CHAPTER I

INTRODUCTION

1.1 Background

To support high speed data transfer as well as 3GPP standards releases for LTE. LTE has introduced resource scheduling technology in downlink which will be used to optimize resource block allocation. Some resource scheduling algorithms are Round Robin, Maximum CSI and Proportional Fair. A good resource scheduling scheme is required to allocate resources blocks to the users to maximize network performance.

Round Robin algorithm is often used in resource scheduling process. This algorithm scheme is scheduling the resource allocation to the users who first occupied the channel will be served first or first in - first serve without considering channel state information (CSI) condition. The Maximum CSI Algorithm is one of the most commonly used algorithms in optimization and also in scheduling process. Maximum CSI algorithm is deterministic that only the user with a certain priority scale than will be served. The priority scheme base on channel state information (CSI) condition. The users who have the biggest CSI will be first priority to get PRB allocation. Scheduling algorithm that has been implemented in some telecommunication vendors is Proportional Fair algorithm. In Proportional Fair algorithm, the fulfillment of throughput and fairness index among users also become one of the reference in the scheduling. Proportional fair is an algorithm that balances the throughput and fairness of the system. This scheduling algorithm demonstrates an acceptable throughput level while providing some fairness between users.

In this study, Modified Round Robin is a scheduling algorithm that use priority base on the highest CSI and the first in - first serve scheme. Users who have the highest CSI and first occupied the channel will be the first priority to get resource first. Then the next user who has a lower CSI will be allocated the next PRB slot. Performance parameters will be observed in this simulation like spectral efficiency, average user throughput, eNode-B throughput and eNode-B payload. The expected result using the Modified Round Robin algorithm to maximize performance.

1.2 Problem Definition

Problems raised in this study are:

1. Difference performance capacity value that have been produced from each algorithm is caused by the difference scheme that being used in scheduling.
2. Within a certain range, user use a better physical resource block (PRB) that have high channel state information (CSI) characteristic to maximize spectral efficiency.
3. Maximum CSI priority scheme is needed when user on the cell to get better throughput.
4. The performance capacity of the proposed algorithm must be maintained.

1.3 Reference Tracking

In [2] [3] the PRB allocation uses Proportional Fair, Round Robin and Maximum CSI algorithms. The spectral efficiency are not maximal or stable and channel utilization is not efficient. Therefore, it is proposed to apply modified Round Robin algorithm as scheduling to generate maximum performance and resource usage efficiently. [4] Scheduling algorithm is applied in downlink using Proportional Fair algorithm. In [3] allocation algorithm is applied in downlink using Maximum CSI algorithm. Research [5] and [6] show the performance values that generated by the Proportional fair and Maximum CSI algorithms are not optimal. This happens because of a priority user scheme gets PRB only based on channel condition or CSI. Users who have the best channel conditions will get the highest priority in the PRB allocation process and the other users will wait for the next sequence. In the Modified Round Robin algorithm, there is priority scale based on channel conditions or CSI and initial time of the channel occupation. The first user occupy the channel and have the highest CSI will be the top priority to get PRB allocation and other users waiting for the next sequence. Every first user can get maximum the number of resource block allocation. The spectral efficiency has correlation to other performance capacity which becomes the benchmark. The other performance capacity parameters are average user throughput, eNode-B throughput and eNode-B payload. Some performance parameters will be analyzed and compared to the simulation results. It aims to derive scheduling algorithms that produce better performance to maximize performance capacity [8].

1.4 Research Purposes

The purposes of this research are:

1. To modify a algorithm as resource scheduling that can produce maximum performance.
2. To apply priority scheme that based on the best CSI value and the first in-first serve scheme to achieve better performance.
3. To analyze and evaluate the simulation results of the four scheduling algorithms to achieve spectral efficiency, average user throughput, eNode-B throughput and payload.
4. To analyze the comparison of performance capacity that have been produced by Modified Round Robin, Round Robin, Maximum CSI and Proportional Fair scheduling algorithm.

