nor always deliberate or rational. Decisions may be greatly influenced by the emotions. We could take as starting points the website of a publisher, an art gallery, a museum, a theatre company. That is, the portal to all the content of every entity, including those offering cultural content. According to conclusions from neuroscientific work that analyses the results of online marketing, two thirds of stimuli reach the brain through the visual system. Hence, Web page design can work in its own benefit when attracting attention, playing, in turn, the emotional role.

Web designers and application developers, of whom we have already seen some examples, are taking an approach of stimulus and understanding, in order to attain a sufficient degree of empathy with the user. In a well-known study[7] on design and user experience, Arhippainen and Tähti, experts on user

DESIGN AND USER EXPERIENCE STUDY
http://www.ep.liu.se/ecp/011/007/ecp011007.pdf
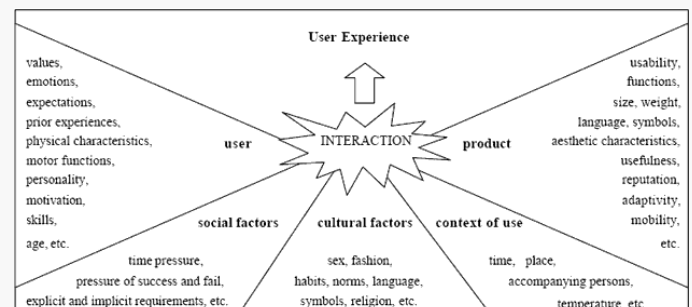
experience of interfaces, classify the various factors to be borne in mind when considering the design of a Web product under five headings: user-specific factors, social factors, cultural factors, context of use and product-specific factors.

In this graphic can be seen on the left value for users, including emotional factors, as well as other equally important factors, such as social or demographic values. A good website design will emphasise visibility, with the consequent increase in the number of visits, as well as the transmission of the experience it is desired to offer: a book, an opera, an exhibition or a concert. In his book *Designing for Emotion*[8], Aarron Walter very acutely describes, giving several examples, these emotional connections between website and its users or visitors, regardless of what sort of website it is. Clarity, simplicity and ease of use, rather than trends, are universal standards; visual contrasts and a design that plays on cognitive elements helps to deepen the user/interface relationship. Furthermore, surprising elements, out of the ordinary, favour emotional responses that can attract users. This is also asserted by Roz Picard, founder and director of Affective and expert on emotional technology. In his opinion, when someone is showing some sort of content on the Web they can make it boring or funny, that is, provoke some sort of reaction. The activation of the webcam, for example, can read the facial expressions of users, so that designers and content creators know how to improve their site.

Since neuroscientists have determined that our brains are designed to follow the emotions rather than the intellect—which means that in reality it is the emotional part of the brain that governs our decision—paying attention to this factor may make an online purchase or search as attractive as it would be face to face, with the appropriate work. Neurodesign enables designers to improve their creative focus and may help to explain why an experience is bad or good, transmit positive or negative emotions. In *On the Emotions*, by Richard Wollheim[9], we read, "Normally, the emotions lead us to form desires, and these desires, together with

the appropriate instrumental beliefs, can lead us to action". A different, attractive interface, with interactive elements, a certain touch of creativity and surprise for the user and related resources (video, audio, derived information) lengthens browsing time and heightens interest in what is being searched for. The time for showcase websites has passed; it is now the time to understand and provoke certain emotions in the user's search experience.

