BBF RFC97: Genetic Circuit Standard 2.0

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1 Purpose

This BioBricks Foundation Request for Comments(BBF RFC) proposes a standard definition and sharing convention for Genetic Circuit which represents an functional independent biological module, in order to make composite parts and device in the Registry of Standard Biology Part more complete, to make genetic circuits precise, organized and sharable. The database and sharing platform of genetic circuits can be found at http://www.sustc-genome.org.cn/igem2013/.

2 Relation to other BBF RFCs

BBF RFC 97 does not update or replace any earlier BBF RFC. The RFC(Request for Comments) is a new proposal for the standardized definition and content of genetic circuits.

3 Copyright Notice

4 Introduction of Genetic Circuit Standard

Current, the Registry of Standard Biology Part set the explicit definition for biological part, that a biological part is a sequence of DNA which encodes for a biological function, for example a promoter or protein coding region. As well, there is well adopted documentation about the definition and information of a biological part in the Biobricks Foundation. We can use these parts to assemble together to build composite parts and devices to conduct some operations in cells. Also, these functional composite parts and devices are documented and stored in the Registry.

The philosophy of the Registry, the open community, is "Get & Give &Share" and make biology easier to engineer. When the "engineering parts" are well stored, documented and provided for researchers, there is a necessary to store and share "engineering designs", which we call Genetic Circuit.

Just like the Registry of Standard Biology Part, in order to store and share Genetic Circuit, we need a standard definition of what it is, a documentation of what information is stored with it, and a sharing convention of how we share it.

5 Definition of a Genetic Circuit

1) A Genetic Circuit is a circuit which could conduct operations and achieve specific function(s) in cell independently.

2) A Genetic Circuit is constructed on one or more than one expression vectors.

3) A Genetic Circuit is composed of different coding frames. A coding frame is a complete coding region which consists of promoter, RBS, coding sequence and Terminators. And a coding frame can express product independently in specific environment.

4) A Genetic Circuit is a logical regular system based on its own regulatory relationships among the coding frames and the outside molecular signals.

5) A Genetic Circuit has predictable inputs and outputs, conducting predictable operations in controlled condition.

6 Information stored with a Genetic Circuit

6.1 Basic Information

1) **Genetic Circuit Name**

A Genetic Circuit has a name, indicating its basic function.

2) **Description**

The Description of a Genetic Circuit contain following information: The function or purpose of the Circuit, and the statement of how does it work in molecular mechanism.

3) **Application**

The application of this Circuit give aspects in environment, medicine, manufacture and agriculture in which this circuit can be applied.

4) **Chassis**

The Chassis show what microorganism the Circuit is constructed in, such as E.coli, Yeast, Bacteriophage and Bacillus subtilis.

5) **Plasmids**

The Plasmids show what plasmids the circuit is constructed on, and the number of plasmids may be more than one and the plasmids may be specific or not specific.

6) **Biobricks**

Biobricks show those biobricks submitted to the Registry which was used in the circuit construction.

6.2 Circuit construct

1) **Coding-Frames**

   The Circuit consists of different coding-frames, and a coding frame is a complete coding region which consists of promoter, RBS, coding sequence and Terminators. Those information will be stored here.

2) **Biobricks Assembly**

   It shows the assembly order of different biobricks used in the Circuit, in order to provide information for researchers to reconstruct this circuit.

3) **Circuit Sequences**

6.3 regulatory relationships

1) **Coding-Frame Expression**

   The Coding-Frame Expression shows the substances expressed by different coding-frame in the Circuit.

2) **Relationships between substances**

   It shows the relationships between substances, which are parts in the Circuit, or expressed by coding-frames, or molecules in environment. The relationships consists of source, target and product effecting in different types such as activate, inhibit, or combine.

3) **Logic Gate**

   It shows The genetic logic gate used in the Circuit. Genetic Logic Gate is defined and standardized in RFC 102 submitted by us.

6.4 Input and Output of the Circuit

1) **Input**

   The Input shows any irritants that stimulate the Circuit, such as substances in environment, molecular signals, light or magnetism.

2) **Output**

   The Output shows any reports or products resulting in the controlled input, suck as GFP, concentration of bacteria, or specific products.

3) **Measured data**

   The Measured data show the practical output data responding to input change in measurement.

4) **Simulate Model**

6.5 Experimental protocol

The experimental protocol of different circuit construction steps, as well as measurement methods

6.6 The evaluation of the Genetic Circuit

All the Genetic Circuits SHOULD be given a probable evaluation. At present, we have three ranks. In the future, we will complete the evaluation standard.

1) The 1st rank: The circuit is reported to be functional in peer-reviewed journals.)

2) The 2nd rank: The circuit is reported by one iGEM team and independently successfully reproduced by another iGEM team.

3) The 3rd rank: The circuit is reported by one iGEM team and the whole circuit is measured successfully.

4) The 4th rank: The circuit is reported by one iGEM team and the devices in the circuit is measured successfully, but the system is not constructed.

5) The 5th rank: The circuit is designed by one iGEM team, but these is no successful measurement.

6.7 Reference

The reference shows the source project, the author and Journal Citation. If the project has its own wiki, the URL will be provided as well.

7 How the Genetic Circuit will be shared

Since genetic circuits was widely scattered in different projects, deeply concealed in different journals and wikis, a central database and sharing platform is needed. The Circuit+ community (http://sustc-genome.org.cn/igem2013/) is put up in this purpose and calls for your submitting.