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SimCardioTest - Simulation of Cardiac Devices & Drugs for in-silico Testing and Certification

SIM CARDIO TEST

Technical Report
D1.3: Cloud-based platform for pacing device simulation

Work Package 1 (WP 1)
Model Standardisation & Interoperability

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PUBLIC

DELIVERABLE INFORMATION

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EXECUTIVE SUMMARY

A first version of the SimCardioTest cloud-based in-silico trials platform is released as a milestone of the SimCardioTest project. Specifically, the platform has been developed to host the three Use Cases developed within the project, and a user-friendly interface for each Use Case has been created. Users will be able to sun simulations on the browser leveraging the models created by the SimCardioTest partners.

This deliverable consists in a recorded demo demonstrating the first version of the cloud-based platform developed for Use Case 1, showing pacing device simulation, available on Youtube: (141) SimCardioTest UC1 demo video showing pacing device simulation. - YouTube and on SimCardioTest website: In-silico trials – SimCardioTest

1- Introduction

In WP1, a cloud-based in-silico trial platform has been developed to host the three Use Cases developed within the project, and a user-friendly interface for each Use Case has been created. The interface serves as the interconnection layer between the models developed by the SCT partners and the input provided by the user through the web-interface. With this cloud-based platform, users will have the ability to run model simulations by simply accessing the platform via any browser, without the need of computational expertise and solvers/IT infrastructure. Also, users cannot download or modify the original models, thus preserving the intellectual property of the model creators.

In this deliverable, the UC1 cloud-based platform is presented. The workflow has been developed by IST in close collaboration with WP2 partners, who provided support to the integration of the model, as well as suggestions, feedbacks and comments on the user interface throughout the development process.

2- Objectives

This deliverable consists in a recorded demo demonstrating the first version of the cloud-based platform for pacing device simulation. This tool includes three different pipelines built upon the electrophysiology model developed by Inria and UBx. These are: 1) Energy thresholds, 2) Population statistics (in silico trial), and 3) Sensed signal. These pipelines are already described in D2.1.

The electrophysiology pipelines aim at computing some key numbers related to the electrical functions of cardiac leads. The workflow answers three practical questions, so that it implements three computational pipelines that share the same software and types of inputs.

In each of these pipelines, the inputs required by the user are numbers or choices from a drop-down list, which are collected and passed to the back-end infrastructure, where the model is solved using the solver CEPS. When the simulation is finished, results are stored in the database and can be viewed through a specific user interface which has been designed specifically for each Use Case.

Moreover, user access and management have been implemented, as well as the possibility to monitor the status of an ongoing simulation and to retrieve the results of all simulations previously run, which are securely stored in a private database within the dedicated SimCardioTest environment.

3- Methodologies

To develop the platform, the following activities have been performed:

- Demos, meetings and documents exchange with UC1 partners to discuss and agree on a final simulation workflow
- Setup of a dedicated, isolated and white-labeled environment for SimCardioTest
- Creation of Login page and user account management
- Implementation of the standardised pipelines for Use Case 1 into cloud-based high-performance computing clusters (making use of Microsoft Azure virtual machines)
- Creation of all required interfaces, from homepage to model results
- Implementation of the CEPS software on the virtual machines and model integration in the workflow

- Definition and mapping of input and output parameters in the web-interface and in the model
- Use Case testing and bug fixing

4- Results

The result of the activities described is shown in the video recording available on Youtube/ SimCardioTest channel: SimCardioTest UC1 demo video showing pacing device simulation. - YouTube and on SimCardioTest website: In-silico trials – SimCardioTest

5- Conclusion

In this deliverable, we presented the demo of the cloud-based platform for pacing lead devices.

The platform has been created by integrating the UC1 electrophysiology pipelines within a dedicated cloud-based environment. Following steps foreseen until M48 will include the refinement of the platform and running in-silico trials.

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