Sixth Sense of Human Using Wi-Fi

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ABSTRACT

We know that the Wi-Fi signal carries the data from sender to receiver. In this paper we have presented how the Wi-Fi signals can help us to extend us with our senses, as we would be able to see through walls and closed doors. Also, can help to identify the number of peoples and their relative position behind the wall or closed door. Wi-Vi has an ability to detect objects accurately as far as 8 meters. It can also be used for communication by simple gesture or by combining a sequence of gestures. In this paper we have shown various methods to increase the efficiency and range of Wi-Vi.

Keywords: wireless, Wi-Vi, Wi-Fi, flash effect, MIMO, UWB

1.Introduction : we all know the use of Wi-Fi in our daily world as it is a information carrier. But can it be used as the sixth sense of human? Can Wi-Fi signal enables human eye to penetrate through walls? Yes! We can make a system which enable us to see through walls using Wi-Fi signal,and to track the moving object behind the wall. This technology can save lives and aid in negotiation for standoff and hostage condition. And to Deja-vu in these condition and take proper precaution. Wi-Vi is very helpful in emergency situation. Further it can be used in intrusion detection, gaming and personal security for the daily uses.

So in this, there is a transmitter which transmits the RF Signal. A fraction of RF Signal would travel through the wall and rest will be reflected by the wall. By capturing and analyzing the reflected signal, we can find out that what is inside the close room or behind the door. But building such a device causing two main problems which is flash effect and power reduction of reflected signal from room.

2.Related work : Our community is trying from decades to use the infrared or Wi-Fi signals to see through dark, haze and other objects as done by wi-see which uses UWB.

UWB system :-Radar community proposed UWB system which is embedded by large antenna array i.e. is used for measuring the arrival time for the reflected signal with respect to transmitted signal from the wall. Due to de-merit that it require large amount of transmitting power along with large bandwidth and can only be used for limited application. For Example- Military application.

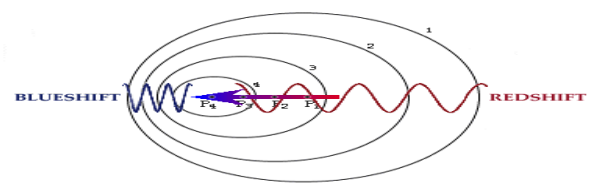



Fig.1: Ultra Wide-Band System [1]

Gesture-based interface:-Using this technique, today in various commercial equipment's for gesture recognisation system such as X-Box Kinect, Ninetendo Wii etc. Also, various system are introduced with the help of cameras and placing sensor on human body. It can identified and detects various types of gesture and by using wi-see system we can also do the same by using the Doppler shift concept in 2.4 GHz range but this can only be done in line of sight.

Doppler effect

Wi-Vi is the first gesture based interface that work on non-LOS base i.e. non line of sight vision contact and even through a wall, also it does not require human labor for its assistance to carry.

Infrared & thermal imaging:-Having a similarly with Wi-Vi these technology works as a sixth sense of human in electromagnetic range that allow us to see through dark, haze, fog, etc.

3.Extracting up-efficiency/ability: For a system to be perfect it should have a reasonable efficiency. Like other systems wi-see/Wi-Vi also have many factors which affect it's efficiency. In this case these two are the most important one i.ei) Flash effect and ii) Power reduction of reflected signal by the room.

i)Flash Effect:- Refers to the effect that occurs due to the reflection produced by the wall rather than the moving objects behind the wall. This decreases the ability of the system and this need to be improved for increasing the efficiency.

In the past, we used to or try to get rid of flash effect by using large array antenna, by transmitting higher power and using large bandwidth which is not feasible in the commercial purpose as explained earlier.so we required 7/8 array antenna for the transmitting/reception purposes. to mitigate the flash effect, this past way that needs to install an additional receiver behind the wall, and connect the receivers behind and in front of the wall to a joint clock via wires. But now a days we are using another way to get rid of flash effect. It is by isolating the reflected signal w.r.t transmitted signal and this can be done by using system signal carrier in time domain and frequency domain. For time domain using very short pulses(i.e< 1ns) and in the frequency domain by using a frequency chirp, but this technique of chirping requires of UWB of order more than 2GHz as in Wi-See system.

