Overview topics for exam

1+3

- Core task of image processing (introduction)
- Properties of the scalar product (intermediate angle, projection)
- Properties of homogeneous coordinates and vectors
- Set up 2D straight lines and 3D planes in homogeneous coordinates
- Intersections of 2D lines and 3D planes in homogeneous coordinates
- Be able to determine 2nd order curves (circles, ellipses)

- Being able to describe central projection and complete transformation via the projection matrix/calibration matrix
- Know and be able to explain parameters and models (extrinsic, intrinsic)
- Projection of surfaces/homography
- Know the sequence of the different calibration procedures and the meaning of the individual steps (including radial distortions)

- Know the parameters of the lens and be able to apply the basic law of ray optics (thin lens).
- Explain effects of the lens: Depth of field/depth of focus, aberrations.
- Radio and photometric quantities
- Types of illumination
- Digital camera: realization of color images and digitization errors

- Interpret images as NxM dimensional vectors
- Decomposition of images into basic images
- Be able to explain singular value decomposition
- Images in spatial and wave number space
- Properties of the discrete Fourier transform
- computational advantages via Fourier transformer and/or separability
- Difference convolution and correlation/filtering, edge treatment
- being able to calculate with correlation/folding e.g. number of multiplications and sums

- Be able to explain histograms
- Normalization possibilities of image data sets via histograms
- Difference between forward and backward transformation,
  know transformation models (affine etc.)
- Properties of different types of interpolation
- Properties and differences of smoothing filters (quality vs. computational effort)
- Properties and differences of edge filters (regularized edge filters)
- Being able to assign names of filters to the function
- Possibilities of edge extraction. Being able to explain procedures
- being able to explain rank order filters, names, function and their application
- being able to explain Hough transformation
- being able to know and to explain the steps of Canny-Edge Detector
- being able to explain the Structur Tensor, the different corner detectors and the coherence measure