USER DENSITY BASED SOFT FREQUENCY REUSE ALGORITHM FOR 5G CELLULAR NETWORKS

BY

ASAKA, Osbert Tarlumun
MENG/SEET/2017/7390

A THESIS SUBMITTED TO THE POSTGRADUATE SCHOOL,FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, NIGERIA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF ENGINEERING(M.ENG)IN COMMUNICATION ENGINEERING.

OCTOBER, 2021

ABSTRACT

Soft frequency reuse (SFR) techniques have been deployed to address the problem of interference experienced by users in cellular networks. In some of these techniques, resources allocations are based on the assumption that users are uniformly distributed.However, in a real network scenario where SFR is deployed for resource allocation, the distribution of users in the network regions is random. Analysis of the impact of random deployment of users in such network scenarios is essential for designing efficient networks. This research proposes a SFR algorithm (User-SFR), which intelligently adjusts resource allocation parameters according to the load distribution in the network. When compared with several results of a fixed SFR algorithm, the results for the proposed User-SFR outperforms the fixed SFR.The Signal to interference plus noise ratio (SINR) of the users at the edge region improved by about 3.2% and the Capacity improved by over 202%.This implies that a more realistic and enhanced network is achieved when random distribution of the users in a network is considered against the assumed uniform distribution of users.

TABLE OF CONTENTS

CHAPTER TWO

CHAPTER THREE

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

Abbreviation	Meaning
SFR	Soft Frequency Reuse
SINR	Signal to interference plus noise ratio
5G	Fifth Generation of Cellular Communication Technologies
FFR	Fractional Frequency Reuse
FR	Frequency Reuse
ICI	Inter-cell interference
4G	Fourth Generation of Cellular Communication Technologies
LTE	Long Term Evolution
OFDMA	Orthogonal Frequency Division Multiple Access
D2D	Device to Device
MIMO	Massive Input Massive Output
ASE	Area Spectral Efficiency
eNB	e node B
ML – SFR	Multi – Level Soft Frequency Reuse
M-SFR	Modified Soft Frequency Reuse
HetNets	Heterogeneous Networks
SIR	Signal to Interference
SSFFR	Soft Sectored Fractional Frequency Reuse
SFFR	Sectored Fractional Frequency Reuse
DyCRA	Dynamic Cost/Reward based Allocation
IR	Inner Region
OR	Outer Region
SORA	Self Organising Resource Allocation
CDMA	Code Division Multiple Access
BSs	Base Stations
CIR	Carrier to Interference Ratio
UE	User Equipment
UEs	User Equipments