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## Feel inside

### Artificial Emotional Intelligence

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#### Abstract

Feel Inside is an interaction design project focused on home-dweller interaction, through artificial emotional intelligence. The present project aims to deepen and speculate about a technological future around smart homes, and to explore various subjects in the domain of artificial intelligence and affective computing. Always keeping in mind the current direction of modern technology, the possibilities and future realities.

Feel inside is a smart and sensitive home, that connects with people through neural implant (biohacking), in order to help improve the daily life. This paper exposes the various domains and characteristics of the project for the purpose of demonstrating a range of scenarios of home-dweller relationship.

**Keywords:** Artificial Intelligence (AI), Affective Computing, Biohacking, Emotional intelligence, Home Automation, Machine Learning, Smart House, Sustainability, Virtual Home Assistant

#### Introduction

The emerging interest in the abolition of the boundary between artificial and natural, in other words, between machine and human being, and the technical aspects of this technological

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Progress in different areas, lead to the questions how these new techniques can be integrated into everyday life and how they can be an improvement in people's well-being.

"In a constant search, robotics has crossed many of the frontiers of the present "by always seeking to go further in understanding the intelligence and autonomy that characterizes humans, in order to create machines that resemble them" [12]

The experimentalism in the search for new solutions it's based on the awareness of the need to understand and trust the machines that modern technology allows us to develop, so that the interaction between us and them is as smooth as possible. More than a machine that knows how

to perform tasks, what is sought is that “it is able to react to unforeseen situations, interact naturally with human beings and protect itself.” 1

In fact, according to Gerard Kim, human-machine interaction is increasingly one of the important factors of interactive software. So, the ultimate goal of this natural interaction is to see beyond the «machines» and accept them as companions for our day life.

## Theoretical Framework

### Affective Computing

“More than facial recognition, what this is about is a machine being able to know what we feel, our state of mind.” [4]

Artificial Emotional Intelligence is still a developing area, that means, is at an embryonic stage. Its main goal and differentiating characteristic is the emotional humanization of the machine so that there is better interaction with the human being. It is through the ability to read and identify emotions that the machine seeks to achieve its goals, but as we know in the human being that ability is related to cognitive and physiological functions. Empathy is an aspect that the current AI still doesn't answer, but that in future developments will undoubtedly bring a contextual understanding of situations and environments, in order to better understand the human being, so that the machine can respond in a more appropriate way, and with an adaptation more natural of the device to the user.

“Emotions play a role in decision-making, which in the past was thought to be exclusively a rational process. (...) All these explanations are an enormous asset to create robots that learn, that make decisions in the presence of uncertainties, that reveal emotions, and that manipulate objects individually or together with humans, helping them.” [12]

In fact, the role of neurosciences in robotics is relevant, in the context of development around emotions. In this context, Rosalind Picard developed the theorization of the affective computing concept.

“Once the emotion process is initiated, deliberate cognitive processing and physical activity may influence the

emotional experience, but the generation of emotion itself is hypothesized to be a perceptual process.” [20]

Many questions have been raised, considering that the machines don't have a cultural, historical and narrative past specific, in other words, life experiences that condition their decision-making and feelings.

“It is in these human-computer interactions that the creative agency of the user must be translated in a way that can be processed by the code written by developers. By placing user intent within a digital environments to assess if the environment is serving the user, or if the user is serving the environment.”[11]

An important factor will be to determine and certify that in these human-machine relationships, the purpose of technology is the common idea that it is a “tool” always ready to serve the purposes and needs of the user. The way the interaction develops is based on an algorithmic code and the own development that each system does (machine learning), building by itself an artificial neural network, which due to its complexity of data crossing isn't readable or possible to interpret, nor by the programmer who wrote the operating code.

“(...) the fact is that artificial intelligence tools are already greatly influencing human behavior. What makes this situation dangerous is that these algorithms are hidden and have no clear line of accountability. These highly influential algorithms are described by Cathy O'Neil (2016) as «weapons of math destruction» or «WMDs». WMDs have three defining elements: opacity, scale and damage. Opacity does not just refer to the ability for an individual to recognize that there is an algorithm, it also refers to the awareness of the algorithm model of what and how things are being measured and calculated. Scale refers to an algorithm's ability to grow. (...) damage describes an algorithm's fairness to the subject involved in the model and the resulting ability to ruin or destroy quality of life.” [11]

### Smart houses and cities

The smart cities are still an area in research and exploration, however, we understand how contemporary cities can be seen as hybrid spaces, of continuous adaptation

according to the crossing of information, relationships and interactions between users, user-device and between devices. The possibilities for transformation and evolution are multiple, raising several ethical issues related to privacy, control and surveillance. The increasing urban complexity means that the incorporation of technological systems in the city's functioning is mandatory.

