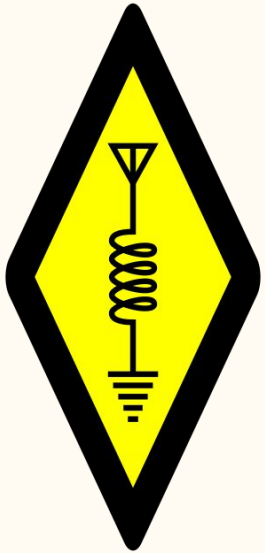
Smart Retrieval and Recommendation for Ham Radio

Pairing Users with Radios with Repeaters

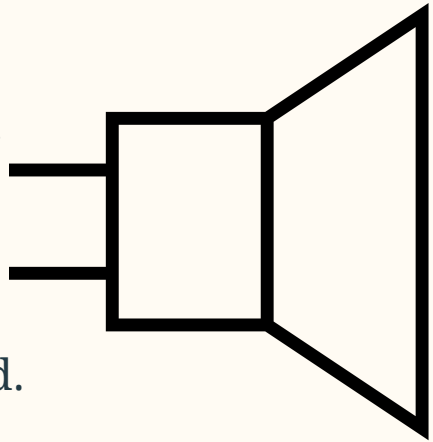
What is Ham Radio?

- A network of licensed amateur radio operators partly organized by the FCC and partly by organizations like the ARRL.
- Communication takes place in the form of talk, text, image, and International Morse Code.
- The hobby combines knowledge of electrical engineering, wave propagation, and communication protocols.
- Many amateurs rely on locally operated “repeaters”.



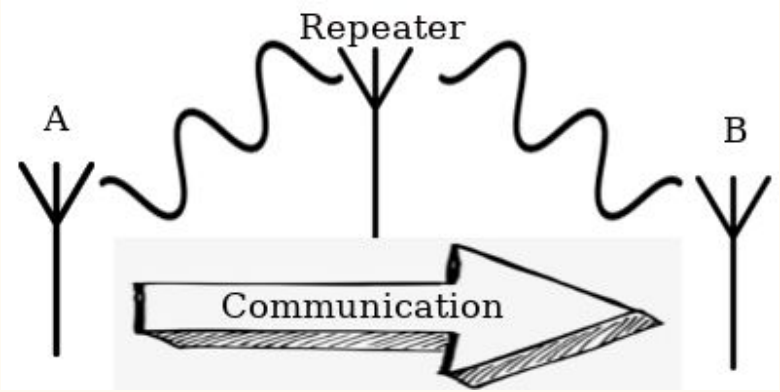
What is a Repeater?

- A repeater is a device that receives a signal on one frequency and repeats it on a another, allowing that signal to travel farther with greater clarity.
- Many repeaters are operated by local clubs and there are few online tools for finding what is available to users.
- Some radios can “talk” for thousands of miles from the transmitting station but these generally require a higher class of license to use.
- Many Ham Radio operators utilize sets which can only transmit for 20 to 50 miles, making these repeaters necessary for communicating outside one neighborhood.



Scope of Project:

- Create a searchable directory of repeaters that takes user input of a location and a token-izable query string.
- Use frequent pattern mining to generate a recommendation for the user of the most common types of repeaters in their area.
- Make these resources easily available online.



What distinguishes a Station?

- **Frequency:** the particular vibrational rate of the wave carrying a signal, expressed in Megahertz. Often separated in “bands” which are groups of close frequencies described with a wavelength. Such as:
  - 2 meter: 144 - 148 MHz
  - 70 centimeter: 420-450 MHz
  - Visible Light: 430,000,000 - 707,000,000 MHz
- **Mode:** the way that a signal is encoded into the carrier frequency. Can be analog (as with AM and FM) or digital (as with DSTAR or DMR).
- **Squelch:** a method of removing noise from voice transmissions. Common methods are tones and carrier codes.

Implementation:

- Digitize the Texas section of the ARRL repeater guide.
- Use the user-input **locations** to select a pool of candidate stations from the CSV stored on the web-server.
- Tokenize the user-input query and the candidate pool on the basis of Band, Mode, and Squelch.
- Present up to 10 stations ordered by the Jaccard similarity of the query tokens and the candidate tokens.
- Apply A-Priori pattern mining to the full pool of candidate tokens.
- Present the most frequent combinations of Band, Mode, and Squelch type.

Tokenization:

- Input strings (both query and candidate) are compared to a series of regular expressions.
- Flexibility is important because there is to universal format for inputting some information.
- Example strings which tokenize to the 2M Band:
  - “145.49”
  - “147.22 MHz”
  - “2M”
  - “2 meter”