Human Body as a Touch Screen

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Abstract: Devices with small sized have some limitations. Since can’t make buttons and screens larger without losing benefit of small size. The main reason for appropriating the Human body as an input device are: Easily accessible by hands. Popularity of mobile devices increasing day by day due to the advantages like portability, mobility and flexibility. There are many advantages of small size mainly we can carry it with comfort, but the limited size gives very less interactive surface area. So we need a large interactive area to use but we want to easily carry it in our pocket. We cannot just make the device large without losing benefit of small size. A novel approach is presented in this paper which solves the size problem. We can use our skin which is largest part of our body as an input surface. Human body produces different vibrations when individual tap on different body parts. With the help of this unique property of human body, this technology uses different functions as different interfaes where users touch themselves instead of a mobile. It's definitely interesting to consider the potential of interfaces where users touch themselves instead of a mobile.

Principle of Skinput
It listens to vibrations in your body. Skinput

Technology Used
Skinput, the system is a combination of two technologies: the ability to detect the ultra low frequency sound and the Pico-projectors. Pico projector applies the use of projector in a hand held device. An acoustic detector detects the ultra low frequency also responds to the various hand gestures.

The arm is an instrument

II. THE HAND AS A INPUT DEVICE
Gustafson and colleagues performed several interesting experiments to determine how well people can use their self-touch UI. Under normal use, people were about equally fast selecting functions from a regular touchscreen phone and from the palm-based system. However, blindfolded users were almost twice as fast when touching themselves as when touching the glass surface of the phone. Obviously, we don't want to blindfold users, though information about nonsighted use is interesting for accessibility reasons and for conditions in which people can't look at the phone. The most interesting aspect of the finding about blindfolded use is that there is something special about touching a hand rather than a phone that makes users depend less on their sight. To tease out why, the researchers tested several additional conditions.

• A phone that provided tactile feedback when touched rather than a stiff pane of glass. Using the tactile phone, users were 17% faster, though the difference wasn't statistically significant given the study’s sample size.
• Having users wear a finger cover to remove the finger’s sense of touch. This made no appreciable difference.
Having users touch a fake hand, rather than their own, to remove the palm’s sense of touch. This condition slowed users down by 30%.

Combining these findings, it’s clear that the key benefit of using the hand as a “touchscreen” is that you can feel when and where you’re being touched. Indeed, that’s a unique benefit of using your own body as an input device a benefit that external devices can’t replicate. This system is a combination of three parts which are microcontroller, bioacoustics sensors and Bluetooth.

According to the need, consider person wearing armband wants to use music application of mobile and there are four different input positions on his hand for play, pause, forward and reverse operation, then he just need to tap on his body. After tapping, some acoustic energy prorogates to air and through body also. These acoustic waves are different in amplitude and frequency in different locations. Frequency of vibrations produced due to tapping are in range of 25Hz to 78Hz [5],[7] i.e. lower frequency range. Those ripples are captured by bioacoustics sensors which are mounted on armband. This armband is connected to the micro-controller which has the Bluetooth module interface with it. With the help of Bluetooth module the controller is connected to mobile devices (android phone). So if individual taps on first location, play operation of music player gets activated in mobile. Similarly for second, third and fourth locations pause, forward and reverse operation will be executed.

Touching specific spots on your own hand enters the commands

Main functional blocks of the system are: Acoustic Sensors (catches the vibrations produced after tapping), Microcontroller (Processes the data), Bluetooth module (transmit the data to phone) and an Android phone. First block which is acoustic sensor array, mounted on armband. User has to wear this armband for capturing the signal produces after tapping on hand. Here Minisense 100 vibration sensor array can be used which is sensitive to low frequency range and produces analog output after vibrations are produced. After converting the analog output into digital, it should get store in microcontroller. Support Vector Machine classifies the data and put into specific category. So this classification gives idea about, on which location the tapping is done. Now as shown in diagram the microcontroller is connected with the cell phone using Bluetooth module. So just tapping on hand, user can control any mobile application (in this case music application). If we tap on 1st location of arm, the play operation is performed in mobile. Similarly for 2nd, 3rd and 4th locations we have given pause, forward and reverse operations respectively. For interfacing cell phone with the microcontroller, an android application in the cell phone is necessary.

