Dynamic Beacon Scheduler (ACAB)

1 Formula (only density)

1.1 Normalized Density Factor

First, we calculate a normalized density factor f based on the number of neighbors:

$$f = \min(1, \frac{N}{N_{th}}) \tag{1}$$

Where:

- N is the current number of neighbors
- N_{th} is the threshold (set to 15)

1.2 Squared Factor

Next, we square the factor to increase the effect of density:

$$F_q = f \times f \tag{2}$$

1.3 Base Interval

The base interval is calculated as:

$$BI = BI_{min} + F_q \times (BI_{max} - BI_{min}) \tag{3}$$

Where:

- BI_{min} is the minimum interval (0.2s or 0.5s)
- BI_{max} is the maximum interval (5.0s)

1.4 Jitter

A random jitter is applied between -0.5 and 0.5:

$$BI_{final} = BI \times (1 + jitter) \tag{4}$$

1.5 Final Bounds

The final interval is constrained:

$$BI_{final} = \max(BI_{min}, \min(BI_{final}, BI_{max})) \tag{5}$$

2 Formula (density + contact)

The contact score is:

$$Cs = \max(0, 1 - \frac{\Delta t}{20}) \tag{6}$$

where Δt is the time (in seconds) since the most recent neighbor contact. The final score is a weighted sum of density and contact scores:

$$S = w_d \cdot f + w_c \cdot Cs \tag{7}$$

where w_d and w_c are weights (for example, $w_d = 0.7$, $w_c = 0.3$). Then, as before, the interval is:

$$F_q = S^2 \tag{8}$$

$$BI = BI_{min} + F_q \times (BI_{max} - BI_{min}) \tag{9}$$

Jitter and bounds are applied as in the previous formula.