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TROST
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EMPIRICAL ROBUSTNESS ANALYSIS OF WIRELESS CONNECTIVITY IN SENSOR NETWORK DEPLOYMENTS

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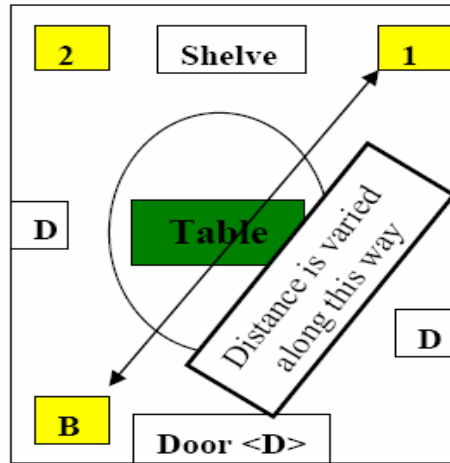
- ✓ **Healthcare is a prospective area for using low power, wireless sensors**
- ✓ **Elderly people can ask for remote assistance with the help of wireless sensor networks (WSN)**
- ✓ **Purpose of my project is to empirically analyze the robustness of wireless connectivity in WSN deployments in a household setting**
- ✓ **Provide some general guidelines about deploying sensors in a household setting**



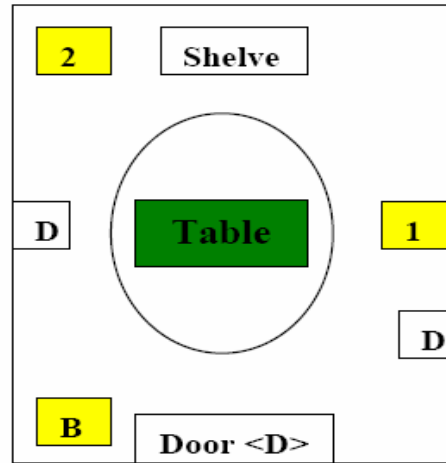
- ✓ **Sensors need to track down the activities of elderly people properly**
- ✓ **Too many sensors can cause traffic congestion in the network**
- ✓ **Too few sensors may not be able to provide full coverage of the sensing region**
- ✓ **Optimal number of sensors are needed to collect data, process them and send alerts whenever needed**
- ✓ **Reduce cost and minimize power consumption**
- ✓ **Provide some ideas about deploying sensors in a household setting**

- ✓ **Worked with the TinyOS platform and used Surge program**
- ✓ **Placed sensors in a ≈ 7.08 meter X 3.29 meter room in Triangular, Rectangular, Random patterns**
- ✓ **Recorded Link Quality Indication (LQI), yield, radio frequency power level and sequence numbers of the received messages**
- ✓ **Processed data for up to 100-120 messages**
- ✓ **Used radio frequency power level of 3 to minimize current consumption**

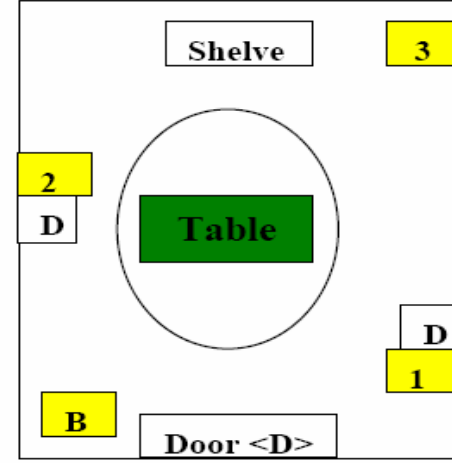
Example of Deployment Patterns



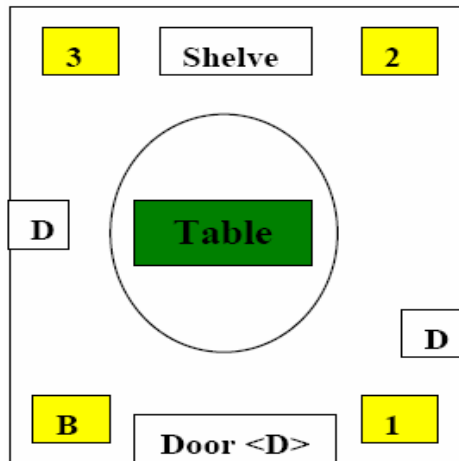
(a)



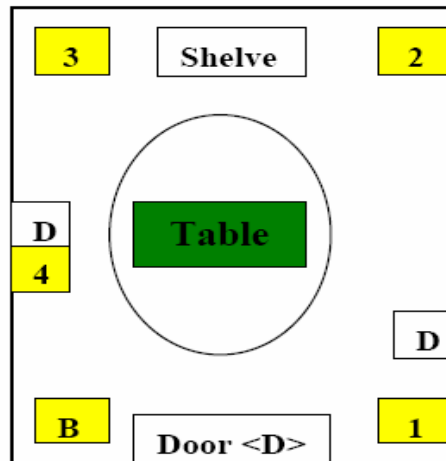
(b)



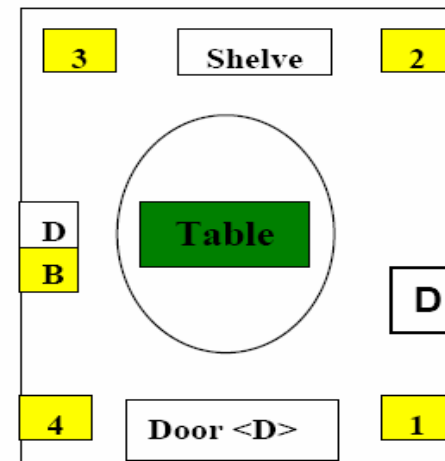
(c)



(d)



(e)

