

# Ubiquitous WiFi and Acoustic Sensing: Principles, Technologies, and Applications



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# Research Objectives

- **Introduce** the background and technologies of WiFi & acoustic sensing.
- **Show** applications based on WiFi & acoustic and introduce the core insights, contents and results of the main work.
- **Discuss** the advantages, limitations and improvements of WiFi and Acoustic-based methods and applications.

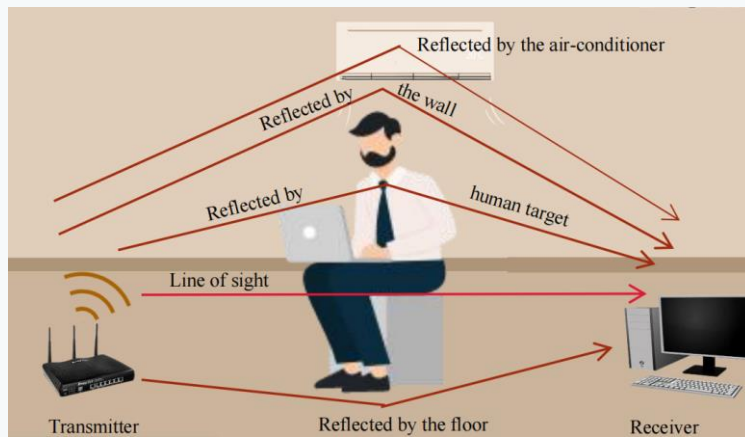


Figure 1. Multi-path Propagation of Wi-Fi signals

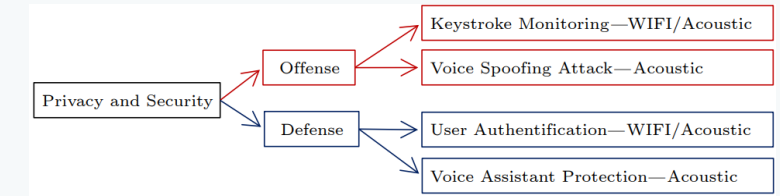
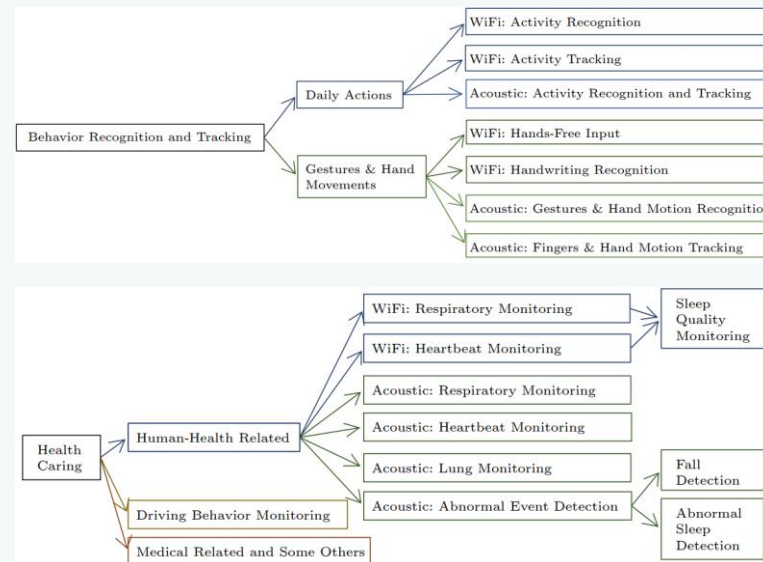
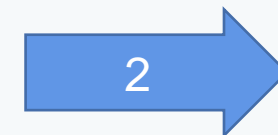


Figure 2. Diagrams of different categories sensing applications based on WiFi & Acoustic



# Research Methods

## • General Framework

- Background, technology, applications, Limitations and discussions of WiFi and acoustic sensing

