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A Natural User interface (NUI) is a system for human-computer interaction that the user operates through intuitive actions related to natural, everyday human behavior. A NUI may be operated in a number of different ways, depending on the purpose and user requirements.

This is the emerging field in computer science. I encourage all the students to know about this kind of new technologies. This article is very much useful to about the methodologies involved in NUI.

Wish you All Success..!!

Dr. S.SELVAMUTHUKUMARAN.

LEARNER → WRITER

B. Kavitha - I MCA

Natural User Interface (NUI)

Introduction

User interfaces that you interact with using modalities such as touch, gestures or voice are often referred to as Natural User Interfaces (NUI).



An NUI is a type of user interface that is designed to feel as natural as possible to the user. The goal of an NUI is to create seamless interaction between the human and machine, making the interface itself seem to disappear. A common example of a natural user interface is a touchscreen interface, which allows you to move and manipulate objects by tapping and dragging your finger(s) on the screen. The digital objects on the screen respond to your touch, much like physical objects would.

This direct feedback provided by a touchscreen interface makes it seem more natural than using a keyboard and mouse to interact with the objects on the screen. Another modern example of an NUI is a motion-based video game. The Nintendo Wii, for instance, allows you to wave a controller in the air to perform actions on the screen. Microsoft's Xbox Kinect allows you to control your on-screen character by simply moving your body. Both of these motion-based interfaces are considered natural user interfaces since they respond to your natural motions. While touchscreens and motion-based games are two of the most common types of NUIs, several others exist as well. For example, a voice recognition interface like Apple's Siri assistant on the iPhone is considered a natural user interface since it responds to naturally spoken commands and questions.



Figure 2.14: Touch surface.

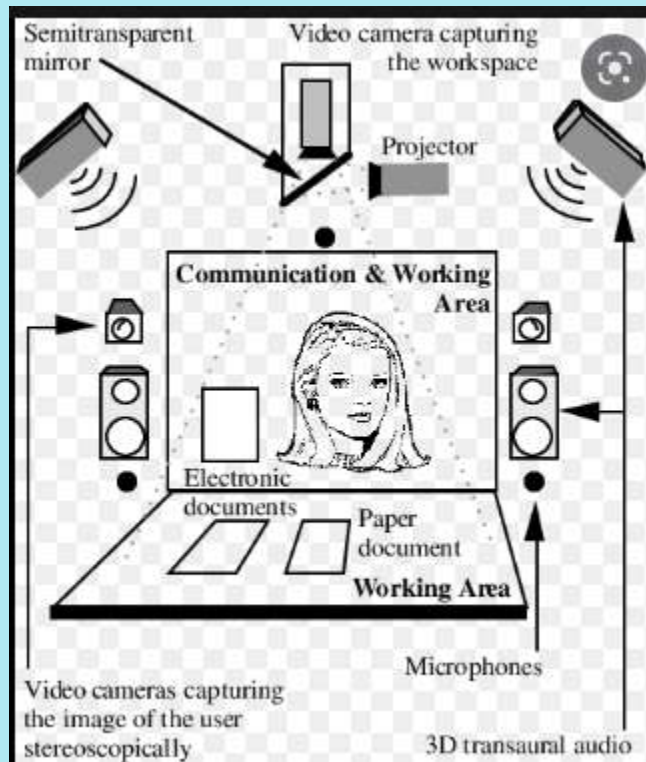


Figure 2.15: Motion Control Technology.

Virtual reality devices are NUIs, since they emulate a real world experience. Even some robots are considered natural user interfaces since they respond to human motion and spoken commands.

NUI elements

- Touch Screen
- Speech Recognition
- Gesture Recognition
- Gaze Tracking, etc.



Attributes of a NUI

While designing a NUI, the first thing that crosses any developer's mind is that the user using the device must be able to interact with the content as directly and easily as possible. NUI is helping people bring something new to

their lives after replacing a couple of buttons with something as easy as to touch the device by itself. "Until now, we have always had to adapt to the limits of technology and conform the way we work with computers to a set of arbitrary conventions and procedures. With NUI, computing devices will adapt to our needs and preferences for the first time and humans will begin to use technology in whatever way is most comfortable and natural for us." — Bill Gates, co-founder of the multinational technology company Microsoft For example, let's consider that you have a group of items, and you browse through them by utilizing the "next" and "previous" buttons. With the introduction of the mouse, you can easily hover over your choices and games that you don't want. Similarly, NUI focuses on employing our natural sensations such as touch, motions, cognition, and gestures, etc., on sending signals to the machines or devices.

Most common attributes of a NUI described below:

Enhance Already Existing Capabilities

When you design a NUI, the most basic thing to keep under consideration is that it should, by no means, go against natural human extinction. The NUI should be able to make use of the existing human capabilities. "[NUIs] exploit skills that we have acquired through a lifetime of living in the world, which minimizes the cognitive load and therefore minimizes the distraction" — Bill Buxton, Principal Researcher at Microsoft It might sound difficult, but it isn't. All you have to do is to choose a common skill set present in almost all — or at least the majority of the humans and incorporate it in your NUI designing. This will not only help you in designing your NUI but will also increase your target audience due to the common human skillset.

