5G Millimeter Wave – Beamforming Challenges and Techniques

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Abstract –

The 5G network is planned to serve a high quantity of mobile data traffic and a big number of wireless connections while also improving communication delay, reliability, and security. Applications such as autonomous cars, remote surgery, augmented/virtual reality games are demanding an increase in data rates. Millimeter-wave (mmWave) is one of the critical innovations to get a better data rate in 5G communications. It is the under-utilized spectrum and is now to be used for 5G networks and beyond. But there are challenges with mmWaves as they are prone to high path loss, susceptible to blockages, and fading [1]. Several cellular networks, base stations are required at very short distances to maintain the communication. There are several techniques proposed to mitigate the challenges. Going forward, Massive MIMO combined with beamforming will play a key role in 5G communication and is now a primary research area. Using beamforming wireless signal can be focused towards a targeted device instead of spreading it in all directions from a broadcast antenna. This will result in a stable, faster and reliable connection. Fine beam alignment between user and antenna is very crucial for initial access and needs to be maintained owing to the channel fading and user mobility. This paper reviews classification of beamforming that includes analog, digital, and hybrid in detail and their applications in real-time. Also, the aim of this paper is to study various beamforming methods, analyze challenges and identify the best-suited techniques that can be employed in massive MIMO frameworks [2] [3].

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