III. THE EAR AS INPUT DEVICE:

Usually, we use our ears to listen. In the terminology of human–computer interaction, this means that the ears are used to consume output from the computer. But the ear’s surface can also be used for input to communicate commands from the user to the computer. Among other benefits, your ear is always in the same place; touching your ear is also slightly less obtrusive than touching your hand.

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Possible interactions include:

- Touching part of the ear surface, with either single- or multi-touch.
- Tugging an earlobe. This interaction is particularly suited for on-off commands, such as muting a music player.
- Sliding a finger up or down along the ear arc. This might work well for adjusting volume up or down.
- Covering the ear — certainly a natural gesture for "mute."

To measure how precisely people can touch their own ears in a simple single-touch interaction, Lissermann and colleagues instrumented 27 users' ears. When they divided the ear arc into only 2 regions, participants achieved 99% accuracy. When a 3rd region was introduced, however, accuracy dropped substantially: people were still highly accurate when touching the top or bottom of their ear, but only 63% accurate when touching the middle. Although 63% accuracy sounds good — after all, it’s better than half — it’s unacceptable for most user interface commands. Just think about using the ear to activate the 3 most common email commands: reply to sender, reply to all, and forward.

The research shows, ear-driven input is best for situations with an extremely limited number of commands. It might also be useful for applications in which accidentally executing a neighboring command is not a big deal; even when dividing the ear arc into 6 regions, users still achieved fairly high accuracy. As the above image shows, in this early research, the prototype hardware is somewhat reminiscent of the Borg from Star Trek, and most people wouldn’t want to wear it on their ears unless they were paid study participants. But it’s easy to imagine smaller, lighter, and more elegant hardware in the future. In addition to offering nearly fail-proof feedback, using body parts as input devices also has another distinct advantage: the device is literally always with you because your body is you.

IV. UBIQUITOUS USER INTERFACES

People often carry their mobile phones, but they’ll never be without their hands or their ears. Thus they’ll never be without system functions that have been assigned to their hands or ears. Of course, this statement is true only if users are within range of a sensor that lets the computer know when they’re touching a designated body part. So, maybe you do have to carry around a small device attached to your ear or maybe in the future, body-based interaction could be mediated through nanobots that you swallow once and for all. Another option is to saturate the environment with surveillance cameras, though (currently, at least) many people would oppose this for privacy reasons. Although these technical obstacles remain to be solved, it’s reasonable to expect that user interfaces might be at least partly body-based in 20 or 30 years.

V. ANDROID

There are many mobile platforms on the market today, including Symbian, iPhone, Windows Mobile, BlackBerry, Java Mobile. But android is the first environment that has following important features: It has free development platform based on Linux and open source, automatic management of application life cycle, high quality graphics and sound, portability across a wide range of current and future hardware. So developing and sharing specific application in android is easy.

VI. FUTURE IMPLEMENTATION

In this paper, four different tap locations has described. It means four different functions of mobile phone are managed. It can extend up to ten points i.e. ten different positions. Also interfacing a pico-projector with controller shows display screen on arm. So it will be
easy to handle mobile operations as we will be having total mobile screen on our hand.

Advantages
No need to interact with the gadget directly.
Don’t have to worry about keypad.
People with larger fingers get trouble in navigating tiny buttons and keypads on mobile phones. With skin input this problem disappears.

VII. CONCLUSION
I have presented the approach to appropriating the human body as an input interface.
I described a wearable bio-acoustic array used to detect and localize finger tap on the hand and the forearm. This system performs well even when the body is in motion.

REFERENCES