**Algorithm Explained: Run/S&P/Unknown Classification**

Overview

This document describes the algorithm implemented in the run\_s\_p.py module for the Contest Log Analyzer application. The purpose of this algorithm is to analyze a contest log and infer the operator's strategy for each QSO, classifying it as one of three types:

1. Run: The operator was "Running," meaning they stayed on a single frequency and called "CQ," with other stations answering them. This is characterized by a high rate of QSOs on a consistent frequency.
2. Search & Pounce (S&P): The operator was tuning across the band, finding other stations who were calling "CQ," and answering them one by one. This is characterized by QSOs on many different frequencies.
3. Unknown: The activity rate on a specific band was too low to be certain. During very slow periods, it's often impossible to distinguish a slow run from a series of lucky S&P contacts. This classification adds a layer of analytical honesty, ensuring that the "Run" and "S&P" labels represent high-confidence assessments.

The algorithm is a heuristic, meaning it is an advanced estimation based on established contest operating patterns. It processes the log as a state machine, moving through the QSOs one by one and keeping track of the operator's likely current strategy. This entire process is performed independently for each band and mode.

The Two-Pass System

The algorithm works in two distinct passes to first identify the clear "Run" periods and then refine the classification of the remaining QSOs.

Pass 1: Initial "Run" vs. "S&P" Classification

The first pass uses a "sticky run" state machine to find and track run frequencies.

1. Establishing a Run: A new "Run" is officially established when the program finds 3 or more QSOs on the same frequency (within a small tolerance) within a 10-minute window. Once a run is established, the program enters a "run state."
2. Maintaining a "Sticky" Run: Once in a "run state" on a specific frequency, the program will assume the operator is still running on that frequency, even if they make a few intermittent contacts elsewhere.
   * Any QSO on the active run frequency is marked "Run".
   * Any QSO on a *different* frequency is marked "S&P".
3. Breaking a Run: The "sticky run" is only considered "abandoned" or "broken" if one of two conditions is met:
   * Timeout: The operator makes no QSOs on the active run frequency for more than 2 minutes.
   * Consecutive S&P QSOs: The operator makes 3 consecutive QSOs on a *new, single* frequency. This indicates they have likely started a new run elsewhere. Random S&P contacts on multiple different frequencies will *not* break the run.

If a run is broken, the program exits the "run state" and begins looking for a new run to be established.

Pass 2: Reclassifying Low-Rate Periods to "Unknown"

After the first pass has identified all the high-confidence "Run" QSOs, the program makes a second pass to analyze the remaining QSOs that were marked "S&P".

For each of these S&P QSOs, the algorithm checks the activity level on that specific band and mode to determine if there is enough data to be confident in the classification.

A QSO is reclassified from "S&P" to "Unknown" only if both of the following conditions are true:

1. Low Preceding Activity: The total count of QSOs on that band and mode in the 15 minutes immediately before the current QSO is less than 4.
2. Low Following Activity: The total count of QSOs on that band and mode in the 15 minutes immediately after the current QSO is also less than 4.

If the QSO rate in either the preceding or following window is high enough, the program considers the context sufficient to be confident in the "S&P" classification, and the label is not changed. This two-pass system ensures that the final "Run" and "S&P" labels represent periods of clear, high-confidence operating strategy.