Development of a myocardial perfusion phantom

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Revision 0.100

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Thursday 14th February, 2019

Preface

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Enschede, 13th of February 2019

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1 Introduction

Myocardial Perfusion Imaging (MPI), or, simply put, the imaging of the blood flow in the heart muscle, plays an important role in diagnosing heart failure or detecting Coronary Artery Disease (CAD). Imaging systems like Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Single-Photon Emission Computed Tomography (SPECT), or Positron Emission Tomography (PET) can visualise a (radioactive) contrast bolus in the supplying arteries and in underlying myocardial tissue, whose flow can give an indication of narrowed or blocked blood vessels.

Many variations in the visualisation process of myocardial perfusion, including variations in hard- and software, can (significantly) influence the outcome and in turn have consequences for patient treatment. These variations need to be validated against a well-known baseline.

A myocardial perfusion phantom will be developed that is able to simulate the blood flow in the heart muscle, i.e. the myocardium, and is able to mimic cardiac defects like (significant) stenosis.

Document overview

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Abbreviations

CAD Coronary Artery Disease

CT Computed Tomography

MPI Myocardial Perfusion Imaging

MRI Magnetic Resonance Imaging

PET Positron Emission Tomography

SPECT Single-Photon Emission Computed Tomography

2 Concept design

The concept designs are based on the mind map, shown in appendix A.

Table 2.1: Concept overview

	Concept 1	Concept 2	Concept x
Myocardium	Shape		
	Model		
Modality			
Design			
Tracer			
Flow	Generator		
	Supply		
	Disposal		
	Configuration		
	Type		
	Perfusate		

2.1 Global restraints

This section describes the global restraints on the concepts, as stated in the system requirements.

2.1.1 Myocardium

To ensure compatibility to the clinical software, 4DM, the myocardium's cross-sectional shapes must be physiological; i.e. the

2.1.2 Modality

2.1.3 Disposal

3 Detailed design

A Appendix: Mind map

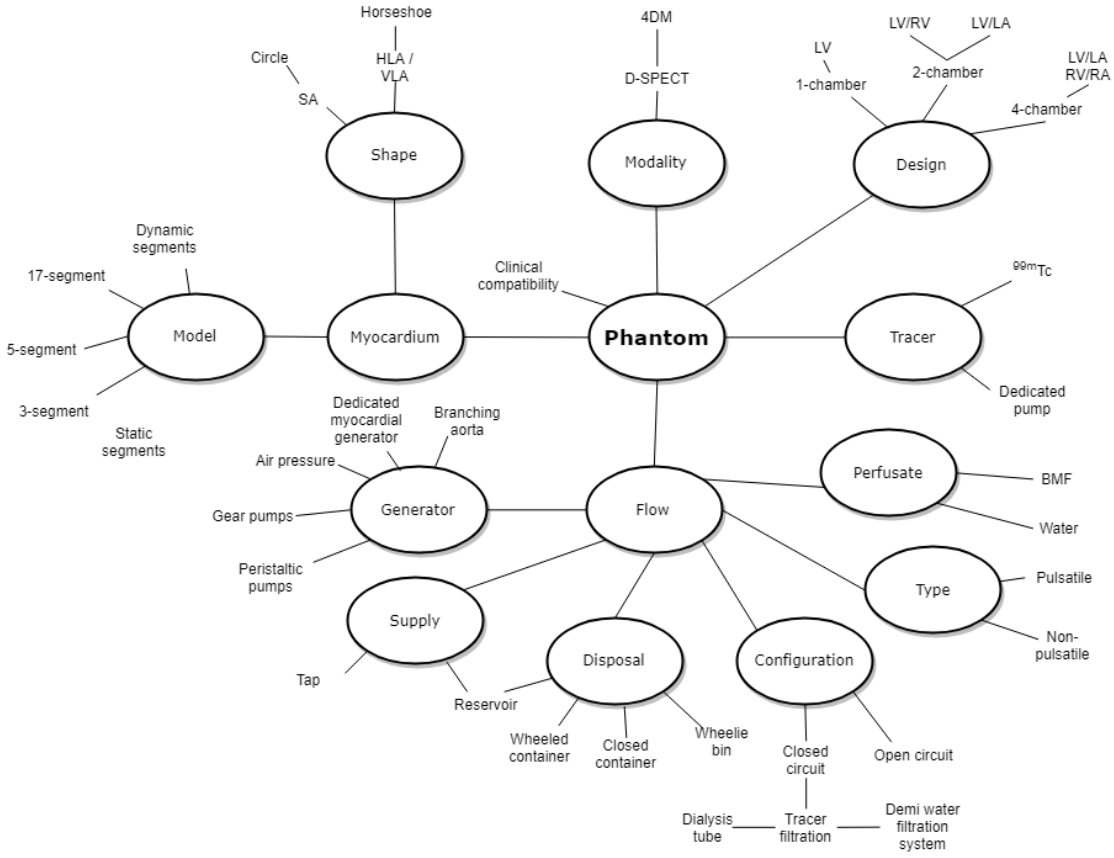

Figure A.1: Mind map for concept designs