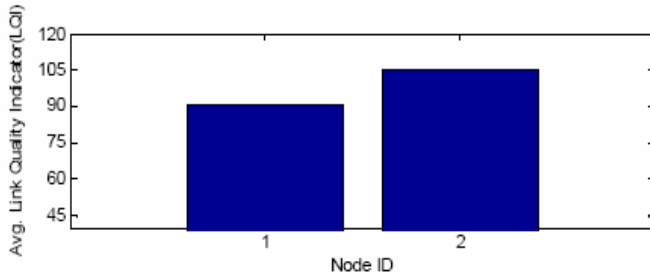
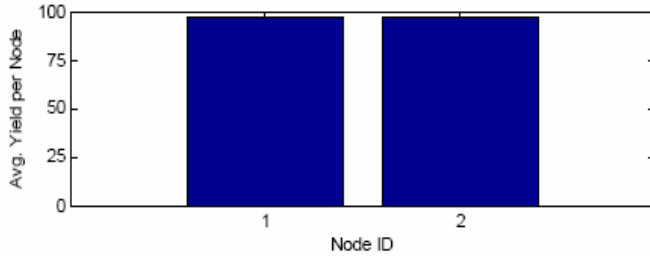


(f)

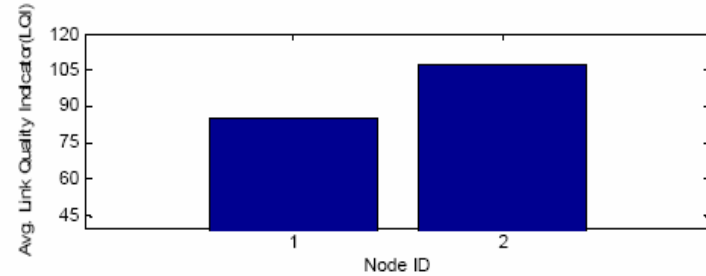
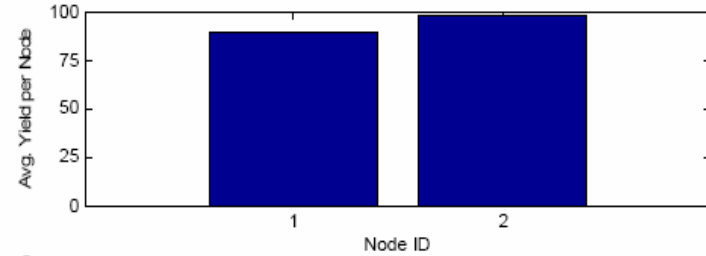
Fig. 1: (a) and (b) Rectangular (c) Parallelogram (d), (e) and (f) Rectangular **B – Base Station

- ✓ In a hall way, a *tmote sky* sensor module can sense ≈ 11 meter with RF power level 3
- ✓ In Fig. 1(a), at the middle of the room node 1 had a good yield but medium avg. LQI. At the far end, 1 had avg. LQI of ≈ 85 with a yield of 85-90%
- ✓ In fig. 1(b), node 2 had $\approx 80\%$ yield but good LQI with the presence of a person walking around the room
- ✓ In fig. 1(c), two foam boards were placed in front of node 2 and 3. Node 3 had a lower LQI compared to the other nodes
- ✓ In different deployment settings the packet reception rate was over 90%

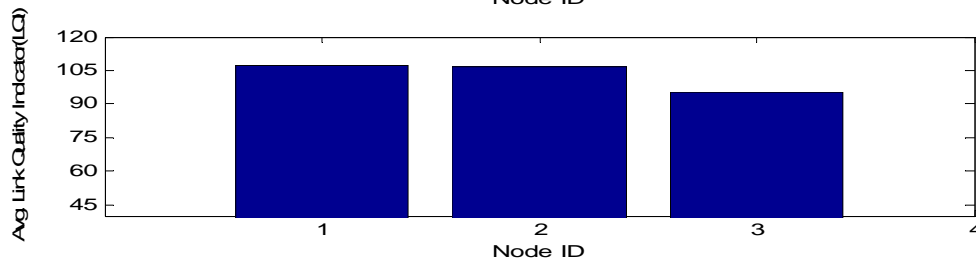
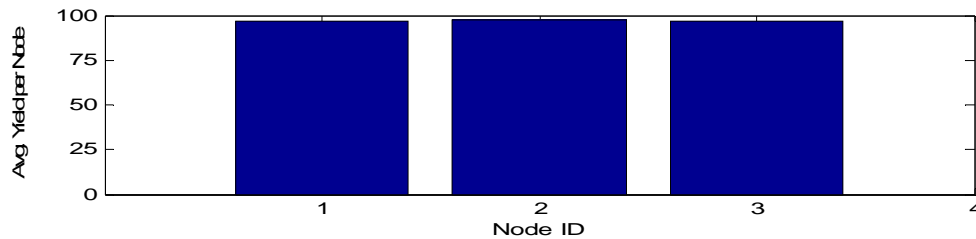
Output



(a)



(b)



(c)

Fig. 2: Comparison of performance metrics for three nodes (1, 2, 3) under different conditions. The top row shows Average Yield per Node, and the bottom row shows Average Link Quality Indicator (LQI). Node 1 consistently shows high yield and LQI, while Node 2 shows slightly lower LQI and Node 3 shows the lowest LQI.

- ✓ **In different deployment settings, I found out from my experiments that the sensor nodes have an overall good wireless connectivity in a typical room**

Future Work:

- ✓ **Include Received signal strength indicator (RSSI) in the experiments to test connectivity**
- ✓ **Evaluate sensor deployment patterns proposed by other researchers**
- ✓ **Perform experiments in larger room and in residential houses**



SPECIAL THANKS to

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- Gu#P lh#Inoxgg
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Questions???