1.5 Scope of Work

This study aims to analyze the scheduling performance in allocating resource block. Some steps are taken in this research:

1. Design Modified Round Robin, Round Robin, Maximum CSI and Proportional Fair scheduling algorithms for LTE network systems that can schedule PRB allocation.
2. Simulate the scheduling algorithm on LTE network system according to the specifications:
    a. Resource Scheduling is performed on single cells with 50 users in fixed positions, no handover process and no interference effects.
    b. Antenna polarization is omnidirectional with frequency carrier 1800 MHz.
    c. Scheduling algorithms are simulated in downlink LTE release 8.
    d. The determination of the parameters are used in this simulations according to those published by 3GPP and [12], [18], [23].
    e. The scheduling resource block allocation is applied as many as 1000 TTIs to produce stable performance capacity parameter values.
3. Analyze the advantages and disadvantages of some scheduling algorithms and evaluate it.
4. Determine the performance capacity of each scheduling algorithm like spectral efficiency, average user throughput, eNode-B throughput and eNode-B payload.

1.6 Research Hypotheses

In this study, designed a new scheduling algorithm to allocate PRB from eNode-B to some users. Each algorithm will have performance capacity value that has been generated based on a predetermined scenario. Round Robin algorithm is used to schedule resource blocks allocation that have high spectral efficiency values. But this algorithm does not consider the channel conditions as reference to schedule resources allocation. Therefore the Round Robin algorithm has been modified by considering the first user active with the best channel condition to be the top priority to get resource block. So the spectral efficiency and user throughput can be generated higher and stable.

1.7 Step of Research

Research on this thesis are divided into several steps:

1. Problem Identification

   The problem identification in this research is conducted by literature study and discussion, which is conducted by collecting and studying various text books and scientific journals that concerned with this research and discussing with supervisors and other competent parties.

2. Model System Design

   The designing process in this study, the cell environment is designed for simulation and evaluation of algorithmic processes. Enode-B has single cell without interference from other cells. The power allocation is 40 Watt and bandwidth 10 MHz. Each channel will be affected by lognormal fading. Users will be distributed randomly within a cell and vary locations.

3. Algorithm Design

   In this step, the resource block allocation scheme will be designed. The Modified Round Robin algorithm process will prioritize the first user who have the highest channel condition will be served first. In the maximum CSI algorithm, users who have the highest CSI value will get top priority in PRB allocation. While in the proportional fair algorithm, users who have the highest ratio of the throughput request than the average throughput cell then the user gets the main priority in the PRB allocation. The designed scheme must be in accordance to the conditions of the LTE network system so that the algorithm can be achieved better performance.

4. System Integration

After all processes are designed, each process will be integrated with another process, so it can compare to the performance results of some algorithms. The input requirements of each process must be met in order to produce output. Integrated algorithms must achieve the main objectives of the study.

5. Simulation Process

The simulation will be performed on a cell using MATLAB software. The simulation will be done through several scenarios to see how the algorithm works.

6. Simulation Results Analysis

The simulation results will be reviewed and analyzed. In this step, all the simulation schemes will be analyzed and achieve the research objectives.

7. Drawing Conclusion

The conclusions will be drawn in accordance to the simulation results and analysis. The final conclusion must meet the main objectives of the study.

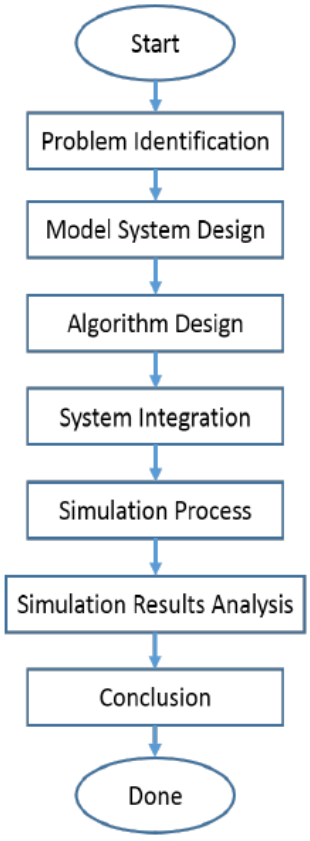

Figure 1.1: Steps of Research