**TWB793: Toets 2: Riglyne (2019)**

**TWB793: Test 2: Guidelines (2019)**

## H6 Kleurverwerking

(1) Jy moet die RGB-, CMY(K)- en HSI-kleurmodelle (en die verband tussen hierdie modelle) kortliks kan bespreek. Jy moet ook weet hoe hierdie modelle met die CIE chromatisiteitsdiagram verband hou.
(2) Jy mag pseudo-kleurverwerking uitlaat.
(3) Jy moet weet wanneer volkleur-algoritmes ook komponentsgewys toegepas kan word en wanneer nie.
(4) Jy moet weet hoe kleursegmentasie in die HSI- en RGB-ruimtes bewerkstellig kan word.
(5) Jy mag randherkenning in kleurbeelde uitlaat.

## C6 Colour processing

(1) You must be able to briefly discuss the RGB, CMY(K), and HSI colour models (and the relationship between these models). You must also know how these models relate to the CIE chromaticity diagram.
(2) You may leave out pseudocolour processing.
(3) You must know when full-colour algorithms may also be implemented in a component-wise fashion and when not.
(4) You must know how colour segmentation can be achieved in the HSI and RGB spaces.
(5) You may leave out edge detection in colour images.

## H8 Beeldkompaktering

(1) Jy moet die drie tipes data-oortolligheid kortliks kan bespreek en weet hoe elkeen aangespreek kan word.
(2) Jy moet die eendimensionele DCT en DICT kan herlei. Jy moet ook die voordele van die DCT (bo die DFT) vir die eendimensionele en tweedimensionele gevalle kan verduidelik.
(3) Jy moet die beginsels van Huffman-kodering korliks kan bespreek en 'n eenvoudige kodewoord kan kodeer (of dekodeer).
(4) Jy moet al die stappe in JPEG kodering (en dekodering) kan uiteensit en kan verduidelik waarom elkeen van hierdie stappe sinvol is in die verwydering van data-oortolligheid. Jy moet ook (vir 'n eenvoudige voorbeeld) een of twee van hierdie stappe met die hand kan uitvoer – tabelle sal verskaf word.

## C8 Image compression

(1) You must be able to briefly discuss the three types of data redundancy and know how each one can be addressed.
(2) You must be able to derive the one-dimensional DCT and DIFT. You must also be able to explain the advantages of the DCT (above the DFT) for the one-dimensional and two-dimensional cases.
(3) You must be able to briefly discuss the principles of Huffman coding and be able to code (or decode) a simple code word.
(4) You must be able to outline all the steps in JPEG coding (and decoding) and be able to explain why each one of these steps is sensible in removing data redundancy. You must also be able to manually implement one or two of these steps (for a simple example) – tables will be supplied.

**H9** Morfologiese beeldverwerking

(1) Jy moet die konsepte van erosie, uitdying, "opening", "closing" en die "hit-or-miss"-transformasie vir binêre beelde kortliks kan bespreek, dit kan toepas en weet waar dit gebruik kan word.

(2) Jy moet kan verduidelik hoe randonttrekking, gat-opvulling (semi-outomaties), die identifisering van aaneengeskakelde komponente (semi-outomaties), verdunning, verdikking en die "snoei" van artifakte met behulp van morfologiese operatore bewerkstellig kan word. Jy kan die konvekse omhulsel en "skeletonization" (in hierdie konteks) uitlaat.

(3) Jy moet die konsepte van morfologiese herstel via uitdying (en erosie) en "opening by reconstruction" kortliks kan bespreek, dit kan toepas en weet hoe dit gebruik kan word vir (vol-outomatiese) gat-opvulling en grenspikselverwydering.

(4) Jy moet die konsepte van erosie, uitdying, "opening" en "closing" vir grysskaalbeelde (met 'n plat struktuurelement) kortliks kan bespreek, dit kan toepas en weet waar dit gebruik kan word.

(5) Jy moet die konsepte van morfologiese vergladding, die morfologiese gradiënt, asook die "top-hat"- en "bottom-hat"-transformasies vir grysskaalbeelde (met 'n plat struktuurelement) kortliks kan bespreek, dit kan toepas en weet waar dit gebruik kan word.

(6) Jy moet weet hoe morfologiese transformasies (met 'n plat struktuurelement) vir granulometrie en tekstuurgebaseerde segmentasie in grysskaalbeelde aangewend kan word.

**C9** Morphological image processing

(1) You must be able to briefly explain the concepts of erosion, dilation, opening, closing and the hit-or-miss transformation for binary images, be able to apply these concepts and know where they are useful.

(2) You must be able to explain how boundary extraction, hole filling (semi-automatic), the extraction of connected components (semi-automatic), thinning, thickening and pruning of artifacts can be achieved by utilising morphological operators. You may leave out the convex hull and skeletonization (in this context).

(3) You must be able to briefly explain the concepts of morphological reconstruction by dilation (and erosion) and "opening by reconstruction", be able to apply these concepts and know how they can be used for (fully automated) hole filling and border clearing.

(4) You must be able to briefly explain the concepts of erosion, dilation, opening and closing for grey-scale images (with a flat structuring element), be able to apply these concepts and know where they are useful.

