

# On The Use Of Digital Twin Technology Arielle For The Development Of New Generation Perinatal Life Support Systems

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# ON THE USE OF DIGITAL TWIN TECHNOLOGY *ARIELLE* FOR THE DEVELOPMENT OF NEW GENERATION PERINATAL LIFE SUPPORT SYSTEMS



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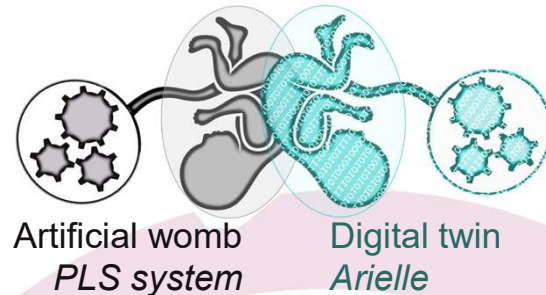
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## Introduction

Perinatal Life Support (PLS) consortium is developing an artificial womb (PLS system) to **increase chance of survival of extremely preterm infants** (<28 weeks of gestational age). To develop such a complex medical device, knowledge from multidisciplinary fields must integrate into one single system. Mathematical models are used to support this integration by composing a digital twin of the system, named *Arielle*, to allow computer simulations of the device. *Arielle* is connected with a manikin to support clinical implementation. For this purpose, a new model named *Arielle* is proposed as digital twin of the *PLS system*. This study presents possible applications of *Arielle*.

## Methods

- Literature search
- Interviews with clinicians and medical engineers



## Results

First the purposes of *Arielle* are defined and a concept of *Arielle* and manikin is developed to test and analyze these purposes:



### Gaining knowledge

*Arielle* should be able to help gaining the necessary knowledge to create an optimal environment for fetal development.



### Mechanical components

*Arielle* should simulate the properties and interactions of components of the PLS system to optimize their desired effect on the status of the fetus.



### Monitoring

*Arielle* should be able to monitor and interpret vital signals of the fetus once integrated in the *PLS system*.



### Decision support

*Arielle* should allow patient specific decision support to inform the user to optimize settings of the *PLS system* and support interventions.

## Discussion

To support the development of the *PLS system*, *Arielle* should be able to simulate the fetal physiology and the *PLS system* to gain knowledge of the fetal physiology and optimize components. When the PLS system is implemented, *Arielle* should be able to interpret vital signals and as a patient specific decision support. Future work focuses on the development and evaluation of *Arielle* with respect to the defined goals.

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