Date:07/10/2021

What did do

1. Literature Review
    1. Before the final topic
    2. understand basic idea
    3. Some methods
    4. Glossary

Literature Review

1.1 Before the final topic

According to suggestions from my supervisor professor Xiaoli, I need to pick one paper which is relevant to her current research area. Since I am always very interested in the combination of algorithm optimization and wireless communication, after a lot of literature review, I finally decided to work on a paper which proposed a prematching algorithm which can highly increase the sum energy efficiency in the SWIPT enabled cellular network. Before I decided to work on this paper, I also do a lot of literature review about combination of Machine learning and wireless communication, however they are not quite related to Professor's Xiaoli's current research area.

1.2 Understand basic idea

The paper *Resource and Power Allocation in SWIPT-Enabled Device-to-Device Communications Based on a Nonlinear Energy Harvesting Model* main goal is to **maximize the sum EE of all D2D links in a SWIPT-enabled D2D underlaid cellular network, where D2D links reuse uplink resources and a piecewise linear EH model1 is considered for SWIPT.**

1.3 Some methods

- A special **prematching algorithm** to separate **SWIPT-enabled D2D links** and non-EH D2D links, then we maximize the EE of each potential SWIPT-enabled D2D link based on the prematching results
- **A special Iterative Algorithm** to solve the nonfractional problem
- **TLEEIA—Inner Loop Iterative Algorithm** to obtain the optimal value of $\lambda_{i,j}^{e}, P_{i,j}^{D}, EE_{i,j}^{D}$ which is the **power splitting ratio**, **transmission power of D2D link**, **Energy Efficiency** respectively

1.4 Glossary

- Cellular network: A **cellular network** or **mobile network** is a communication network where the link to and from end nodes is wireless. The network is distributed over land areas called "cells", each served by at least one fixed-location transceiver (typically three cell sites or base transceiver stations).

- SWIPT: SWIPT is **a wireless communication technique through which** it is possible to receive information and harvest energy from a received signal, and the harvested energy can be utilized for relaying of information or processing purposes.
- **Device-to-Device (D2D)** communication in cellular networks is defined as direct communication between two mobile users without traversing the Base Station (BS) or core network.
- user-equipment: like mobile phone, lap top etc..
- Resource block: In 5G, One NR Resource Block (RB) **contains 12 sub-carriers in frequency domain similar to LTE**.
- circuit sensitivity: A simple definition of circuit sensitivity is **how much a circuit characteristic changes when a component value is different**.