Institute for Digital Communications

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Internship Project

Resource Allocation Design for Simultaneously Transmitting and Reflecting (STAR)-IRS Assisted Communication Systems

Recently, employing intelligent reflecting surfaces (IRSs) in communication systems has been proposed as a promising paradigm to boost system performance. In particular, an IRS is a planar metasurface comprising a set of passive phase shifters where each element can be tuned individually to reflect the incident signals with a desired phase shift. As a result, the wireless channels can be proactively manipulated by adaptively programming the IRS. However, most of the existing works consider the case where the IRSs are only able to reflect the incident wireless signal. In this case, both transmitter and receiver have to be located on the same side of the IRS, thus leading to a half-space service zone. This geographical restriction may not always be met in practical implementations, and substantially constrains the flexibility and effectiveness of IRSs, as generally users are randomly located around an IRS.

To circumvent this issue, the novel concept of simultaneously transmitting and reflecting IRSs (STAR-IRSs) was proposed in the literature. In particular, the wireless signal incident on an element of a STAR-IRS is divided into two parts. One part (reflected signal) is reflected to the space in front of the IRS, i.e., the reflection zone, and the other part (transmitted signal) is transmitted to the space behind the IRS, i.e., the transmission zone, which leads to a flexible full-space service zone. In this internship, we consider a STAR-IRS assisted wireless communication system and aim to minimize the transmit power at the base station while satisfying the quality-of-service requirement of users. The performance improvement compared to conventional IRS assisted communication systems will also be studied in this internship.

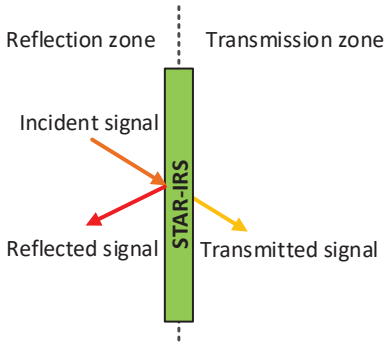

Figure 1: The concept of STAR-IRSs.

Main guidelines for the work:

- Acquisition of basic knowledge in communications and convex optimization theory
- Formulation of the optimization problem and development of a corresponding algorithm
- Verification of the adopted approach and presentation of results via simulation

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