Expose:

The main purpose of medical professionals is to treat patients but over the years the documentation burden of medical professionals has dramatically increased.**{Beleg?}** ~~Documenting~~ the ~~patient~~ history is ~~of cause~~ important for future treatments and to establish a history of responsibility for every diagnosis and treatment. ~~But if we could reduce~~ the time of medical professionals spend on administrative tasks ~~we~~ would increase the time spend with patients and the number of treated patients ~~by each medical professional~~.

The analyses of blood flow in the aorta could become an essential diagnostic tool in the near future to identify mitral valve abnormalities, aorta wall calcification, thrombus formation, aorta wall thinning and a host of other critically important conditions ~~in an elderly society~~. But it is currently not widely utilized in clinical practice. One of the reasons ~~for that~~ is that the analysis and documentation of time depended 3D data is time consuming ~~and has to be done by specialized personal e.g. Radiologist and Cardiologists~~. This work is ~~trying~~ to reduce the documentation workload ~~for those professions~~.

Currently after analysing the blood flow in the aorta and diagnosing either some kind of disease or the absence of the same, a medical professional has to document his findings in the patient's document via representative a image of the blood flow. ~~But~~ since the aorta flow data is a 4D dataset consisting of 3D objects changing over time~~,~~ It is time consuming to find a viewpoint and a fitting point in time ~~so that a snapshot would~~ accurately document the findings.

Automating the process of finding a medically interesting time point and choosing a ~~desirable~~ camera position to capture ~~the disease typical abnormality~~ is subject of this work. The first step ~~in achieving this~~ is to ~~build the capability to~~ visualize the dataset and to explore it with a free moving camera ~~controlled by mouse and keyboard~~ as well as implementing an efficient way to step through the different time points. Furthermore the visualisation should be able to ~~swap~~ between ~~the~~ different ~~five different data modi~~.

The second step is to identify interesting time points for each imaging modality. **{Was macht eine stelle interessant???}**. The naive approach of ~~simply~~ choosing the time point in each ~~imaging modus~~ which displays the highest value of the current metric ~~is probably a good~~ starting point to finding diagnostically relevant points in time. ~~But~~ this method alone could result in ~~time points being chosen that only show salt and pepper noise~~. ~~To prevent that some kind of global parameter has to be established to measure if the single high value is just an outlier.~~ ~~To clarify: for instance a single high pressure value is probably not important but higher then usual pressure over a large area of the aorta is probably connected to some pathology~~.

The third step is to find a suitable camera position at a given time point to ~~document the 3D object~~ and to display important blood flow behaviour. In a first processing step a rough camera position will be determined via analytical analysis of the 3~~d~~ object. This could be done by utilizing a PCA ~~which can~~ identify the first ~~2~~ ~~Basis vectors, if we now place~~ the camera ~~orthogonal to the plane created by the basis vectors we should directly point at the most interesting part of the object~~. A first approximation of the distance above this plane for the camera could be done calculating coordinates above of the mentioned plane that would still make it possible to view all pixels with a given field of view. From this rough position imaged based ~~analyse methods~~ **{was für welche? ← hier fehlt noch literature(muss noch suchen)}** will then fine tune the camera position to its final point.

After combining the camera position algorithm with the time point algorithm we will be able to create snapshots of ~~hopefully~~ medically relevant parts of the 4D ~~D~~ataset. ~~But to know if the found snapshots can compete with the snapshots that a medical professional would choose our solution hast to be evaluated~~.

We propose a two part evaluation scheme. In the first part a group ~~people familiar with medical imaging~~ will be presented with the visualisation of the 4D data and ~~they will be~~ tasked to a find medically interesting time point and camera position ~~using a keyboard and mouse driven free floating camera~~. The performance of the automatic ~~found~~ camera position will be evaluated by a distance measure ~~between~~ the position found by the ~~test group and the automatically determined position~~.

In the second part the test group will presented snapshots ~~determined automatically~~ and snapshots ~~at random time points and at random camera position of the same dataset~~. The test group ~~has then~~ to decide which snapshot would capture ~~a better summery of~~ the relevant information. ~~To call the automatic camera position project a success significantly more people from the test group have to choose the automatically generated snapshots then the random ones compared to random choice.~~

The work on this project will start in September and according to examination regulations of the Faculty of Electrical Engineering and Information Technology the work has to be completed ~~in a maximum of~~ 20 weeks. This means the latest this work will finish is in February of 2020.

~~**{schlussworte?}**~~