



CALIFORNIA STATE SCIENCE FAIR 2013 PROJECT SUMMARY

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Project Title Wi-Fi Watchdog: Application to Observe the Indoor Mobility of Senior Citizens	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Our goal was to design a system that will remotely monitor the movements of a senior citizen between the rooms of their house without invading their privacy. Our Wi-Fi Watchdog application would run on a smart phone carried by the senior citizen and would use Wi-Fi signatures.</p> <p>Methods/Materials Wi-Fi Watchdog will demonstrate the ability to identify the current room in the house by matching its Wi-Fi signature against the Wi-Fi signature database of all the rooms in the house. The matching algorithm uses the Least Squares method for the prediction. For setup, we measured the Wi-Fi signatures in all the rooms of the house and stored the data in a signature database. For testing, we measured the Wi-Fi signature at a test location and identified the closest match from the signature database using the method of Least Squares. The closest match was the predicted room. We conducted our testing experiments in both a single-story and a double-story house. We used 10 tests per room in each house to show repeatable results. The test data is presented in a Confusion Matrix which shows the Predicted Room vs. the Actual Room We used Google Nexus 7 tablets as development and test devices; Eclipse IDE for Android Platform Development, BlueJ as an interactive Java Environment; and multiple standard wireless Access Points (AP's).</p> <p>Results Demonstrated 90% prediction accuracy using 3 Wi-Fi AP's in a double-story house with 6 rooms. Demonstrated 78% prediction accuracy using 5 AP's in a single-story house with 9 rooms. Showed that prediction accuracy can be increased by increasing the number of AP's. In the single-story house, with 3 AP's, we had a 53% accuracy rate. With 4 AP's, we had 66% to 71% accuracy in two separate experiments. With 5 AP's, we had an accuracy of 78%. Our project successfully solved challenges related to measurement noise in Wi-Fi data; variability in data due to direction of mobile device; and due to interference from undesired neighborhood AP's. Our system provides enhanced privacy, convenience and lower cost as compared to alternate designs such as video cameras or IR sensors.</p> <p>Conclusions/Discussion Our project successfully demonstrated a working prototype that can monitor the movements of a senior citizen between the rooms of their house without invading their privacy. With enhanced algorithms, this system can be used in retirement homes, hospitals and other scenarios where the indoor location of a person needs to be monitored.</p>	
Summary Statement Wi-Fi Watchdog, an Android application, will remotely monitor the movements of a senior citizen between the rooms of their house without invading their privacy.	
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