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Smart Earphones

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Abstract

Smart earphones use both a proximity sensor and a skin conductance sensor to demonstrate several implicit interaction techniques achieved by automatically detecting the intended use. The Smart earphones have three features. The first involves detecting the left and right sides of ears, which provides audio to either ear, the second involves detecting the shared use of earphones and this provides mixed stereo sound to both earphones and the third involves using the proximity sensor to detect when the earphones are withdrawn from the ear which directly triggers the pause feature. These features free users from having to check the left and right sides of earphones and they enable them to share stereo audio with other people and they do not have to worry about pausing their playback.

Keywords: Smart Earphones, Proximity sensor, Skin conductance sensor.

1. Introduction

Even though interfaces have been widely prevalent and intuitively utilized by everyone, they are quite problematic. For instance, when we are utilizing earphones and headphones, we occasionally face problems in utilizing them, i.e., in placing them on the erroneous ears. This might seem a tad bit troublesome, but it demonstrates the possibility of refining conventional interfaces by making them acutely intellective. We consider that good interfaces and interactions are implicit, and users should not have to worry about them. If interfaces have perspicacity to capture the contexts of users, no matter how minute, and users are oblivious to these contexts, the interfaces and interactions will be much better than the precedent ones.

We therefore present a contrivance called smart earphones that automatically detect the left and right sides of the auditory perceivers and provide stereo audio to the most congruous side. The single greatest impediment when utilizing earphones is matching each earphone to the most opportune side of auditory perceivers as this is obligatory to relish audio experiences, particularly in professional audio engenderment and modern 3D audio environments like those for 3D games and movies. They not only free users from having to check the sides of earphones, but they withal support detection when a single set of earphones is being shared by two people. In such cases, commercially available earphones force users to divide output into two audio channels, i.e., each person is able to aurally perceive either the left or right channel. They generate stereo sound and present it to both sides of the earphones. These two features engender implicit interaction between the utilizer and the earphones, and they enable these earphones to act as a good music communication medium. However the third feature enables the user to simply remove the earphones from the auditory perceivers in order to pause their playback.

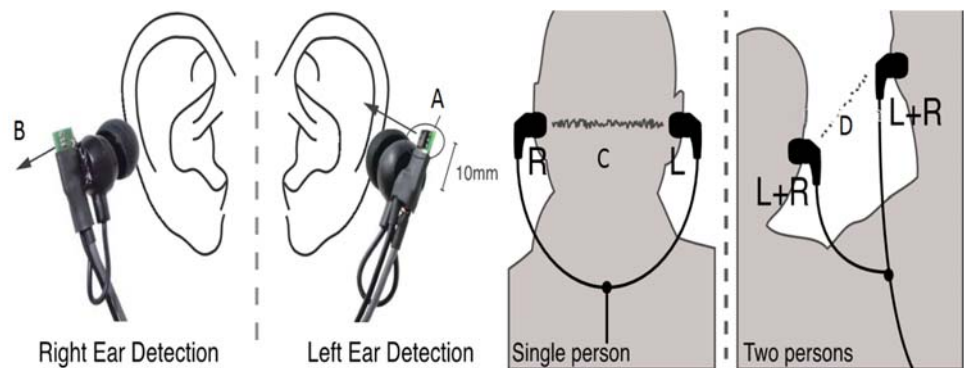


Fig 1: Left: Side detection. Right: Shared use detection.

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- A – Proximity Sensor**
- B – Distance less than 30mm**
- C – Weak current**
- D – No connections**

2. Auto Pause

The threshold distance has been noted down and whenever the earphones are removed from the ear, the sensors automatically measure the immediate change in distance and once it reaches the threshold limit, it automatically triggers the pause feature.

3. Side Detection

We installed a proximity sensor on each of the buds belonging to the earphones to detect the left and right sides of the ears. The distance from the center of the earphone has been measured and whenever this distance is less than 30mm, the smart earphones activate right channel otherwise the channel is changed to the left. To enable such features, we use a proximity sensor and an analog switch IC into the earphones.

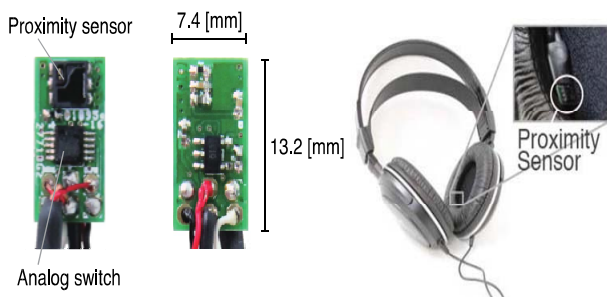


Fig 2: Left: Sensor unit. Right: Photograph of headphones.

4. Photoelectric Sensor

This device contains the electronics, along with the optics. It requires some power source for effective operation. This sensor is capable of performing its own modulation and demodulation, amplification, and output switching. An untypical self-contained sensor provides options as built-in control timers or counters.

Remote photoelectric sensors used for remote sensing contain just the optical components of a sensor. The circuitry required for power input and amplification are positioned on a tiny control panel.

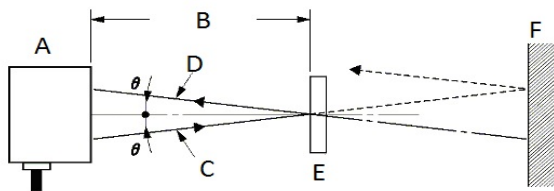


Fig3: Photoelectric sensor.

- A – Emitter and receiver**
- B – Sensing distance**
- C – Emitter axis**
- D – Receiver axis**
- E – Sensing object**
- F – Background**

A retro reflective arrangement places the transmitter and receiver at the same location and utilizes a reflector to bounce the light beam back from the transmitter to the receiver. It senses an object when the beam is interrupted and fails to reach the receiver. A proximity-sensing arrangement is one in

which the transmitted radiation must reflect off the object in order to reach the receiver. Here, an object is detected when the receiver visually perceives the transmitted source rather than when it fails to visually perceive it. Diffuse sensor's emitters and receivers are located in the same location. The target behaves as the reflector, so that detection of light is reflected off the perturbation object. The emitter sends out a beam of light that diffuses in all directions, packing a detection area. The target then enters the area and deflects part of the beam back to the receiver. Detection takes place and output is toggled on or off when sufficient light falls on the receiver.

The detecting range of a photoelectric sensor is the maximum distance from which the sensor can retrieve information minus the minimum distance. A minimum detectable object is the most minuscule object the sensor can detect. More precise sensors can often have minimum detectable objects of smaller dimensions.

5. Skin conductance Sensor

The skin conductance sensor measures electrical conductance between two points on the skin, and here, we connect it in such a way that it interacts with the earlobe. Its input impedance is 10^{12} ohms.in parallel with 10pF. It has an operating input bias in approximately a range of 1.0 to 2.0 V above sensor ground. The signal input range is +/- 40mV while the channel bandwidth is of the range 0.05 Hz to 1 kHz. If a sensor isolator is equipped with this, the signal output range becomes +2.8V.

It has an impressive accuracy of +/-5%. It takes up less than 1.5 mA of current.

6. Acknowledgement

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7. References

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