Artificial Bee Colony Algorithm for DNA Fragment Assembly Problem

Sameer Ravi and Jesun Sahariar Firoz
DNA Sequencing Process

1. Duplicate and Sonicate
2. Sequence
Error can occur in terms of insertion, deletion, substitution!!
Artificial Bee colony Algorithm (ABC_FAP)

• Behavior of a Honey Bee Swarm:
  ✓ Food Sources
  ✓ Employed foragers
  ✓ Unemployed foragers: scouts and onlookers
**Algorithm 1** Generic ABC Algorithm

1: Initialize potential food sources for employed bees.

2: while Requirements are not met do

3: Each employed bee goes to a food source in her memory and determines a neighbour source, then evaluates its nectar amount and dances in the hive.

4: Each onlooker watches the dance of employed bees and chooses one of their sources depending on the dances, and then goes to that source. After choosing a neighbour around that, she evaluates its nectar amount.

5: Abandoned food sources are determined and are replaced with the new food sources discovered by scouts.

6: The best food source found so far is registered.

7: end while
Artificial Bee colony Algorithm (ABC_FAP)

• **Initialization:**
  ✓ Food Source => A permutation of fragments
  ✓ Generated randomly (No seeding technique involved)

• **Calculate Fitness:**
  ✓ By summing up the overlap amount of consecutive fragments.

\[
F_{\mu} = \sum_{i=0}^{n-2} w(f[i], f[i + 1]),
\]
Artificial Bee colony Algorithm (ABC_FAP)

- Memorize the best solution.
- Send Employer bees
  - Estimate nectar amount => evaluate fitness
  - Modify the solution using Problem aware local search (PALS).
  - Apply best movement.

\[ i \downarrow \begin{array}{cccccccc}
5 & 4 & 8 & 1 & 7 & 3 & 6 & 2 \\
\end{array} \]

Reverse

\[ i \downarrow \begin{array}{cccccccc}
5 & 4 & 3 & 7 & 1 & 8 & 6 & 2 \\
\end{array} \]
Experimental Results
Questions?