### **Biohacking**

According to Dave Asprey, "Biohacking is the art and science of changing the environment around you and inside you so that you have full control over your own biology." The term, at first, may seem somewhat fictional, but in fact it is present in our daily lives more than we are aware of. It is undoubtedly a very vast area, which is present in several technologies, such as: microchips; body implants; devices for recording biometric data, and even for increasing physical capacities, psychological and human intellectuals; interaction chips with electronic devices for various tasks (such as unlocking cars and making payments). The border of this field is as far as we want to expand the human body and establish the limits of interference in nature.

"The notion of a creative or intelligent machine invites fresh perspectives on the human condition." [14]

### **Project**

#### **Problem Statement**

As a first step of idealization phase of we identified some current problems and negative factors, which we intend to solve with this project, such as:

Currently, there is no interaction from the house and to the inhabitant, just from the inhabitant to the house.

Residents are responsible for controlling and managing housing, in order to provide themselves the best surrounding. The need to adapt the house to different situations, and to the different moods of the residents.

When an external person (friend, guest, etc.) enters a home, the environment is not ideal for them, as it is already established and designed for the residents of it. Security and surveillance of protection of the habitation is dependent on cameras and alarms.

Inhabitants concerns for the safety and actions of pets, when they are absent of the home.

### **Practice Area**

Feel Inside focuses on two main areas: housing combined with modern technology, in the field of smart houses and cities.

### **General Concept**

Creating a smart and emotional home, specifically an artificially emotional intelligent operating system without screen interfaces.

### **Goals**

We intend to explore the idea of a house adaptable and custom to its dwellers, allowing an interpersonal relationship between them, where both sides demonstrate and share their emotions.

Therefore, Feel Inside assume a more fictional and experimental character, as it speculates about a future possibility and technologies under development. Exploring the functionalities of artificial intelligence in emotional terms. With this project we try to artificially reproduce the human mind in a technological system, more than a brain we try to replicate the "heart", the human emotional and sensitive side. We aim to create a home that feels and decides directly based on its emotions, that has its own personality, empathy and that has the ability to understand the feelings and moods of the dweller(s) allowing a relationship between them and the home. This means that the home has contextual understanding to respond more appropriately to each situation and day-life scenario.

This would be a house that provides its dwellers the ideal environments and settings adapting to the changing moods of them. The house is self-management, so it will control the environments (temperature, ventilation, humidity, light), electricity, gas and water expenses, inventories of food and other essential goods in order to be a sustainable and environmentally conscious home. The house will ensure surveillance without resorting to cameras, which for many residents are an invasive presence of technology in their day-life, stealing their privacy, but will resort to motion sensors. It will also control pets and children to maintain

their safety when there is no adult around. With all these general functions the inhabitants will be able to establish a personal connection with their home that resembles a relationship between two persons. The resident will receive an attention and care in his day-to-day experience custom to the specific personality of them, and to the mood of each moment.

### Related work - Benchmarking

ONLY. According to its creators, "ONLY materializes the dream of a smart home in a simple and intuitive way. Seductive design, simplicity of use and absolute customization provide an incomparable lifestyle." It consists of an app, and so the dweller has on their devices (tablet, smartphone or computer) the power of home automation, for a better comfort, safety and energy efficiency. This operating system materializes in wall panel, which ONLY currently has available according to three technological typologies: Only Click: For users who like the feel of a button; Only Touch: A subtle touch option; Only Wave: no buttons or touch, just wave up or down, to left or

right. The current features possible are: audio; lighting; air conditioning and safety. All of them available at any time.

ONLY was for us a reference to the main functions of a smart home, as a starting point for our project. In which we develop a house that is more than an assistant to tasks but a friend, because there is an emotional relationship with the resident.

RealEyes. This project is a startup in the area of Emotional Artificial Intelligence. They consider themselves "The World's Leading Emotion AI Platform", and aim to transform the technology more human, creating memorable experiences for its users through human responses incorporated into the content and work. This system collect and analyze data about people's reactions and emotions during visualization of videos or online content, only through facial recognition done by the webcam of the device in question for viewing. It allows companies that depend on this type of content understand and monitor the impact of their business strategies.



