High Speed Wireless LAN's Using MIMO Technology

Students: Lau Fai
Tsui Hon Ming
Tung Ka Chun

Supervisor: Dr. Ross Murch

Project ID: MR1-02
In this project, **multiple-input-and-multiple-output (MIMO)** technology has been integrated to existing IEEE802.11a standard. Uplink and downlink techniques have been explored to simplify mobile stations. Moreover, An **adaptive modulation scheme** with suggested optimum frame length has also been developed. Finally, the integrated system improves the throughput by at least a factor of 10 and it is fully compatible to IEEE802.11a.

**System Block Diagrams**

- **Adaptive Link Layer Control Unit**
- **MAC**
- **MLME (MAC sublayer management Entities)**
- **SME (Station Management Entity)**
- **PLCP (PHY convergence procedure)**
- **PLME (PHY layer management entities)**
- **PMD (PHY medium dependent)**

**Note:**
- SAP (Service Access Point)
- Sub Layer with slight modification
- Sub Layer with large modification
- Proposed layer control unit
This is the program flow of the proposed adaptive modulation scheme. With the look-up table used, different system with their respective number of Tx and Rx antenna will have their corresponding expected throughput. By comparing their respective throughput, we can be able to select the one with the best performance.
**Simulation result**

The figure on the left hand side shows the Average Throughput of the proposed MIMO System, the speedup is at least 10 times comparing to the SISO IEEE802.11a System as shown in the figure on the right hand side.

This is an important equation to calculate throughput from various factors.

$$TH = \frac{PL \times (1 - BER)^{PL}}{T_p + T_H + T_{ACK} + \frac{PL}{BR(M)}}$$

**Modification Result**

The IEEE802.11a standard is modified to support MIMO system.

The figure above shown the modified MIMO PPDU frame format which is used in our proposed MIMO system.