
STI07-ETI-007

Overcoming wireless communication bottlenecks by leveraging the IRS

Anne N. Munira*, Joseph Muguro and Waweru Njeri

School of Engineering, Dedan Kimathi University of Technology, Private Bag, Nyeri,
7381, Kenya, E-mail: *anne.njeri@dkut.ac.ke

Abstract

Massive MIMO (mMIMO) and Holographic MIMO are some of the approaches used for performance improvement in wireless communication networks. However, these approaches are limited by high power consumption and little control over the propagation environment. In the case of a blocked Line of Sight (LOS) scenario, the above-mentioned approaches would be less effective due to the multiple paths formed by the signal from the transmitter to the receiver. An Intelligent Reflecting Surface (IRS) is a 2D array of subwavelength metamaterials that has emerged as a potential solution to these challenges. It provides an alternative path for propagating signals resulting in an SNR that increases squarely with the number of IRS elements. The main objective of this work is to demonstrate how the IRS offers unmatched performance, particularly in blocked LOS scenarios. Blocked LOS scenarios interfere with data transmission especially where there is a need for high data rate transmissions. Current approaches to overcome the blocked LOS problem have not been cost effective due to their high-power consumption and cost. The performance of a passive IRS is investigated through MATLAB simulation and compared with the performance of mMIMO and half-duplex relays. A comparison is done for the data rate increase with the number of antennas/IRS elements for the three systems. Results indicate that the data rate of an IRS-aided system increases squarely with the number of IRS elements while that of mMIMO relay increases linearly with the number of antennas. Although the IRS can outperform the relay only if the number of IRS elements exceeds the number of relay antennas, previous studies have shown that the power consumption of an IRS is significantly lower than that of a relay with a similar number of antennas [1]. This makes the IRS an attractive solution for data rate and SNR issues in communication systems. This work shows that the IRS is a novel solution to performance bottlenecks, making it vital for current and future wireless communication systems.

Keywords: Wireless Communication, IRS, data rate, performance bottlenecks.