

THE WEAKLY IDENTIFYING SYSTEM  
FOR DOORWAY MONITORING

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Dissertation submitted in partial fulfillment of  
the requirements for the degree of Doctor  
of Philosophy in the Department of  
Computer Science in the  
Graduate School of  
Duke University

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ABSTRACT

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# Abstract

The System Architecture for Tracking Individuals (SAFTI) is an indoor person location tracking system designed for use in the field of pervasive computing. SAFTI provides location tracking in environments where cameras are too privacy invasive, where tracking devices are too costly, insecure or inconvenient, and where usability is a high priority. While many location tracking systems satisfy each of these constraints individually, SAFTI satisfies all three constraints simultaneously. Upon entering and exiting SAFTI buildings, users submit identification credentials. Once inside the building, using SAFTI is effortless – simply passing through doorways is sufficient for supplying SAFTI with the information it needs to perform location tracking. An integral part of SAFTI is the Weakly Identifying System for Doorway Monitoring (WISDOM). These instrumented doorways contain a variety of infrared, ultrasonic and pressure sensors that detect the direction of passage and measure each user's body size and shape. We quantify the measurement and identification accuracy of WISDOM by analyzing data collected from a user study containing 530 passes through a WISDOM prototype from 10 different subjects. We combine the results from WISDOM with large publicly available anthropometric databases to evaluate how accurately SAFTI performs location tracking with respect to building size, density of occupants, and matching algorithm used.

# Acknowledgements

I would like to thank my wife Christine for her support throughout the research, writing and revising that went into this dissertation. She accompanied me on trips to get PVC pipe, connecting endless wires to sensors, power supplies and I/O devices. She was a patient and helpful editor by suggesting changes to make my papers and dissertation more readable, understandable, and grammatically correct. My advisor Carla Ellis has been extremely helpful, offering me timely and valuable feedback, encouragement, support and guidance. She helped me convert the research I was excited about investigating into a solid executable research plan, all the while without taking away my enthusiasm for applying my research. I would also like to thank my office mate Mark Fashing who not only put up with an extra doorway in the middle of the office with wires hanging everywhere, but also was great at listening to my ideas and helping me refine and explain them. Finally, I would like to thank the Kareem Lee, Tianhe Zhang, and other members of the Duke Home Depot Smart Home who are now working to deploy an actual WISDOM doorway. I cannot wait to see the results. I would also like to thank my family and friends who have offered generous support through the completion of this dissertation.

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