Habib University

EE 322L - Analog and Digital Communication

Demonstrating Scheduling Algorithms in an Ad-Hoc Network

Lab Project Proposal

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1 Objective

The objective of this project is to demonstrate nodes, using 3-4 Arduino-RF module pair, in an Ad-Hoc network (pair-to-pair decentralised communication) and develop a hybrid sceduling algorithm in multi-hop routing.

2 Methodology

We will demonstrate the use of a hybrid multiple access scheme on 3-4 nodes in an Ad-Hoc network. There will not be any central structure used for single hopping or for scheduling. The network will consist of 3-4 Arduino-RF module pairs, which will communicate pair-wise. A unique ID will be given to each of the nodes and based on that they will cipher and de cipher the message, hence using CDMA (Code Division Multiple Access). The undesirable node should not decipher the message (although if it does it wont mean anything to that reciever), to reduce the risk of deciphering TDMA, Time Division Muliple Access, can be used. So each node is assigned T_{TDMA} seconds to recieve and decipher, and don't even decipher if it is not their slot in time.

An additional (but optional) thing could be to incorporate multi-hop via which the message is conveyed to the desired node via other nodes without the intermidiary nodes decoding or distorting the information. The multihop is followed to avoid a drop in signal power bellow a certain threshold. If two nodes are very far away from each other one or more intermediary nodes can relay the message, that needs to be done on the basis of information of the spatial location of each node. An algorithm needs to be developed in order to know location (using gyroscope) of each node once every $T_{Location}$ seconds.

For all this to happen smoothly the nodes must be synced to avoid confusions. An algorithm must be developed to get them synced, and also to check every T_{sync} whether the nodes are synced or not.

3 Block Diagram

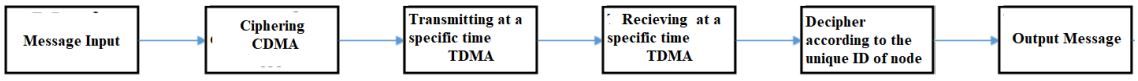

Figure 1: Block Diagram of the Flow as seen from one node

The input can be via a keypad/keyboard. The ciphering is done with respect to the ID of the intended reciever. The transmission is done at a specific time set aside for the intended reciever to recieve. The transmission is done via the RF transmitter module. The reciever then recieves in he selected slot. An optional task could be to implement an algorithm for multihop routing. After the intended reciever deciphers the message it can be displayed to the user via LEDs/screen output/LCD.

4 Resource description

The following items will tentatively be required,

- Arduinos
- RF Modules
- MPU6050 (Gyroscopes)(Optional)
- LCD Displays
- LEDs
- Connectors