**Introduction**

In future generation cellular wireless communication system, high data rate coverage and system throughput will be highly demanded. The use of intermediate relay stations can help meet this demand. In this thesis, a fixed relay scheme was studied through dynamic simulations in a simulation tool developed jointly with another FYP group.

**Objectives**

- Modify a suggested fixed relay scheme
- Explore performance improvement in the downlink scenario through dynamic simulations

**Simulation Tool**

Dynamic simulation tool developed jointly with another FYP group

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**Proposed Modifications**

**A. Path Selection Algorithm**

Original algorithm: SNR-based path selection algorithm

1. Out of the six relay stations in a cell with distance 350 nodes, select two closest ones (R1, R2).
2. Calculate SNR as the sum of the two relay links (RXNi, RXi-RNi) and then in the direct link (RX, RSi).

Proposed modification: SNR-based path selection algorithm

Replace RXNi with RXNi for path selection criteria

**B. Channel Allocation for Relay Stations**

Original algorithm: Fixed channel allocation using reused channels

Proposed modification: Demod-based channel allocation

- $N$: amount of channels allocated to BS
- $M$: amount of channels allocated to RSi
- $R$: amount of relay link requests at RSi

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**Results and Conclusion**

The performance in a heavy interference situation was studied. The performance improvements resulted from three combinations were compared and presented below:

- **DCA/ANR**: Demod-based channel allocation with SNR-based path selection
- **IC/ANR**: Fixed channel allocation with SNR-based path selection
- **IC/ANR**: Fixed channel allocation with SNR-based path selection

- DCA/ANR system: IC/ANR
- DCA/ANR system: IC/ANR

- DCA/ANR system: IC/ANR

*SNR improvement in average spectral efficiency over relay link station

- Original SNR-based path selection algorithm is more suitable for interference-limited system
- DCA/ANR can better utilize the allocated channels for relay links
- DCA/ANR supports more high-performance downlink connections