Keep the Learning Process Progressive

It is quite important in part of your NUI that it is not very difficult or hard for the novices to learn. You should be able to devise a mechanism that will take really small baby steps, starting from the first and basic steps to getting more and more advanced progressively. At the same time, the NUI must provide ways for the experts to avoid the basic steps and reach the right point according to their skill set. Something that's too basic for the experts and veterans will make them frustrated, that you surely don't want.

Action-Reaction Correlation

The action-reaction we talk about here is not essentially the same Newton's law that we have been running from ever since we started studying physics. This action-reaction correlation is with respect to the Natural User Interface or NUI. The NUI must be physically accessible to the user directly. Both of them should be able to interact with each other in the best possible way. The NUI and User actions should correlate, and their reactions should come accordingly. The NUI must imitate the exact same reactions from the physical environment and give out the best results.

Minimum Cognitive Load

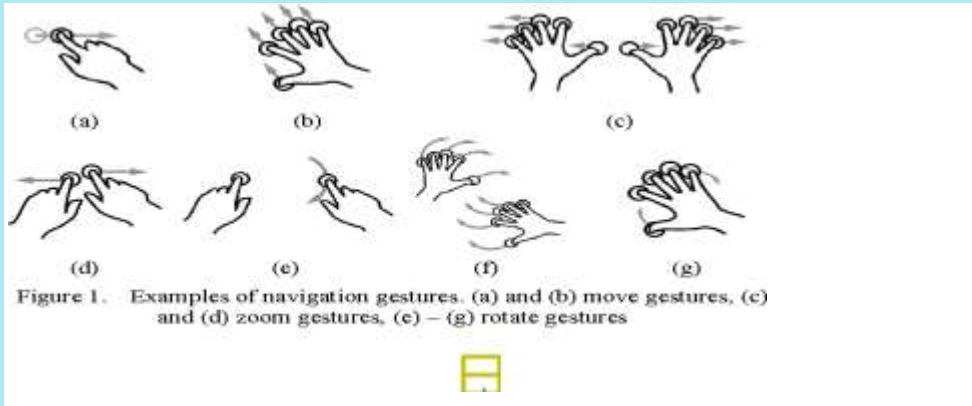
Are you wondering how cognitive abilities are concerned with the Natural User Interface? To answer the most anticipated question, we have a whole lot of stuff to support the claim. If the NUI is too difficult and hard to understand, the cognitive load gets very high — which is not very desirable. Hence, the key is to develop such a NUI that is simple and straightforward.

Speaking of NUI, we have come across different ways in which NUI is operational and is providing its services. Some of the NUIs are quite attractive, while others are invisible and, in fact, more unobtrusive and modest. Hence, the ultimate goal of a Natural User Interface is to create a smooth and seamless interaction between the user and machine — it is as if the interface does not even exist in between.

Applications of NUIs

Touch Screen

The touch screen interface is an interface allowing users to interact with the machine or device — simply by the touch of the finger. It's pretty simple and exciting, right? It means that you no longer have to use buttons or a mouse to hover over the graphical user interface. You can take examples of Smartphones, tablets, and other devices that employ the use of the "skinput." Additionally, the touch systems are being evolved to rule out this requirement of having a "skinput." Instead, some companies like Microsoft are striving to make the interaction possible simply on their own skin. Hence, there is no better and more seamless way to manage your machines and devices.



Speech Recognition

When we speak of Natural User Interface (NUI), it's a must that we discuss speech recognition as well. It is also an example of NUI that allows the users to interact with the devices and machines through spoken commands. Have you ever come across the term "Spoken Command"? As the name indicates, the spoken command is such a command that relies on our voices. When we speak, the system within the devices identifies the words uttered from our mouths and converts them into a kinda "robotic" or "machine-readable" language. Speech recognition examples include call routing, speech to text, and handsfree computer and mobile operations. It allows its user to interact with the system and produce responses accordingly. Hence, Speech recognition is one of the best examples of a Natural User Interface using natural modalities for professional reasons.

Gesture Recognition

Tracking user motions and then making use of them to send instructions to the system or device is what we call Gesture Recognition. It is mostly employed

in Nintendo Wii and PlayStations in which the gesture recognition allows the controllers to have accelerometers and gyroscopes. The main purpose of this equipment is to sense the rotation, acceleration, and tilting. In addition to this, more advanced versions of NUI involve cameras and supporting software. It works by recognizing specific human-body gestures and then translating them into actions. In this regard, Microsoft's Kinect is top of the list that allows the gamers to interact through their gestures, body motions, and speech commands.



Figure 2.21: Gestures such as pinch are a logical extension of the real world.

Gaze Tracking Ever wondered that something or someone legit — follows the movements and motions of your eyes and particularly the eyeball? Well, in this case, everyone is quite lucky! Gaze tracking interface is such a NUI that allows users to control the system or device through its eye movements. Some of the companies, such as Lenovo, have been working tirelessly to produce a laptop or device that provides and operates the functions through an eye gaze? Thus, whenever you are not looking at the screen, it will turn off your device on its own. Moreover, some of the devices are providing locking and unlocking mechanisms based on gaze tracking, such as Face Recognition, to lock or unlock a mobile or device.

