Characterization of 802.11 Wireless Networks in the Home

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Setup

- 3 homes: 2 US, 1 UK
- 6 nodes per house in normal usage rooms
- Ad-hoc network with Netgear MA701 for 801.11b and Netgear WAG511 for 802.11a
- Start by sending UDP probe packets with source and number in series
- No link layer retransmissions
- No simulation transmissions

Methodology and Validation

Table I
Description of homes used in experimental testbeds.

Label	Size (ft²)	Construction	# Floors	# Nodes
ushome1	2,500	Wood	2	6
ushome2	2,000	Wood	2	6
ukhome1	1,500	Brick / steel	3	6

Fig. 1. Matrix of probe packets successfully delivered between each pair of nodes in *ushome1* at 30mW and 2Mbps.

- Test based on 300 probes over 150 seconds
- Tested in ushome1 with similar results in other homes
- 150 second tests are similar to 20 minute
- Time of day did not affect comparative link quality

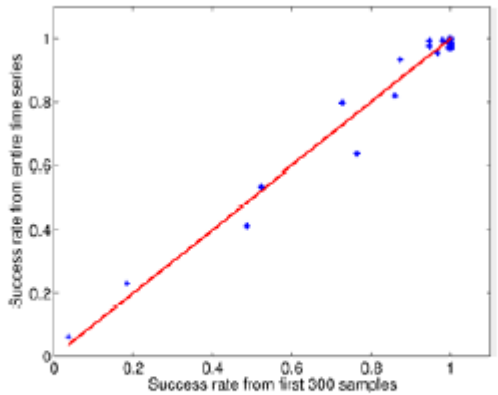

Fig. 3. Comparison of success rate results for 300 and 2400 sample lengths. The straight line provides a reference for equality (y=x).

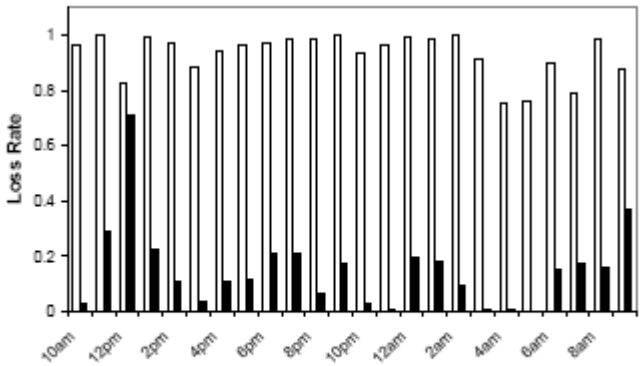

Fig. 4. Loss rate as a function of time of day for *ushome1* (*txpower*=30mW, *txrate*=11M). First bar is node-4 to node-6, second bar is node-6 to node-4.

