Examination protocol IMIP, September 26, 2014

ECTS: 7.5

Examiner: Dr.-Ing. Andreas Maier

Assessor: I didn't know

Duration: 40 min

Result: 1.3

- To start with, give an overview of the topics covered → Draw the "IMIP Cloud" from the lecture

- Dynamic Density Optimization, what is that actually? What do you do there? → Scatter correction. Gaussian filter with a large σ, then subtract the filtered image from the original.

- What is the structure tensor? What does he say? → Structure Tensor provides information about the gradient orientation in a local environment. Definition written down, gradient vector is multiplied by itself. Explains that a Gauss filter is applied to it to get two eigenvalues ≠ 0. Without filters, the rank of the matrix would be 1, i.e. only an eigenvalue ≠ 0. Then cornerness is explained based on the distinction between the two eigenvalues.

- What is it like when you want to recognize vessels? You also compare eigenvalues, how is that exactly? → explain Vesselness filter → eigenvalues of the Hesse matrix are compared. The difference between the structure tensor and the Hesse matrix is the use of the second derivative to obtain the curvature. → Case distinction explained on the basis of the eigenvalues, formulas for S and Rb written down. S = sqrt (λ1 ^ 2 + λ2 ^ 2) and Rb = λ2 / λ1 For Rb I had swapped the two eigenvalues, but it wasn't that dramatic. → Determination of the "Vesselness" value was still required, I didn't know the exponential function, but it wasn't that bad. In the end it is a Gaussian curve so that you get values between 0 and 1

- Then explain to me what the epipolar geometry is → picture drawn and explain that the point can be projected from one image plane into the other image plane by means of translation and rotation. → The epipolar constraint is then derived from this

- You have now mentioned factorization in the summary. How exactly does that work? Where do you apply that? → Used for 3D ultrasound. Take several pictures of a 3D object, whereby the respective 3D point must be included in each picture. → If the projection is perpendicular to the image plane, then mapping onto the two main axes of the image plane is explained using unit vectors u and v. → Structure of the measurement matrix explained → The last thing was the factoring algorithm, i.e. SVD (M) and forcing from rank 3 via the singular values and submatrices of U and V. He then wanted to point out that the factorization of the measurement matrix is not clear, in the end I wrote that down, but it took a while. In the end, everything went well.