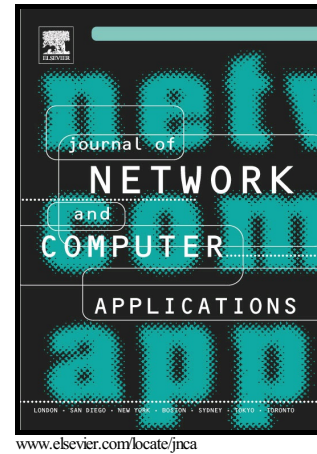# Author's Accepted Manuscript

Intelligent Deployment of UAVs in 5G Heterogeneous Communication Environment for Improved Coverage

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Intelligent Deployment of UAVs in 5G Heterogeneous Communication Environment for Improved Coverage

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Abstract

With hard requirements of high performance for the next generation mobile communication systems, especially 5G networks, coverage has been the crucial problem which requires the deployment of more stations by the service providers. However, this deployment of new stations is not cost effective and requires network replanning. This issue can easily be overcome by the use of Unmanned Aerial Vehicles (UAVs) in the existing communication system. Thus, considering this as a problem, an intelligent solution is presented for the accurate and efficient placement of the UAVs with respect to the demand areas resulting in the increase in the capacity and coverage of the wireless networks. The proposed approach utilizes the priority-wise dominance and the entropy approaches for providing solutions to the two problems considered in this paper, namely, Macro Base Station (MBS) decision problem and the cooperative UAV allocation problem. Finally, network bargaining is defined over these solutions to accurately map the UAVs to the desired areas resulting in the significant improvement of the network parameters, namely, throughput, per User Equipment (UE) capacity, 5th percentile spectral efficiency, network delays and guaranteed signal to interference plus noise ratio by 6.3%, 16.6%, 55.9%, 48.2%, and 36.99%, respectively in comparison with the existing approaches.

Keywords: UAVs, 5G, Heterogeneous Networks, Interference, Capacity

1. Introduction

Unmanned aerial vehicles (UAVs) have made a mark in the area of networking with provisioning of continuous support to the network devices. This connectivity has improved the data rate which is the primary requirement of the 5G networks. With solutions to the CAPEX/OPEX issues, UAVs allow a vast range of applications in the heterogeneous networks. The next-generation heterogeneous networks aim at providing high data rate with improved coverage and capacity by deploying network facility in all the components. The use of multiple devices is the key aspect of the heterogeneous networking. These networks can be used to resolve the problems related to high stream data transfers [1] [2]. These networks aim at increasing the data rate, serving user demands for 100% availability and lesser delays in transmissions [3]. These networks although gel well with the fronthaul and the backhaul of the existing network formations, yet these are not capable of providing the full connectivity and coverage to all the users in the particular area [4].

A traditional heterogeneous network comprises of the macro base station (MBS), small cells, femtocells and picocells for connectivity users [5] [6]. According to the architecture suggested under METIS, METIS2, and 5GPP, small cells, Radio Access Networks (RANs), Cloud-RANs form the crucial part of the 5G deployment [7]. These components are the backbone of the high-speed transmission in these 5G networks. How-

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