International Journal of Scientific & Engineering Research Volume 9, Issue 4, April-2018
ISSN 2229-5518

A Study on Future Scope of Wi-Vi Technology

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Abstract—Technology is progressing rapidly and it making many things easier. Wi-Fi is the most popular wireless networking technology, Wi-Fi used radio waves to provide network connectivity. Wireless Vision (Wi-Vi) is a new technology similar to Wi-Fi which using for seeing through walls with the help of Wi-Fi signals. Wi-Vi relies on capturing the reflections of its own transmitted signals off moving objects behind a wall. So particularly we can use such signals to identify number of objects or people in a wall. We can also identify simple gestures. This paper investigates for future application of Wi-Vi, in some example of Emergency Situavation,Law Enforcement, Personal Security and etc.

Keywords—Wi-Fi, Transmitter Technology, Wi-SEE.

1 INTRODUCTION

This paper explores the potential of using Wi-Fi signals and recent advances in MIMO communications to build a device that can capture the motion of humans behind a wall and in closed rooms. .Emergency responder scan use it to see through rubble and collapsed structures. Ordinary users can leverage the device for gaming, intrusion detection, privacy-enhanced monitoring of children and elderly, or personal security when stepping into dark lanes and unknown places.This system detects human behind the wall and shows moving blobs in output screen. To overcome the drawbacks of this system two new system were developed named WI-VI and WISEE. These both systems use WI-FI signal to recognize the moving object behind the wall. The objective of this paper is to enable a see-through-wall technology that is low-bandwidth, low-power, compact, and accessible to non-military entities.Wi-Vi based on capturing the reflections of its own transmitted signals off moving objects behind a wall or door in order to track them. Wi-Vi operation does not require any access to any device on the other side of the wall. Specifically, when it is interact with a non-metallic wall, some form of the RF signal would traverse the wall; reflect off objects and humans. It comes back with a signature of what is inside a closed room.

2 WHAT WI-VI CAN DO

2.1 Detect the Number of Moving Humans in a Closed Room

Wi-Vi allows us to detect presence of a moving human in a closed room. It can also determine with high accuracy up to multiple moving objects

2.2 Enable Communication through a Wall without Carrying a Wireless Device:

Wi-Vi is both a transmitter and a receiver. A human can communicate with it using simple gestures without carrying or wearing any wireless device.

2.3 Identify Simple Gestures from Behind a Wall:

Wi-Vi can detect very simple gestures made through a wall, making it the first through-wall gesture-based interface.

3 WI-SEE

This system can recognize the human gesture without requiring any sensing device on the human body. The required prototype for WISEE system is developed using USRP-N210. WISEE is a gesture recognition system that utilizes wireless signals to recognition of human gesture. WISEE is a gesture recognition system that utilizes wireless signals to recognition of human gesture. The wireless reflection from all the humans can be separated using MIMO receiver.

1.WI-SEE system can track the 9 human body gesture shown in Figure.

2. Using four receiving antenna and one transmitting antenna WISEE can achieve 60% accuracy.

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3.Using five receiving antenna and single transmitting antenna WISEE can perform the human gesture classification in presence of other three people who are performing random gesture

4 Related Work

They are three major areas in Wi-Vi

- Through wall radar
- Gesture based interfaces
- Infrared and thermal imaging

4.1 Through wall radar

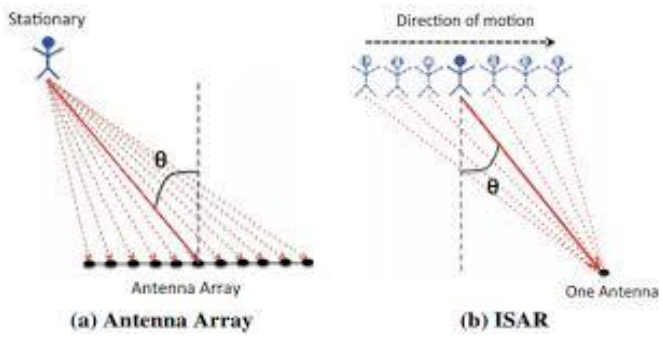
There is growing interest in through-wall imaging for about a decade. Earlier work in this area focused on the simulations and modeling. Recently, there are some design implementations tested with moving humans. These past design of systems or devices eliminate the flash effect by doing isolation of the signal reflected off the wall from signals reflected off objects behind the wall. Wi-Vi technology is different from the above systems. In that Wi-Vi, it requires only few MHz of bandwidth and operates in the same range which is required for Wi-Fi. They also describe the capacity of usingnarrowband radars for through wall caused by moving objects behind the wall and door. The attempt which we are aware of that uses Wi-Fi signals in order to see through walls was made in 2012. This system needs both the transmitter and reference receiver to be inside the imaged room.

4.2 Gesture based interfaces

Now a days commercial gesture recognition systems such as the Nintendo Wii, Xbox Kinect, can identify a wide variety of gestures. The researchers have also developed some systems which are capable of identifying human gestures either by using cameras or by placing the sensors on the human body. Recently the narrow band signals strength has also been improved to 2.4 GHz to observe the human activities in line-of-sight using Micro-Doppler signatures. Wi-Vi Technology presenting that the first gesture based interface has worked in non-line-of-sight scenarios, and also through a wall. This particular technology does not require the human beings to carry any device or carry any type of sensors.

4.3Infrared and thermal imaging

This technique is operated by capturing infrared or thermal energy mirrored from the primary obstacle in the line of sight of their sensors. System supported infrared and thermal imaging extend the human vision on the visible Magnetism vary and permitting us to find objects in presence of smoke & darkness.