Methodology and Validation

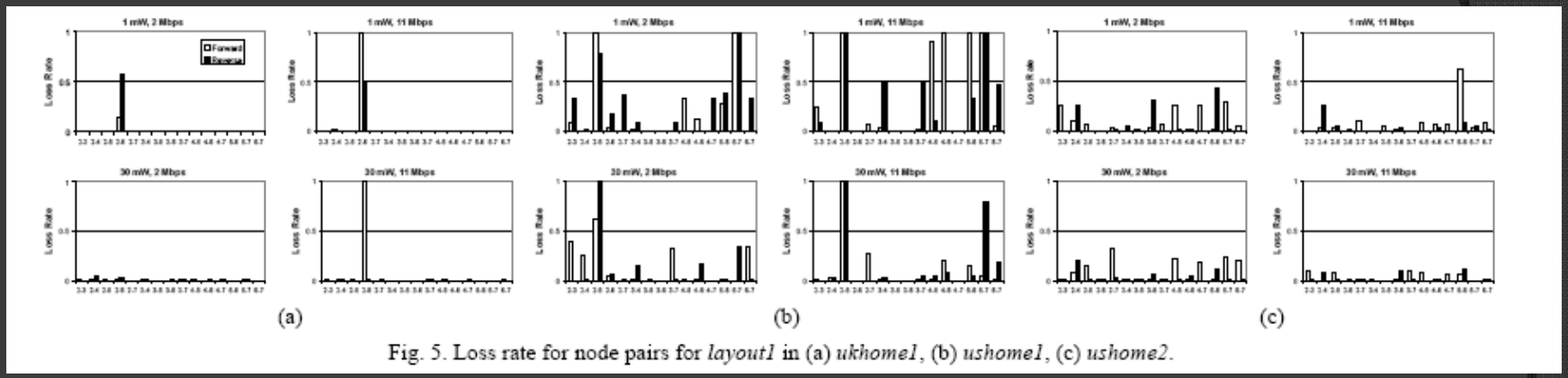

Fig. 5. Loss rate for node pairs for *layout1* in (a) *ukhome1*, (b) *ushome1*, (c) *ushome2*.

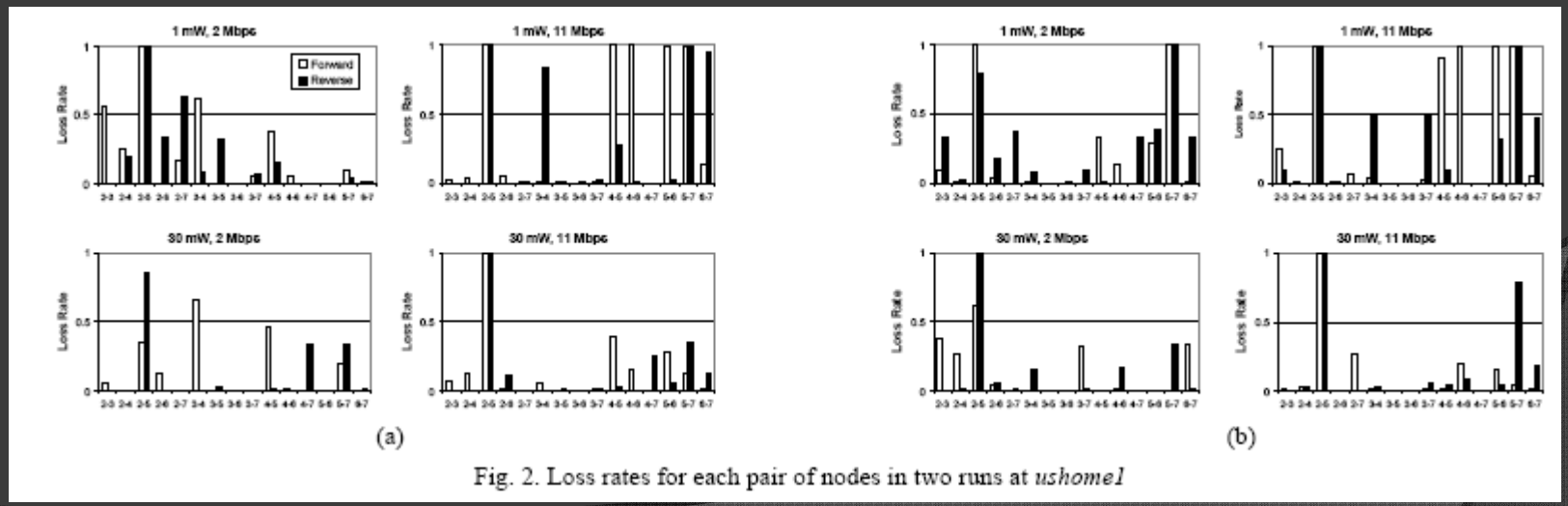

Fig. 2. Loss rates for each pair of nodes in two runs at *ushome1*

Results: Overall

- Higher loss with higher encoding
- Lower with higher power rates
- Problems were not completely eliminated
- Low loss are minimally affected

Results: Antenna Orientation

- Angle of Antenna changes what obstacles are in the way of the signal
- Small changes make significant impact
- Small changes of location also make an impact