4. MONITORING AND SENSITIVE TECHNOLOGIES: SPACE AND CREATIVITY

Emotional or affective technologies are not necessarily restricted to the virtual realm. Some of them, in close relationship with sensitive technologies and monitoring, are used in the pubic space and sometimes are also focussed on improving the visitor's experience. Monitoring of a person in real time is becoming one of the fundamental tools to analyse the public present in places where some sort of cultural event is going on. For example, in some of the venues where exhibitions take place, the Promotion of Art department of the Ministry of Education, Culture and Sport is using data-collection technology from the company Eco-Compteur, which also works with the Louvre and the Orsay museum in Paris. The method uses a mat with sensors that can be placed under a carpet or rug. As people step on it, the system not only counts the numbers entering the exhibition, but can also tell by their weight how many of them are adults and how many are children. This technology is based on a smart counting algorithm with a probable accuracy of over 95%. The results are given as instantaneous attendance statistics renewed every three minutes

> **Organisations can stimulate the emotional response of users through their Web sites by applying neurodesign**

and with the ability to perform an analysis every fifteen minutes. The data collected by the sensor mat are uploaded to the company's application so that later, on the website, the results, trends, busiest times, etc., can be seen.

These intelligent systems for data collection are attaining greater and greater precision. In fact, the latest technology can automatically turn everything that happens inside a given space (fair, gallery, bookshop, library, museum, theatre, etc.) into data. On the same pattern as website analysis tools, companies like ShopperTrak can work on specific visitor data, rather than on estimates. With their devices placed in the entrances to, and exits from, various spaces they can predict the number of visitors on the basis of the frequency of the public's entry and exit. But a more advanced version of this technology is able to monitor individuals one by one to analyse what their behaviour is in particular places, such as boutiques, shops and department stores. If this technology is combined with others we have seen such as face recognition or more recent ones such as those from Emotient, the results can be amazing. In fact, ShopperTrak is able to monitor visitors through their wi-fi and with their smartphones.

It is a technology which, if not used well, may not fulfil minimal privacy requirements, although it is true that such a method of data collection is performed anonymously. Nonetheless, users should always know what types of technology are operating in the places they visit and whether that technology might invade their privacy. If these measuring tools provide the visitors themselves with some sort of service or advantage this methodology is easier to justify. Nonetheless, it seems to be true that the incorporation of technology of all types within physical spaces will become more and more commonplace. The data themselves may be used to analyse how the monitored individuals are feeling. We are in the era of Big Data and Data Mining, in which the feelings and emotions being monitored help to build more data, as in the case of the technologies we have already discussed. Companies such as Digital Reasoning, specialised in stopping

fraud through data analysis, are working on the understanding of all types of human communication, including interpretations of how certain colours are used in communications.

The possibilities offered by screens, sensors and cameras may be quite fruitful when devising attractive and even interactive campaigns. Similar things can often be seen in some electronics shops, causing passers-by to stop, play, and even interact with the window display. The cameras in mobile phones may be the ideal tools to enable people to participate in a display window with an intelligent monitor, for example, or for their contacts to see it. It is becoming common in cities such as London and New York to find shop windows with tactile technology. Customers may touch the screens to compare and choose the product they want. Recently, a giant interactive mirror/screen was installed in a Paris shopping mall, in front of which passers-by could position themselves according to instructions given by the software. A scanner analysed the style and physiognomy of each person. Then, a search engine offered a series of results with various similar standard profiles. With these results, shoppers would discover that their style of dress was not unique. The most interesting thing is that the recommendations given by this technology are social in nature. That is to say, it is directed and fed by the patterns of all the users it is continuously memorising, as in other recommendation technologies based on algorithms.

The tendency is, then, to work on sensory stimulation in spaces and commercial premises to create experiences and emotions in the visitors. Some museums are adopting applications together with augmented reality, 3-D technology and face recognition as data for games and experiments with the visitors, the use of GPS or eye-tracking technology using special glasses in order to give visitors detailed information about what they are seeing according to where they direct their gaze. More and more studies are investigating the relationship between sensory stimulation and the emotions in a variety of settings, while more and more companies are working on such projects. What

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was formerly based on the lighting, furnishing, music, air quality, odour and temperature of spaces, something linked with what has been called the "narrative of design[10]", is now carried out on a more technological plane in which members of the public, furthermore, also enjoy experiences that let them feel new things in a special, much more "inmersive" setting.

