# Generation of Random Shapes for Modular Robots

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The main goal of this project is to develop a generator of random shapes for modular robots, and integrate it into an existing modelling framework.

## Context

Modular robots are composed of entities that are able to compute and communicate with their neighbors by using sensors and actuators. We consider modular robots, which are either shaped and handled by the user (such as Blinky Blocks), or capable of sliding along the faces of their neighbours (as simulated in VisibleSim). These systems perform dynamic changes depending on their execution environment (activated or desactivated entities), and the individual goals of the entities may change as well.

## Project goals

As part of a previous Master project we have developed a model of robots composed of Blinky Blocks using DR-BIP [2] — an extension of the BIP [1] component-based design framework for dynamically reconfigurable systems. However, the initial shape of the robot must still be defined statically by the user.

The **first goal** of this project is to design a generator of random shapes for modular robots, satisfying a set of user-defined constraints. The **second goal** is to integrate this random generator into the DR-BIP model and validate it through the simulation of power distribution through robots of different shapes.

## Benefits

You will learn the principles of rigorous system design based on formal operational semantics and get an in-depth understanding of BIP, a state-of-the-art component-based framework. Successful internship can lead to a research publication.

## Required skills

Good analytical skills will definitely be required. The candidate must have good understanding of Finite State Machines and some experience in C++.

## Location

The internship will be carried out at the Spirals project team at Inria Lille – Nord Europe under co-supervision by Simon Bliudze and Olga Kouchnarenko

([FEMTO-ST institute](#)).

## Contact and application

For additional information and to apply please send an e-mail to [Simon Bliudze](#) and [Olga Kouchnarenko](#) (in English or French) with the subject "Modular robots internship".

## References

1. Ananda Basu, Saddek Bensalem, Marius Bozga, Jacques Combaz, Mohamad Jaber, Thanh-Hung Nguyen, and Joseph Sifakis: Rigorous component-based system design using the BIP framework. *IEEE Software* **28**(3):41–48 (2011) [[Website](#) | [PDF](#)]

2. Rim El Ballouli, Saddek Bensalem, Marius Bozga, and Joseph Sifakis: Programming dynamic reconfigurable systems. *International Journal on Software Tools for Technology Transfer* (2021) [[PDF](#)]