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DIRECTION OF USER INTERFACES DEVELOPMENT

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Every day we deal with user interfaces. When preparing a presentation or calling on the phone, when using a calculator or an elevator. But what does the concept of a user interface mean?

Let us look at an abacus and a calculator. These are simple tools for performing operations with numbers. What is the difference? Of course, between these inventions there are many years of technological development and the calculator allows you to perform more complex operations with numbers but the goal is the same.

How do these tools allow you to work with them? To add or subtract numbers on abacus, you need to move the stones following certain rules. Thus, you manipulate the concept of quantity but not the concept of number. Four stones in the abacus become the number four in your head. You do not even need to know how the number 4 looks.

The calculator provides us with more complex functions for working with numbers. It allows us to work with trigonometric functions and irrational numbers, which is very difficult to do with abacus. In order to do this it uses its own calculus system – binary. It would be very difficult to use a calculator if it had been built according to the principle of abacus, where the calculation process is inseparable from the process of input and output of information. We would have to translate numbers to the binary system and back and track the calculation process itself. Therefore, we gave the calculator the task of performing these functions and it had a display and buttons with understandable functions. Here the concept of the user interface (UI) appears. We do not need to know what processes occur inside the calculator to be able to use it.

So we can say that the interface is like a portal that connects worlds: the decimal world of man and the binary world of computer for example. This definition can be applied to many things that we use in everyday life, for example, a door lock. In the door lock, we have an external part with which we interact and internal one, which controls the closing and matching of the key.

What is the direction of development of the user interfaces? Today you can hear a lot about the fact that the interface is a barrier. People assume so as it is believed that the best way to convey information is to transfer it directly. But at the moment, the technology has not reached such a level to move information directly to the brain and receive a response, but developments presented below are under way.

Brain-Computer Interface. The brain-computer interface is a system that allows the user to interact with his environment through control signals generated by his brain activity.

One of the biggest challenges facing brain-computer interface researchers today is the basic mechanics of the interface itself. The easiest and least invasive method is a set of electrodes – a device known as an electroencephalograph (EEG) – attached to the scalp. The electrodes can read brain signals. However, the skull blocks a lot of the electrical signal, and it distorts what does get through.

Another way to measure brain activity is with a Magnetic Resonance Image (MRI). An MRI machine is a massive, complicated device. It produces very high-resolution images of brain activity, but it can't be used as part of a permanent or semi permanent BCI. Researchers use it to get benchmarks for certain brain functions or to map where in the brain electrodes should be placed to measure a specific function. For example, if researchers are attempting to implant electrodes that will allow someone to control a robotic arm with their thoughts, they might first put the subject into an MRI and ask him or her to think about moving their actual arm. The MRI will show which area of the brain is active during arm movement, giving them a clearer target for electrode placement.

One of the most exciting areas of BCI research is the development of devices that can be controlled by thoughts. Some of the applications of this technology may seem frivolous, such as the ability to control a video game by thought. If you think a remote control is convenient, imagine changing channels with your mind.

Although most people are capable of using BCI technology, it is not for everyone. Current BCI systems are challenging to use, and require expensive equipment and time-consuming setup. People who already have a reliable method of controlling a computer or communication device (e. g. using hand, foot, head, or eye movement) are likely to find that BCI is slower and more complicated, and simply not worth it. BCIs will be most beneficial for people who have little or no reliable muscle movement.

Gesture Interface. Today, with the advent of motion-sensing devices user interfaces move in direction of gesture recognition. In gesture recognition, the input comes in the form of hand or any other bodily motion. Finding and tracking people is the core of any vision-based gesture recognition system. After all, the computer must know where in the image the person is.

Any gesture control product contains several different key hardware and software components, all of which must be tightly integrated in order to provide a compelling user experience. First is the camera, which captures the raw data that represent the user's actions. Generally, these raw data is then processed, in order to reduce the noise in the signal, for example, or (in the case of 3-D cameras) to compute the depth map. A camera(s) feeds image data into a sensing device that is connected to a computer. The sensing device typically uses an infrared sensor or projector for the purpose of calculating depth. Specially designed software identifies meaningful gestures from a predetermined gesture library where each gesture is matched to a computer command. Once the gesture

has been interpreted, the computer executes the command correlated to that specific gesture.

The meaning of the term ‘gesture recognition’ has become broader over time, as it is used to describe an increasing range of implementation variants. These specific solutions may be designed and optimized, for example, for either close- or long-range interaction, for fine-resolution gestures or robust full-bodied movements, and for continuous tracking or brief-duration gestures.

Gesture recognition technology entails a wide variety of touch-free interaction capabilities, each serving a different type of user interface scenario. The addition of the z-axis to our existing two-dimensional UI will improve the human-computer interaction experience.

Tangible User Interface. Imagine having a computer system that fuses the physical environment with the digital one to enable the recognition of real world objects. TUI designers are looking for a seamless connection between physicality and virtuality. The basis for interaction with the interface can be the following: augmented physical surfaces (e. g. walls, desktops, ceilings, windows), graspable objects (e.g. building blocks, models, instruments) and ambient media (e. g. light, sound, airflow, water-flow) within physical environments.

In Microsoft Pixelsense the interactive computing surface can recognize and identify objects that are placed onto the screen. In the technology the screen includes sensors to detect what touches the screen. The system is also programmed to recognize sizes and shapes.

TUI supports collaboration more than one user interacting with environment, also the physical models in TUI offer the user an intuitive understanding of complex structures. The potential users of TUI can be people who are not always sitting at a computer and people who do things better with their hands and objects. In many ways, TUI can be beneficial to children’s learning. Tangible interface is a natural interface, it is a more explorative, expressive and collaborative technology in comparison to others. TUI has greater potential, if there is enough technological support.

These were three of the most promising options for the development of user interfaces incorporating technologies such as augmented reality, voice user interface, sensor network user interface and other.

Now it is impossible to predict what the user interface of the future will look like, but we can say for sure that interfaces under development today tend to reduce the number of actions necessary to bring our ideas to the computer and increase the possible ways of using them.