MIS 3104 Individual Project Proposal

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Title of project: Privacy and security implications on Wireless (Wi-Fi) Tomography

This Project: New Project ☑ Repeat Project ☐

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Signature of candidate Date: 23 / 03 /2015

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Privacy and security implications on Wireless (Wi-Fi) Tomography

1. Introduction

With this research project I'm trying to implement a system which has the capability to track humans using the existing Wi-Fi hotspots and detect the privacy and security issues related to this.

At present day Wi-Fi is the popular wireless networking technology that uses radio waves to provide wireless high-speed Internet and network connections. Wi-Fi connections support millions of people in homes, businesses, and public locations around the world supporting them to be connected at every possible time. Tomography refers to imaging by sections or sectioning, through the use of any kind of penetrating wave. Radio tomographic imaging (RTI) is an emerging application which offers a new way to image passive objects in buildings and outdoor environments using received signal strength (RSS).

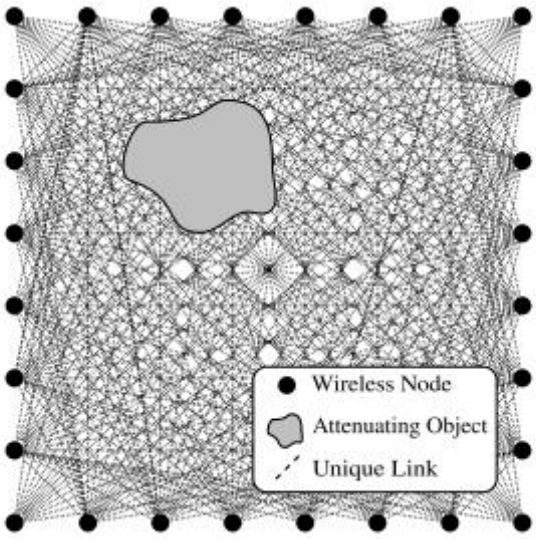


Figure 1: An illustration of an RTI network. Each node broadcasts to the others, creating many projections that can be used to reconstruct an image of objects inside the network area. [1]

Research shows when an object moves inside a wireless area that object causes the received signal strength (RSS) to be dropped. By tracking these drops we can map the path and movements of the object. Apart from providing internet and network access Wi-Fi is used in sensor networks to transfer data gathered from sensors. These sensor networks power and enable modern concepts like smart homes, smart power, smart cities, Internet of things etc. With all these usage of Wi-Fi increases rapidly and in a small area there can be many Wi-Fi networks. Issue with this is by using wireless

tomography technologies we can track movements of people unknowing to them that someone is tracking them.

2. Related Projects/ Previous Research

There are various research projects done on radio tomography using wide range of bands including the Wi-Fi range 2.4 GHz and 5 GHz. Although researchers are interested on mapping objects using tomography no one has published a paper on security and privacy issues that can arise by tomography.

Below are related papers

1. J. Wilson and N. Patwari, "Radio tomographic imaging with wireless networks," IEEE Transactions on Mobile Computing, vol. 9, no. 5, pp. 621–632, May 2010. Published, 01/08/2010.
   http://span.ece.utah.edu/uploads/RTI_version_3.pdf

2. Chiew Loon Goh, Nor Muzakir Nor Ayob, Ruzairi Abdul Rahim, Herlina Abdul Rahim, Muhammad Jaysuman Pusppanathan, Mohd. Hafiz Fazalul Rahiman, Leow Pei Ling, Zulkarnay Zakaria "Study on wireless sensor based industrial tomography systems" Sensors and Transducers, vol. 154(7), 2013, pages 71-81. Published 2013. http://www.sensorsportal.com/HTML/DIGEST/july_2013/P_1253.pdf

Related Videos

1. Radio tomography: seeing through concrete walls, Published on Aug 23, 2013 https://www.youtube.com/watch?v=ZOfUypFpPE8

2. Through-Wall Tracking with Wireless Networks, published on Apr 24, 2009. https://www.youtube.com/watch?v=ifQkbMJ_sXM

3. Expected Methodology, Methods & Approaches

Phase 1

This research requires a practical approach. In the phase 1 a test bed has to be setup with wireless access points, gather data and implement the previous research work. By analyzing the collected data demonstrate it is possible to track humans using tomography.

Phase 2

In phase 2 data will be gathered by altering the test bed and these data will be analyzed to find the ideal situation for tacking.

Phase 3

Security audit mechanism will be made to find vulnerable wireless areas that can used for tracking.

4. List of Deliverables

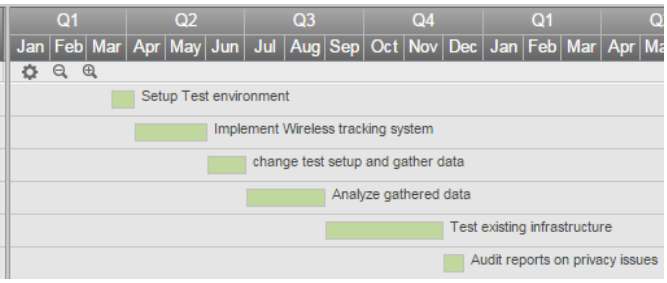
1. Find the optimal number of wireless devices that are able to map accurately.
2. Security audit on deployed wireless networks and their vulnerability to tomography

5. Evaluation

Do a security audit to USCS with existing wireless access points using the implemented movement tracking system.

6. Project Plan and Schedule

Task Name	Start Date	End Date
Setup Test environment	03/20/15	04/06/15
Implement Wireless tracking system	04/07/15	06/01/15
change test setup and gather data	06/02/15	07/01/15
Analyze gathered data	07/02/15	08/31/15
Test existing infrastructure	09/01/15	11/30/15
Audit reports on privacy issues	12/01/15	12/16/15



7. Additional Information

References

[1] J. Wilson and N. Patwari, “Radio tomographic imaging with wireless networks,” IEEE Transactions on Mobile Computing, vol. 9, no. 5, pp. 621–632, May 2010. Published, 01/08/2010.

8. Details of Project Supervisor(s):

	Supervisor (USCS Staff Member)	Advisor (Can be outside of UCSC)
Name	Dr.Chamath Keppitiyagama	Primal Wijesekera
Designation	Senior Lecturer	
Comment (To be filled by the supervisor/ Advisor)		
Supervisor's / Advisor's Signature	…… Date:	…… Date: