The Institute of Applied Dynamics is looking for a student who is interested in the topic:

master / phd thesis in
finite-element based modelling of cardiac electromechanics – new approaches to help a diseased heart

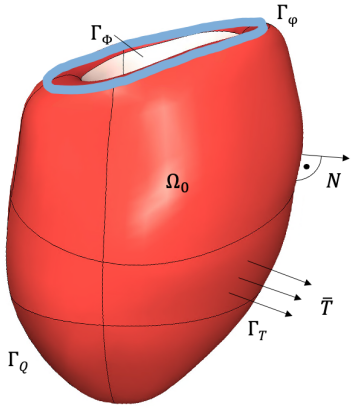
Cardiovascular diseases (CVDs) remain the leading cause of death worldwide. The World Health Organization estimates 18 million deaths caused by CVD each year.

Computational models, especially finite element models, describing the electromechanical process in living hearts help to understand disease mechanisms and to improve overall diagnosis, efficient treatments of patients as well as the development of medical devices for all types of heart disease – they are able to save time and costs. The cardiac electromechanics of a living heart comprises the electrical signal, so called electrical potential, which is transmitted through the heart and triggers the contractions of the muscle cells. Consequently, the heart pumps the blood from the right and the left ventricles into the pulmonary and cardiac system, respectively. In diseased heart, e.g. after myocardial infarction, the heart becomes insufficient and the pump capacity and ejection fraction are reduced. One possible therapy is to support the heart mechanically in order to improve the heart functionality.

The aim of this master / phd is divided into two steps: firstly, a temporal varying pressure distribution on the outer surface of the left ventricle (epicardium) should be modelled such that the ejection fraction (how much blood the left ventricle pumps out with each contraction) in the diseased heart is increased and reaches the physiological value. Secondly, an appropriate material which can develop the needed pressure on the epicardium should be modelled in the finite element setting.

Qualification

- independent working
- interests in biomechanics and finite element simulations
- technology/pure sciences studies (engineering, medical technology, physics, mathematics ...)
- knowledge in continuum mechanics
- programming experience in Matlab or C/C++ or Python, finite element simulations
- basic experience in Abaqus (would be perfect, but not mandatory)



Starting date

- as soon as possible

If you are interested or need more information, please email denisa.martonova@fau.de.