Sensorial or sensitive technology, depending on the case, is not alien to the stage arts. Not just as regards the use that can be made of it for cases such as we have already seen with monitoring, or particularly the management of space and resources for performances, but also on the creative level, where some artists are using similar technologies both to dialogue with them and to create their own works. Whether it be sound, costume design using "wearable technology[11]", multimedia resources, etc., performers are gradually adopting such elements with a high degree of creativity and interactivity with the audience. Such technological resources have the ability to create great surprise and astonishment. In a recent international conference on the stage arts held in Oxford (Performance. Visual Aspects of Performance Practice[12] September 2013), there was a very interesting segment devoted to the most creative aspects of the use of these sensory technologies, able, furthermore, to transmit disparate emotions. Technologies such as mobile solutions and interfaces, analysis and monitoring of emotions, communication and semantic computing, technologies and solutions for live performance, new story-telling modules, 3-D and 4-D technologies and tools, cerebral and interactive interfaces, augmented reality (AR) and speech-processing and comprehension systems. In other words, many of the things we have been discussing in the course of this article.

Creativity makes use of these technologies, and becomes integrated to form part of new artistic expressions. Some contemporary dance, performance art and contemporary artworks incorporate sensorial and multimedia elements that map the emotions through movement, the mind

and even the data themselves. The French artist Maurice Benayoun is the creator of Emotion Forecast, a work consisting of a multimedia system for displaying data that reflects on the concept of the Net understood as a "nervous system". This creative mapping exercise sets up an emotional statistical prediction system for everyone, whose interface is reminiscent of stock-market infographics or weather maps.

Many artistic experiences and creations involve screens, particularly touch-screens. A few years ago, a project called "Keep in Touch[13]", by Nima Motamedi, drew attention to the possibilities of touch, together with body language or gestural language, to give emotional and sensorial responses, precisely in response to the massive appearance of smartphones and cameras everywhere and in all devices, and to the lack of privacy accompanying these platforms. It sought to evoke the sensations and the emotions in the fusion of the visual and the tactile on screens. To take interfaces to a new level of interaction where what is physical is not restricted to being a mechanical act and the users of this prototype may communicate with each other through touch, even caress one another, through the screen.
Another multimedia and performance artist who

EMOTION FORECAST
http://www.benayoun.com/

seems to me to be particularly interesting is the Korean Lisa Park. She uses her body and her mind to develop works of performance art. In Le Violon d'Lisa she uses a nichrome wire fixed to a cello bow. When this wire touches the artist's body, the data are collected by a computerised system, and after a process of calibration, are converted into sound. She has turned her whole body into a sort of interface and instrument at the same time. In another of her works, Eunoia, it is her brain-waves that create the sound the audience hears. The brain-wave data are transmitted to the computer via Bluetooth, where a program collects them and turns them into different sounds. These sounds are played through speakers with various dishes full of water on top of them. Every time a sound is emitted, a sprinkling of water comes from one of the bowls. Something at which many people would

An artistic creation that incorporates sensorial and multimedia elements to map emotions through movement

shudder—particularly those with an aversion to technology, even more integrated or in contact with the human body—is turned into a strange calm, between the artist, the sounds and the movement of the water responding to the reading of brainwaves.

5. THE VALUE OF INTEGRATION

On the basis of the Internet, technology is weaving another web of connections, a sort of computational intersubjectivity, in which it seems more and more that everything is possible. From the most advanced scientific research to our pockets, technology is invading our daily lives much more than we are aware. This is perhaps the success of these technologies, or of their proper implementation: their ability to integrate, which under no circumstances should be understood to mean to destroy. The integration of technology, from today's

basic levels of online communication to the more developed examples of affective or contextual computing, does not imply—or ought not to imply—a complete rupture with the analogue world we have known, but a natural evolution in which these technologies are just tools to be used.