Brain-machine Interface

The brain-machine interfaces are something extraordinary as they are able to read your neural signals and literally make use of them. They generally work by using different programs that translate the signals into action. Brain-computer interfacing (BCI) has many applications, particularly in the health sector. It allows the paralyzed patients to operate their wheelchair or even the limb merely by the power of the thought!

The Verdict

The Natural User Interface (NUI) is definitely something beyond the comprehension of a normal human mind. However, it has made our lives easier and enjoyable. Different NUI applications such as speech recognition, gazing, gesture recognition, and the brain-machine interface are things that we are using in our daily lives but haven't done the research about it. The NUI has found its applications in many areas of life — such as in the health sector, in offices, and in everyday lives. Therefore, it is important to have a little insight into all of these — for who knows, this is going to be our future, and we have to keep the things in mind.

Advantage of NUI

The advantage of NUIs is that the user interaction feels fun, easy and natural because the user can use a broader range of basic skills compared to more traditional graphical user interface interaction – which mainly happens through a mouse and a keyboard.

Natural User Interfaces and Accessibility

The widespread adoption of mobile computing is a good thing for librarians who care about access for all. That's because mobile devices make use of natural user interfaces, and those interfaces are making computing easier for people of all ages and abilities, as you'll see in this report. This trend, combined with the move toward multi-device ecosystems and the emphasis on students as creators with mobile apps, means that mobile learning is headed in a direction that is empowering for learners of all abilities. There are other trends in mobile learning, but this report focuses on these three:

- natural user interfaces and accessibility
- multi-device ecosystems
- content creation with mobile devices

That's because there are synergies between these trends that offer opportunities for those who care about access for all.

Natural User Interfaces Are Making Computing Easier for All Ages and Abilities

NUI stands for *natural user interface*. Natural user interfaces are those where humans interact with computers using actions related to everyday behavior, such as touch, gestures, speech, and conversation. The goal is to make it easy for humans to understand and use computers without having to learn complicated or abstract ways of doing things. Designers of these interfaces aim to create experiences that feel just as natural to a novice as to an expert user—and for expert users it can feel like an extension of their body.

Putting the Human before the Computer: The Move from GUI to NUI

NUIs are a new branch in the evolution of human-computer interaction, after GUIs (graphic user interfaces). GUIs were designed to make computing easier to learn than command-line interfaces, where you had to remember specific commands and type them. By using the metaphor of a desktop, with a trash can, menus, and so on, users no longer needed to memorize commands. You could just look under each menu to find the command you needed. Now with NUIs, it's possible to move away from abstract metaphors and toward interactions that feel more natural. Some examples of natural user interfaces are touchscreens, speech recognition, and voice commands. There is also camera input, which allows the device to recognize objects in the real world, and augmented reality, using the camera in a way that shows additional information superimposed on your view of the real world. Experts agree that NUIs won't entirely replace GUIs. Instead, they are opening up a new niche of computing that is accessible to a wider audience. GUIs will continue to exist for those applications and devices where they work best. Mobile devices are using many kinds of natural user interfaces, and that's good news for learners. In this section, we'll look at several examples of how these interfaces work and how they make computing easier for all ages and abilities. And in the final chapter of this report we'll discuss some opportunities for librarians to help their communities by serving as expert advisors about these mobile technologies.

Types of NUIs

The NUIs we'll discuss can be grouped into the following categories:

Touch, including the following:

Touchscreens and multi-touch gestures, such as those used on smartphones and tablets. Haptic interfaces, such as the Apple Watch's ability to tap your wrist as a way to notify you. Force Touch and 3D Touch. These are Apple's technologies used in the Apple Watch, the trackpad on newer models of Apple's MacBook, and the latest models of iPhones (6s and 6s Plus). With Force Touch you can push down on the screen to activate certain functions. With 3D Touch, there are more sensitive levels of touch based on a lighter or firmer push.

Sound, including the following:

Speech recognition, such as that used by Siri and other digital assistants. Conversational interfaces, where you can talk to your device and it can react, such as that used by the Amazon Echo, a device that listens for your commands for answering questions, playing music, and controlling other smart devices. "Hearables"—new kinds of devices that merge the health-tracking features of smart watches and fitness bands with high-quality audio like that found in premium earbuds. An example is "The Dash"—wireless, bio-sensing headphones.

Sight, including the following:

Camera as seeing eye, such as that used by Google Translate, which allows you to point your camera at text in one language and see it translated to another language on the fly.

Camera as scanner, such as with document-scanning or barcode-scanning apps, especially apps that use OCR (optical character recognition) to

translate what the camera sees to written text. Scanbot for iOS and Android is a good example. Augmented reality, such as the ability to show a virtual overlay on top of what you are seeing, like that offered by the app Layer.

Rush your ideas to
M. ASHOKVEL MCA.,M .Phil, M.Tech.,
Assistant Professor / CA
Editor – CAS
Mail-Id: editor.cas@gmail.com,
mashokvel@gmail.com