Flux Scanning based on Enforced Objective Function

The Flux Scanning based on Enforced Objective Function (FSEOF) method is a technique employed to identify genetic modifications that can enhance the production of a desired metabolite in a target organism.

Overview of FSEOF

1. **Objective**:
    - The main goal of FSEOF is to identify gene knockout or overexpression targets that can increase the flux towards a desired product in a metabolic network.
2. **Methodology**:
    - **Step 1**: Set the objective as maximizing the production of the desired metabolite in the FBA model. This is done by modifying the objective function to include the desired metabolite.
    - **Step 2**: Constrain the production of the target compound from 5% to 95% of the value calculated previously, using the growth rate as objective function
    - **Step 3**: Identify reactions whose flux increased/decreased consistently.
    - **Step 4**: Filter the reactions identified with flux variability analysis simulations. Consider reactions that satisfy: vmaxj ·vminj > 0
    - **Step 5**: For each reaction, perform an overexpression simulation (e.g., 1.2x) using an appropriate method (e.g., MOMA). Determine the phenotypic evaluation funcion, defined as:
        i. $$f_{ph} = \frac{v_{carotenoid,OE}}{v_{carotenoid,WT}} \cdot \frac{v_{biomass,OE}}{v_{biomass,WT}}$$,

        where vcarotenoid are the production rates of the target carotenoid, biomass are the growth rates. OE and WT design for overexpression and wild-type, respectively.