In this we are using Wi-Vi technology over Wi-See to see through walls. So by using MIMO nulling remove the flash effect way far better than in the past systems by overcoming the need for UWB.

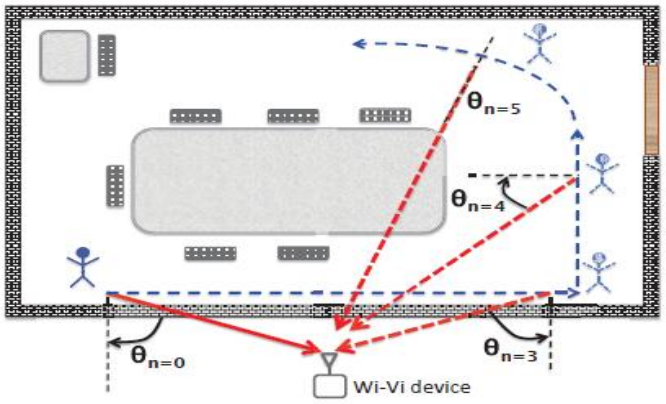
hres =h1 + h2 (-h1/h2) == 0

4.Identifying and tracking human:now we can give our attention towards the moving object behind the wall as we have eliminated the static factors.

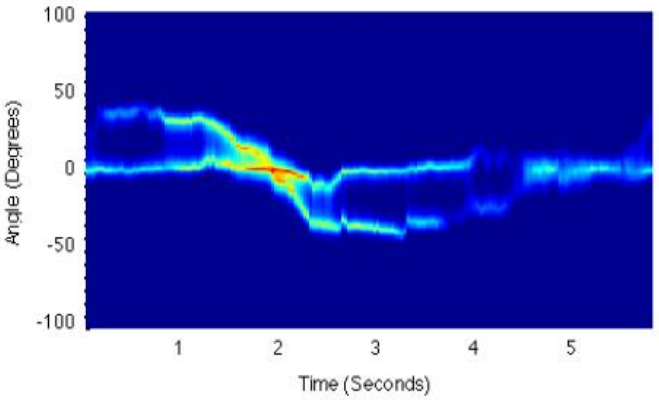
as there is advantages and disadvantages of using an antenna array as in wi-see. So our aim in Wi-Vi is to make a system which captures the benefits of an antenna array and get rid of all the drawbacks.in Wi-Vi we used a technique called inverse synthetic aperture radar (ISAR). ISAR can be used with an antenna array and don't have there disadvantages. The earlier systems uses an array antenna which receives the reflected signal from spatially spaced antenna and process the information by which it can figure out the direction of target/human with respect to array.

But in ISAR, We only use one receive antenna. So at a particular time Wi-Vi captures a single measurement .and when the target moves, it samples the other successive location of the target. Due to channel reciprocity, samples is treated as consecutive time hence Wi-Vi can emulate an antenna and can find out the moving object behind the wall.

6.Experimental Setup And Result: all are experiments were run in the college campus using two different rooms/seminar hall. They have all the benches for students and podium for teachers. The thickness of the building wall is around of 6 inches. The experiment was concluded with two students of different heights and weight.so the experiment is performed many times with different interior inside and the result is concluded as seen.



(a) **Experimental Setup**



(b) **Wi-Vi's output**

5.Effect of building materials: as we know the Wi-Fi signal has to penetrate the wall or obstacle twice, in the process so the material by which wall could be made of, effects the signal power. In table 1 we have given some of the examples.

Building Materials	2.4 GHz
Glass	3 dB
Solid Wood Door 1.75 inches	6 dB
Interior Hollow Wall 6 inches	9 dB
Concrete Wall 18 inches	18 dB
Reinforced Concrete	40 dB

Table 1—One-Way RF Attenuation in Common Building Materials

7.Concluding remarks: Wi-Vi uses the Wi-Fi signal as the sixth sense of humans. The earlier technology was for only military uses but as Wi-Vi is cheap and more efficient so it could be used commercial

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