We are not in the era of the man-machine singularity, but in that of technology at the service of man and I think that is how it should be understood. Describing a series technology-related trends, examples and projects does not imply that all or any of them should be adopted by every stratum of the cultural sector. As has already been the case with Web 2.0, every cultural organisation must choose which tools to use, which might advance its aims, whether they be trade, communication, service, content or even creation (there is already a generation of digital artists, some of whom use Facebook not as a promotional platform, but a creative one).

Similarly, this next generation of technology must be understood, not as an imposition, but as an opportunity. Naturally it is still necessary to have many reservations and not everything is applicable to every discipline, entity or business in the cultural sector. There are still questions such as privacy to be resolved. The digital transformation cannot serve as an excuse to destroy some of our most fundamental rights.

For the most fearful, there is still a long way to go before a machine is capable of developing emotions and behaving exactly like a human being, whether it be for entertainment or to provide a specific service. Nor will human beings all respond in the same way to any given stimulus. Think of Agatha, the protagonist of George Bernard Shaw's ill-fated novel *An Unsocial Socialist*. In her yearning for knowledge to escape from the conservative education considered appropriate for well-bred young ladies, she reads books on medicine, but the descriptions of the symptoms makes her feel as if she has got the diseases being described so she has no choice but to give up this sort of reading. Then she decides to read a novel in which "none of the emotions described in

the least resembled anything that she had felt".
Discovery or recognition?

The proper use of technology—like the reading of a
book, seeing a play, a painting, a photograph—
should also help us know ourselves and learn
through our different reactions and actions that we
find ourselves in a similar interaction. The qualities
of the world may change, but the world understood
as what affects us is still the world, whether in the
desert or on the computer screen.

NOTES

1 In this regard, I recommend the chapter "El arte de masas y las emotions" in a work by Noël Carroll *Una filosofía del arte de masas*, Madrid, Antonio Machado Libros, 2002, pp. 213-248. An idea of "mass art" that approaches what John Street would call "popular culture" in *Política y cultura popular* (Madrid, Alianza, 2000): "Popular culture is all entertainment that is produced on a mass scale or is accessible for a large number of people".

2 And not just in what we could call "alternative"; "'refinement' may be perfectly commercial", as we know very well, and as we have been reminded by Terry Eagleton in his book *La idea de cultura. Una mirada política sobre los conflictos culturales* (Barcelona, Paidós, 2001), where he picks apart the various conceptions there are about culture and its complexities.

3 In "Emotional Voice Processing: Investigating the Role of Genetic Variation in the Serotonin Transporter across Development".

4 Vikas Ganjigunte, Ashok Song and Feng Yejin Choi: *Success with Style: Using Writing Style to Predict the Success of Novels*. Department of Computer Science, Stony Brook University, NY.

5 Saif Mohammad: *From Once Upon a Time to Happily Ever After: Tracking Emotions in Novels and Fairy Tales*. Institute for Information Technology, National Research Council Canada, Ottawa, Ontario, Canada.

6 Various authors: "EmotionSense: A Mobile Phones based Adaptive Platform for Experimental Social Psychology". Cambridge University. http://emotionsense.org/

7 Leena Arhippainen and Marika Tähti: "Empirical Evaluation of User Experience in Two Adaptive Mobile Application Prototypes". University of Oulu, Finland.

8 *Designing for Emotion*, http://www.abookapart.com/

9 Richard Wollheim: *Sobre las emotions*, Madrid, Antonio Machado Libros, 2006.

10 Jihyun Song: "Retail Design and Sensory Experience: Design Inquiry of Complex Reality". Iowa State University, United States.

11 "Multimedial Enhancement of a Butoh Dance Performance - Mapping Motion to Emotion with a Wearable Computer System".

12 "Emergent Sensorial Forms of Performance". http://www.inter-disciplinary.net/

13 Nima Motamedi: "Keep in Touch: A Tactile-Vision Intimate Interface", School of Interactive Arts and Technology, Simon Fraser University, USA, 2007.

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