An evolutionary compression algorithm for LTE downlink signals

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***Abstract*—As the communications has improved the human behavior also changed and it is also creating new demands and challenges for the next generation of broadband access. The greatest challenges are provide high connection rates and also concerns about environmental issues. The new architecture of access networks CRAN (centralized radio access network) is proposed in order of provide higher data rates and enables the green communications.In CRAN the improvements are due to its centralization but it also creates some impairments such as limitations in fronthaul capacity. Thus this article aims improve the compression of baseband signals in a fronthaul of CRAN by proposing a new evolutive clustering method.**

1. Introduction

It is projected that the 5G network will be required to deliver data rate about 100 to 1000 times the current 4G technology, utilizing radical increase in wireless bandwidths at very high frequencies, extreme cellular network densitification, and massive number of antennas [1].

Traditional base stations (BSs) comprise either a co-located baseband unit (BBU) with a radio unit or a distributed BBU with a remote radio unit (RRU) connected via fiber. For either case, a separate equipment room with supporting facilities such as air conditioning is required in order for BS deployment, rising the operating expense (OPEX) of the network. Nevertheless since the operating frequency of LTE is usually higher than that of 2G and 3G, the coverage of an LTE cell is smaller than that of a 2G or 3G cell. As a result, more LTE cells are needed to cover the same area, meaning that more equipment rooms are required and more capital expenditure (CAPEX) is needed [2].

However according of climate change, rising fossil fuel prices and energy security increase, companies and governments around the world are committing great efforts to develop new technologies for the green strategies addressing climate chance globally and facilitating low greenhouse gas (GHG) development [3].

CRAN (centralized radio access network) is new architecture for radio access network who was proposed for the next generation of cellular networks, the “C" could means centralized but also collaborative or cloud radio access network.

In this architecture the baseband units (BBU) and the remote radio heads (RRH) are physically separated, and digitized baseband complex samples are transported between RRH and BBU [4].

The centralization enables many advantages, first the number of equipment rooms for BS placement is greatly reduced, leading to CAPEX reduction. Furthermore, the facilities, especially the air conditioning, could be shared by BBUs in the same central office, leading to reduction in a OPEX of the network [2]. Then CRAN is also concerned with environmental issues.

2. Compression principles for LTE signals

In a LTE downlink signals there is many redundancies whose are inserted in order of transmit this signals over a wireless channel whose impose some distortions. Thus LTE signals has some redundancies in a time and frequency domain that could be removed.

Compression of downlink LTE signals is a process that is performed before fronthaul, it aims remove redundancies of a baseband LTE signal.

The fundamental idea of this process is remove all the redundancies in a compression module whose is inserted before the fronthaul and so that they can be reinserted after the fronthaul in a decompression module. Then the fronthaul capacity is improved.

Compression process and the proposed improvements are described in the next sections.

2.1. Remove time redundancies

2.2. Remove frequency redundancies

2.3. Clustering samples

3. Proposed method

References

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