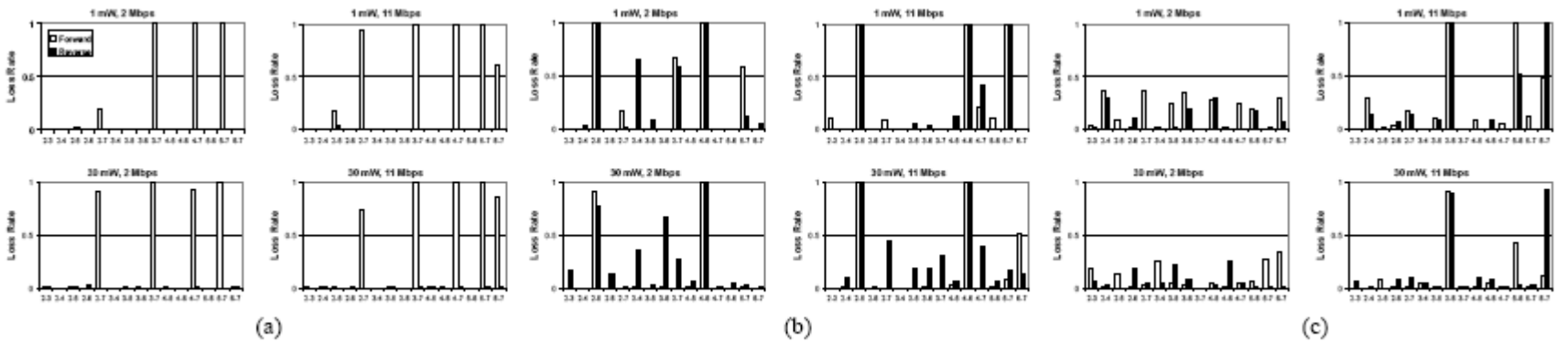

Fig. 6. Loss rate for each pair of nodes for *layout2* in (a) *ukhome1*, (b) *ushome1*, and (c) *ushome2*.

Results: Large Movements

- Could have different results, some improve some reduce quality of connection
- No correlation between distance and quality
- Obstacles determine quality and not distance

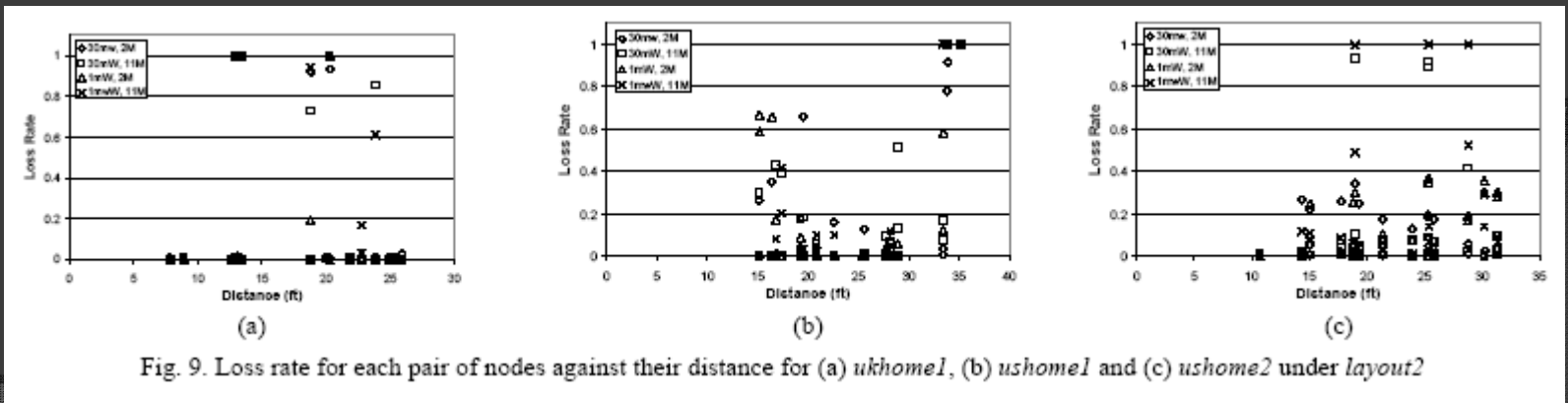

Fig. 9. Loss rate for each pair of nodes against their distance for (a) *ukhome1*, (b) *ushome1* and (c) *ushome2* under *layout2*