Aromatic pollution has become a world-wide concern. Widening the power of synthetic biology, the Peking iGEM team has developed a biosensor toolkit to monitor aromatics in the environments. We first applied a bioinformatic method to select a promising collection of aromatic-sensing biosensors. We selected a collection of biosensors optimized for aromatics, which analysed complex samples. Aiming at comprehensive detection, metabolic enzymes, functioning as Adaptors were incorporated into our toolkit to further expand detection profiles. Furthermore, a genetic "Band-pass Filter" was rationally designed to implement efficient semi-quantitative detection.

Biosensors

The core component of our biosensor toolkit is the collection of promising aromatics-responsive transcriptional regulators. An automated bioinformatics method was developed to mine potential regulator candidates from protein databases. Optimal candidates that serve our purposes best were manually determined for construction of biosensor circuits.

Multi-component Analysis

Considering the complex aromatic components present in practical samples, it is essential to confirm that the performance of a particular biosensor is NOT interfered with irrelevant aromatic compounds. Equipped with the comprehensive collection of fine-tuned biosensors in our toolkit, complex multi-component analysis can be implemented.

Adaptor

Aromatics-metabolizing enzymes were gleaned from natural metabolic pathways and coupled with biosensor circuits to function as ‘Adaptors’ to convert undetectable aromatics into detectable molecules.

Band-pass Filter

A band-pass filter is a genetic device that responds only to a specific range of input concentration.

Human Practice

In order to evaluate the aromatic pollution in China, the Peking GEM team has conducted a series of investigations including survey, factory visit, interview and practical analysis.

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