

Tasks for completing exercises on rule-based adaptation in the presence of a frequency-hopping interferer:

- https://vtwireless.github.io/HLSI/exercise_rule_based_ml_freq.html
- New exercise that allows users to edit adaptation code

Tasks for completing

https://vtwireless.github.io/HLSI/exercise_rule_based_ml_freq.html:

1. Ensure that when the simulation is restarted, the throughput history graph is cleared.
2. Set the signal gain to a constant value and remove the slider.
 - a. The gain should be slightly higher than the current maximum value, so that it is possible to set the bandwidth to a large value and transmit and receive at a low data rate using a low order modulation and coding combination, even when the interferer overlaps with the desired signal.
 - b. This change will allow a very simple working baseline strategy, but will also provide an incentive to increase throughput by using more intelligent adaptation.
3. Give the user a choice of adaptation strategies and parameter values, for example by using a menu or radio buttons. Options should include:
 - a. Radio capabilities / limitations:
 - i. fast vs. slow sensing capability
 - ii. high vs. low sensing threshold (e.g., due to hardware limitations)
 - b. Adaptation strategies: Automatic adaptation of...
 - i. frequency only
 - ii. frequency and bandwidth;
 - iii. frequency and modulation / error correction coding combination
 - iv. frequency, bandwidth, and modulation / error correction coding combination
 - v. As one of the strategies, can the link use a bandwidth that occupies nearly half of the band so that it can always avoid the interferer, while using a larger, constant bandwidth?
 - vi. As another strategy, can the link vary its center frequency and bandwidth to occupy the largest contiguous sub-band that is not occupied by the interferer?
 - vii. As yet another strategy, could the link use discontinuous spectrum, e.g., representative of an OFDM signal with variable subcarrier allocation (This would not be a high-fidelity simulation of OFDM, so would calculating the data rate based on total occupied bandwidth be a reasonable approximation?)

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Tasks for completing new exercise that allows users to select adaptation strategies and edit adaptation code, based on

https://vtwireless.github.io/HLSI/exercise_rule_based_ml_freq.html

Although the resulting exercise will be complex, the ability to edit adaptation code would be interesting to some students and STEM professionals who will be using the HLSI courses, so we will develop an exercise that includes this capability for the frequency-hopping interference scenario.

1. Modify the exercise https://vtwireless.github.io/HLSI/exercise_rule_based_ml_freq.html to display adaptation code for a few different adaptation strategies, and make the adaptation code editable, as in `exercise_capacity7.html` and `exercise_capacity8.html`. The static (set and do not change parameters) and frequency-hopping strategies from `exercise_capacity8.html` can be two of the options. Other options can be the same as for https://vtwireless.github.io/HLSI/exercise_rule_based_ml_freq.html, except that the user will be able to view, edit, and run the code.
2. Initially, code for all adaptation strategies used in https://vtwireless.github.io/HLSI/exercise_rule_based_ml_freq.html should be viewable and editable.
3. After students and faculty on the project and a few other people try to edit and run the adaptation code, we may determine that some adaptation strategies such as 5.b.v.-5.b.vii from https://vtwireless.github.io/HLSI/exercise_rule_based_ml_freq.html are too complex for students to edit. Only if we determine that this is a problem after trying all strategies first, we can comment out the most complex strategies or remove them from the list of strategies, and restrict the list to simpler adaptation strategies that match 5.b.i – 5.b.iv. for https://vtwireless.github.io/HLSI/exercise_rule_based_ml_freq.html.