## • Thesis Selection Criteria

- Nearly 10 years, representative in the field

## • Analysis method

- Taxonomy, Summarization and comparison

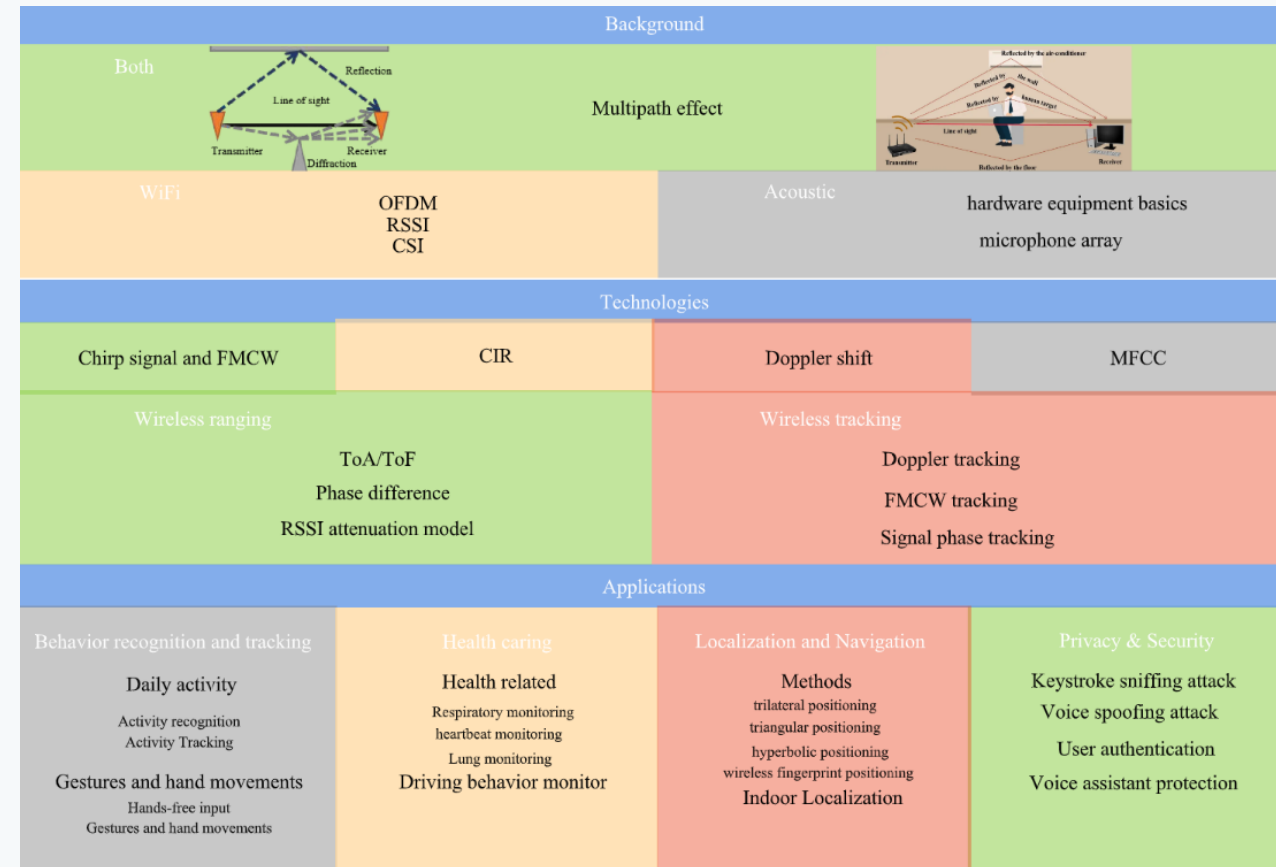


Figure 3. The Overall frame diagram of the survey

# Research Results

- Based on WiFi & acoustic **background**, as well as a comprehensive introduction of **technologies** such as OFDM, RSI, CSSI, FMCW, CIR, Doppler frequency shift, MFCC, ranging, tracking, etc.

- Considering the sensing **applications** of WiFi and acoustic, it shows the research fields including behavior recognition and tracking, health care, positioning, privacy security, and introduces the core contents, insights and performances of their main work.

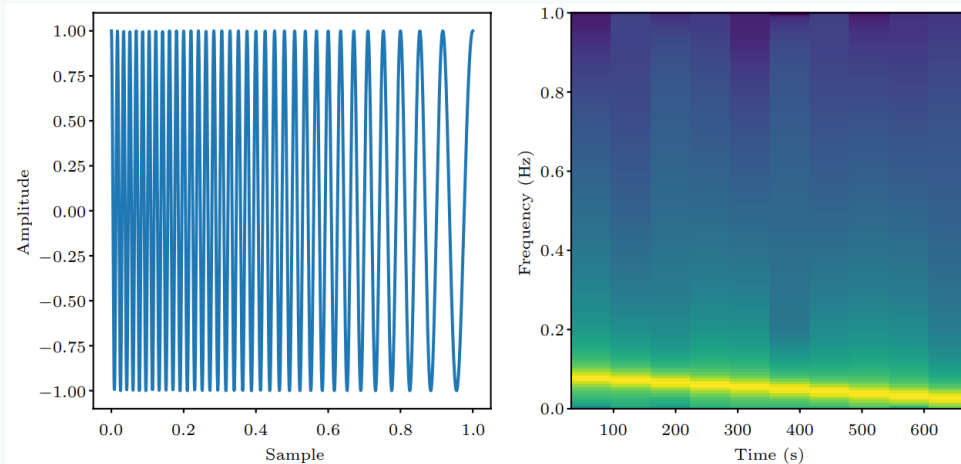


Figure 4. Chirp signal representation in time and frequency domain. (a) Linear chirp in time domain. (b) Spectrum of the chirp signal

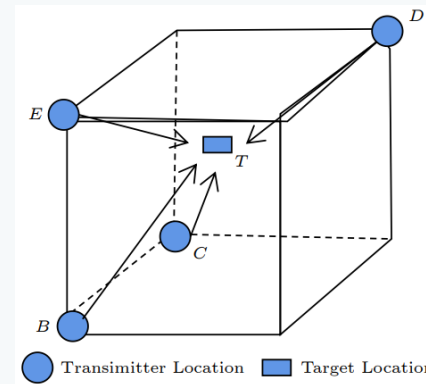


Figure 5. Positioning based on the signal phase



# Research Conclusions

- **Explain** the background of WiFi sensing and acoustic sensing and the fundamental techniques used in those works.
- **Demonstrate** how to utilize the technologies mentioned above for different categories of applications
- **Discuss** some limitations of existing research works and put forward several open issues remaining to deal with in the future.