Figure 1: ONLY home control interface [In [http://onlysmartbuildings.com/pt/smart home/](http://onlysmartbuildings.com/pt/smart%20home/)]

RealEyes was for our project, a reference about the analysis and recognition of emotions in specific contexts, although this project uses a different technique (webcams) comparing to Feel Inside. In our project the recognition of emotions is made by neural data collected by an inner implant in the body of the users, that recognizes the dispositions and actions of the user that may reflect his psychological state.

**Smart Assistants.** A smart home is convenient, but voice control takes it to another level. Smart Assistant is a software agent that can perform tasks or services for an individual based on commands or questions. Users can ask assistants questions, control home automation devices and media playback by voice, and manage other basic tasks, such as email, task lists, and calendars with verbal commands. Regarding to virtual home assistants, it is also expected that they will be able to bring sustainability.

Some of the best known on the market are Google Home, a smart speaker that can play music but it's primarily designed as a vehicle for Google Assistant (Google's voice-activated virtual helper that's connected to the internet) and Alexa from Amazon who is capable of doing the basic actions of any virtual assistant and also has the ability to control lots of devices around the house and add skills from programmers other than Amazon. Apple also supplies the well-known Siri, present in all branded devices of the last generations and capable of supporting a wide range of user commands. One of the last concerns of its programmers was to make their voice even more human, so that there is more empathy.

### **Target Audience**

In the matters of such ample and experimental project, we believe it is directed to a very varied target audience, according to their interest in the issues and specific needs of their day-to-day lives. Therefore, we intend to highlight the machine learning factor of the artefact, which will have the ability to adapt and evolve, developing a personality and simultaneously establishing an emotional relationship based on the information it collects and the decisions it makes. So, the home will grow in a increasing knowledge according to each user and context.

It is our intention to make the installation and adaptation

of Feel Inside in any home feasible. Although, in certain cases it will be an "adaptable conditioning", due to certain construction and technological factors of the house that may limit the system and its functions. In these more restrictive situations, the system will be readjusted. Consequently, any person or family will be able to access and own this home system, regardless of their age groups, genders and place of residence. The vastness of users is numerous, and because of that the Feel Inside is prepared to adapt to everyone, from users who are more or less comfortable with technological devices, to larger or smaller habitations, or even to home sharing contexts in which the residents have no relations between them.

### **How Feel Inside works**

Nowadays there are already several studies of biohacking on the market. For our project we thought that the best option would be to use a neural implant that would be able to recognize the emotions and feelings of the user. The house, through this implant, will have access to the users preferences, adapting to them in all situations, for example concerning to temperature and light (intensity and color adjustment).

Another very important fact is that the house is safe. Security will be done through motion and heat sensors, with no invasion of the residents' privacy. The house can identify whether or not it is a resident, analyzing the person's implant. This recognition of the implant allows the access to the property to be made without using the conventional keys (useful function when the user forget them).

The sustainable aspect is reflected in the control of expenses, such as gas, water, and electricity. The house is connected to all technological devices and has smart plugs: for recording usage data, monitoring the amount expended; identifying anomalies and problems; and being autonomous to turn them on or off (remote power control). In this way the house creates a better plan for the environment and allow the resident to have less expenses to pay. This plan is also created taking into account several factors such as the number of residents, the hours they stay at home and their professional activities.

The house also has a concern for the health of its residents by giving them different suggestions for habits and meals.

It makes an inventory of the food we have at home, being very useful when we want to make the shopping list. This functionality is possible through a system that controls food expenses by weight. When an ingredient is running out the house adds it to the shopping list and notifies the resident. Each ingredient has its own container that is connected to the house through technology.

It is through the sharing of feelings that the house expresses itself, making possible a relationship between the resident and the house as close to a human relationship. If she doesn't feel clean and organized, she will react sadly or even irritably towards the resident. We can hear the house in two different ways, through speakers in the house or in our head (in order to have more privacy). It is adaptable to all types of people even if they have some type of disability, it adapts to their way of thinking, whether through images or gestures. If there is more than one resident in the house, she can speak to more than one person at the same time almost like telepathy.

### Conclusion

This paper introduces a virtual home assistant for prototyping home-dweller interaction and connection, for a mutually affective and emotional relationship. To this end, we designed a emotion AI system that is highly personalized to each individual, and that defines his own personality as his relationship with the resident develops.

We believe that in a future scenario in which Feel Inside was implemented, it would have a very positive and significant impact on improving the well-being of residents who use it.

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