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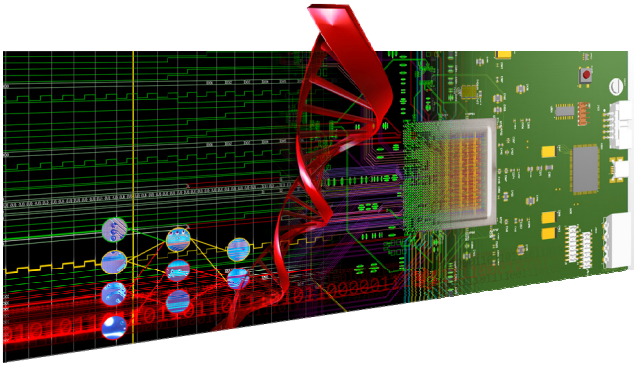

HIPERBIO

High-**pe**rformance **r**econfigurable computing toolset for **bio**informatics applications

Abstract of the project

HiperBio is a High-Performance Reconfigurable Computing set of tools and methodologies for the development of hardware accelerators for Bioinformatics and Computational Biology (BCB) applications.
Focusing on their structural parallelization and pipelining, four industrially relevant applications representing a wide spectrum of BCB problem domains have been implemented: the PLINK algorithm focused on the Single Nucleotide Polymorphisms (SNPs) association, an evolutionary fuzzy-logic based disease diagnosis application, a version of the Growing Neural Gas algorithm and finally an evolutionary-based functional modeling of gene regulatory networks.
These specific solutions have then been generalized to extract principles, ideas and building blocks that could be used to ease the process of developing further hardware accelerators for BCB (or other) algorithms such as sequence alignment, motif search, functional network simulation, etc.

Valorization

This project enabled us to acquire new skills and know-how for the implementation of hardware accelerators dedicated to BCB applications and familiarized us with their inherent specificities. We also got used to the CoDeveloper environment which pointed the pros and cons of the co-design development methodology, thus enabling us to be more efficient in deciding or not to use such a tool in the conduct of any further project.

The tools and building blocks developed within this project could be the basis for future collaborations with several companies or institutions specialized in BCB applications. Some contacts have already been established with such groups that could be interested in the outcome of this project. Moreover, during the course of this project, some of its results were already successfully used within the framework of an ongoing collaboration with a major multinational company.

The possible follow-up would consist in more detailed and specific optimizations of the general principles extracted from this project and the tailoring of the general solutions proposed to the specific needs of targeted institutes and private companies. Additionally, even if the framework of this project was especially focused on BCB applications, its results could also be used for different kinds of algorithms sharing some of the specificities of BCB applications such as the high amount of data transfer, the simple computational cores, etc. As a result, the outcome of this project could also raise an interest in companies which are not directly in the BCB field.

Finally, we already presented some parts of this work in an international conference, and we think there is enough novelty remaining that could be worth to be proposed to pair reviews.

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This project was done at the **R**econfigurable & **e**mbedded **D**igital **S**ystems institute (ReDS) of the Heig-vd.

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