Comparing Mobility and Predictability of VoIP and WLAN Traces

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Introduction

Realistic modeling of user mobility is one of the most critical research areas in wireless networks.

- Even mobility models based on the analysis of real WLAN traces capture little mobility
- To capture the mobility of wireless users, we focus on VoIP device users
  - ❖ Why?

    VoIP devices are assumed to be light enough to carry around while using and are turned on most of the time
- Compare the behavior of highly mobile VoIP users to the general WLAN user
- Examine the effect of any differences on protocol performance such as prediction protocols

Data Sets

- Dartmouth campus movement trace from CRAWDAD
- Device type – MAC address map used to distinguish VoIP users
- VoIP set: 97 out of 13888 users in the WLAN movement trace

Three additional sample data sets with different criteria are collected from the WLAN movement trace to justify our findings.

- Sample 1 : a set of users that have visited more than 200 APs.
- Sample 2 : a set of users that have visited more than 170 but less than 200 APs.
- Sample 3 : a set of users that have visited an area range larger than 160000 ft^2
- Each of these data sets have roughly the similar number of users

Prediction Comparison

Markov O(1), O(2), O(3) and LZ predictor are visited

- **Order-k Markov predictor:** assumes that the location can be predicted from the current context which is the sequence of the k most recent symbols in the location history
- **LZ predictor:** predicts in the case when the next symbol in the produced sequence is dependent on only its current state

- Each of these predictors are run for the WLAN movement trace, the VoIP data set and for each of the sample data sets
- The prediction accuracy is measured as the percentage of correct predictions of the next AP to visit

Results

WLAN trace always has the *best* prediction accuracy
VoIP trace always has the *worst* prediction accuracy

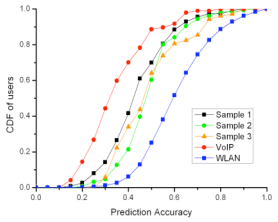


Figure 1: Prediction accuracy of the Markov O(1) Predictor

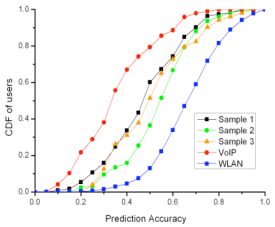


Figure 2: Prediction accuracy of the Markov O(2) Predictor

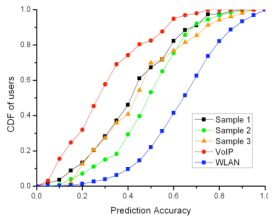


Figure 3: Prediction accuracy of the Markov O(3) Predictor

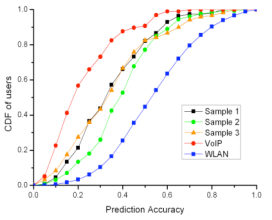
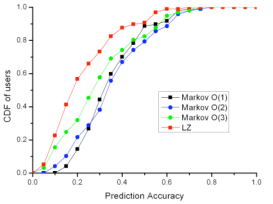


Figure 4: Prediction accuracy of the LZ Predictor



- WLAN traces have the best accuracy with an average of approximately 60%
- VoIP traces have the worst accuracy with an average of approximately 25%
- Markov O(2) has the highest accuracy and LZ has the lowest

Figure 5: Comparison of different predictors on the VoIP data set

Future Work

- Improved prediction and modeling of *highly mobile* users
- Design a better predictor for *highly mobile* users, especially for the VoIP traces
- Investigating domain-specific knowledge, regressions, schedules and repetitive or preferential user behavior
- Extended experiments on other WLAN trace sets

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