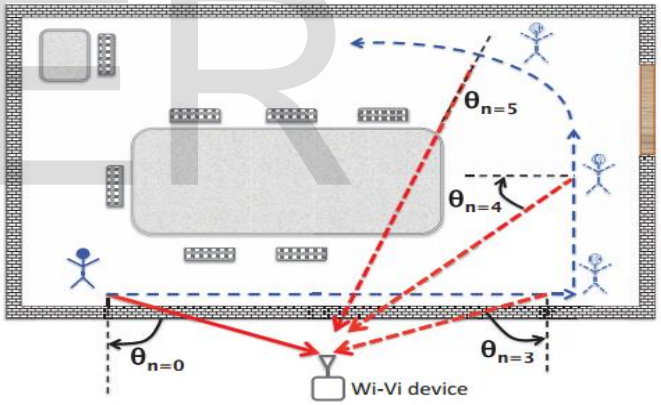


They operate by capturing or collection infrared or thermal energy reflected off the first obstacle in line-of-side of their sensors.

5 Identifying And Tracking Humans

5.1 Tracking a Single Human

Most prior through-wall systems track human motion using an antenna array. They steer the array's beam to determine the direction of maximum energy. This direction corresponds to the signal's spatial angle of arrival. By tracking that angle in time, they infer how the object moves in space.

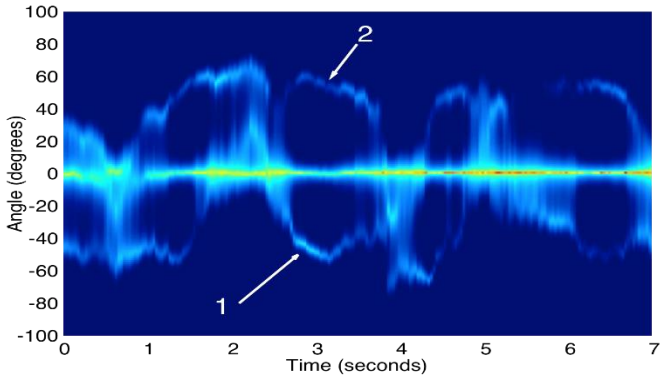


However, Wi-Vi avoids using an antenna array for two reasons: First is in order to obtain a narrow beam that means achieve a good resolution, one needs a large antenna array with many antenna elements. This would result in a bulky and expensive device. Second is, since Wi-Vi eliminates the flash effect using MIMO nulling, adding multiple receive antennas would require nulling the signal at each of them. This requires adding more transmit antennas so the device will become bulkier and more expensive.

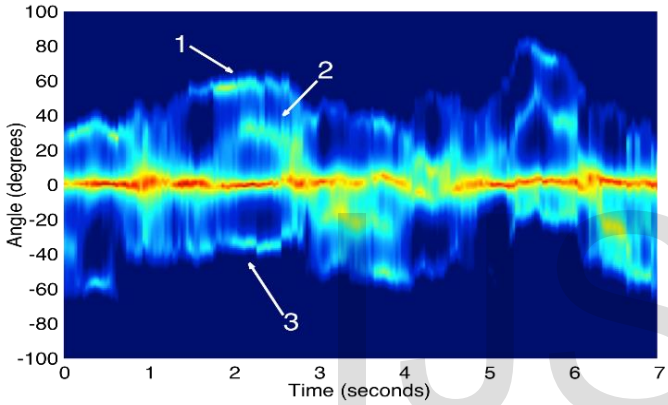
5.2 Tracking a Multiple Humans

In this section, we show how Wi-Vi extends its tracking procedure to multiple humans. Our previous discussion about using human motion to emulate an antenna array still holds. However, each human will emulate a separate antenna array. Since Wi-Vi has a single antenna, the received signal will be a superposition of the antenna

arrays of the moving humans. In particular instead of having one curved line as in at any time, there will be as many curved lines as moving humans at that point in time.



Two Moving Persons



Three Moving Persons

6 Applications Of Wi-Vi

They are the some of the application of Wi-Vi technology following here.

6.1 Emergency Situation

Emergency responders can use Wi-Vi see through rubble and collapsed structure. Wi-Viinvents the technology could one day we use for range of application including search in rescue operation and disaster areas.

6.2 Law Enforcement

Law Enforcement personal can use the device to avoid walking into an ambush and minimize causalities in hostage and standoffs situations, and the police to identify number of suspects in building before the ride.

6.3 Personal Security

Common users can use it for intrusion detection and when stepping into dark alleys and unknown places.

6.4 Smart Sensing

This Wi-Vi technology can be extended to sense motion in different parts of a building and allowautomated control of heating or cooling and lighting systems.

6.5 Entertainment

It enables a new dimension for input output devices in gaming which does not effect on occlusion and works in non-line-of-sight.

7 Advantages Of Wi-Vi

- This system uses only one receiver still effectively measures the time it takes for the signals to reflect to calculate the exact location.
- It's with low cost Wi-Fi technology system can be utilized in disaster recovery and gaming activities.
- Wi-Vi technology, as a gesture-based interface, does not require a line of sight between the user and the device.

8 Dis-Advantages Of Wi-Vi

- This is a low range of resolution device.
- Short range of communication.
- We cannot to detect the humans behind the wall thicker than Eight inches (8Inch).

9 Conclusion And Future Scope

The proper study provide Wi-Vi system is best system to recognize moving object behind the wall, and many improvements can make this system more accurate and

better.We believe that Wi-Vi is an instance of a broader set of functionality that future wireless networks will provide. Future Wi-Fi networks will likely expand beyond communications and deliver services such as indoor localization, sensing, and control.These improvements will further allow Wi-Vi to capture higher quality images enabling thegesture-based interface to become more expressive hence promising new directions for virtual reality. Wi-Vi technology had just been introduced. It is an emerging technology with a wide range of applications. In the possible future we would be able to see through solid materials by using smartphones.

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