(5) You must be able to briefly explain the concepts of morphological smoothing, the morphological gradient, as well as the "top-hat" and "bottom-hat" transformations for grey-scale images (with a flat structuring element), be able to apply these concepts and know where they are useful.

(6) You must know how morphological transformations (with a flat structuring element) can be utilised for granulometry and texture-based segmentation in grey-scale images.

## H10 Beeldsegmentasie

(1) Jy moet weet wat met rand-gebaseerde en gebied-gebaseerde segmentasie bedoel word en watter segmentasietegniek meer geskik is vir 'n gegewe scenario.

(2) Jy moet weet wat die rol van diskrete benaderings vir eerste en tweede afgeleides in randherkenning is.

(3) Jy kan die Marr-Hildreth randherkenner uitlaat.

(4) Jy moet die Canny randherkenner kan bespreek.

(5) Jy moet die Hough-transform as 'n algoritme vir globale randverbinding langs 'n parametriseerbare kromme, soos 'n reguit lyn, parabool of sirkel, kan bespreek.

(6) Jy moet weet wat die invloed van ruis en nie-uniforme beligting op outomatiese drempelwaarde-afskatting is en hoe daar hiervoor gekompenseer kan word.

(7) Jy moet die basiese algoritme vir outomatiese drempelwaarde-afskatting (10.3.2) kan bespreek.

(8) Jy moet Otsu se metode vir outomatiese drempelwaarde-afskatting (10.3.3) kan bespreek. Jy hoef net die twee-klas algoritme te kan bespreek, maar moet bewus wees daarvan dat dit ook na meer as twee klasse uitgebrei kan word (10.3.6).

(9) Jy moet weet hoe vergladding (10.3.4) en rand-inligting (3.10.5) gebruik kan word om outomatiese drempelwaarde-afskatting te verbeter.

(10) Wat variërende drempelwaarde-afskatting betref (10.3.7), hoef jy slegs beeldonderverdeling te kan bespreek.

(11) Wat gebied-gebaseerde segmentasie betref (10.4), hoef jy slegs die beginsels van "region-growing" en "region splitting and merging" baie kortliks te kan verduidelik.

## C10 Image segmentation

(1) You must know what is meant by edge-based and region-based segmentation and which segmentation technique is more appropriate for a given scenario.

(2) You must know what the role of discrete approximations for first and second derivatives are in edge detection.

(3) You may leave out the Marr-Hildreth edge detector.

(4) You must be able to discuss the Canny edge detector.

(5) You must be able to discuss the Hough transform as an algorithm for global edge linking along a parameterised curve, like a straight line, parabola or circle.

(6) You must know what the influence of noise and non-uniform illumination are on automated thresholding and how this can be compensated for.

(7) You must be able to discuss the basic algorithm for automated thresholding (10.3.2).

(8) You must be able to discuss Otsu's method for automated thresholding (10.3.3). You should only be able to discuss the two-class algorithm, but you should be aware of the fact that it can be generalised to more than two classes (10.3.6).

(9) You must know how smoothing (10.3.4) and edge information (10.3.5) can be used to improve automated thresholding.

(10) What variable thresholding is concerned (10.3.7), you should only be able to discuss image partitioning.

(11) What region-based segmentation is concerned (10.4), you should only be able to very briefly discuss the principles involved in "region-growing" and "region splitting and merging".

**H11** Voorstelling en beskrywing

(1) Jy moet die verdunningsalgoritme in 11.1.7 kan bespreek. Jy moet onder meer kan verduidelik waarom "skeletonization" noodsaaklik is en wat die rede vir elkeen van die stappe is.

(2) Jy moet die beginsels van Moore se randvolgingsalgoritme baie kortliks kan verduidelik en weet waarom dit noodsaaklik is.

(3) Jy moet kettingkodes en vormnommers (vir voorstelling/beskrywing) kan bespreek, weet hoe om vormnommers met mekaar te vergelyk, kan verduidelik waarom hierdie beskrywers skaal, translasie en rotasie invariant is, en ook kan verduidelik waarom hulle robuust ten opsigte van ruis is.

(4) Jy moet die verskillende veelhoekbenaderings vir randbeskrywing baie kortliks kan bespreek.

(5) Jy moet "signatures" as beskrywers kan bespreek, kan verduidelik waarom hierdie beskrywers skaal, translasie en rotasie invariant is, en ook kan verduidelik waarom hulle robuust ten opsigte van ruis is.

(6) Jy kan die onttrekking van randsegmente (11.1.6) uitlaat.

(7) Jy moet Fourier-beskrywers kan bespreek, kan verduidelik waarom hierdie beskrywers skaal, translasie en rotasie invariant is, en ook kan verduidelik waarom hulle robuust ten opsigte van ruis is.

(8) Jy kan statistiese momente as beskrywers van randsegmente (11.2.4) uitlaat.

(9) Jy moet kan verduidelik hoe tekstuur met behulp van statistiese benaderings en spektraaltegnieke beskryf kan word.

(10) Jy kan die gebruik van "principal components" vir beskrywing (11.4) uitlaat.

**C11** Representation and description

(1) You must be able to discuss the thinning algorithm in 11.1.7. Amongst other things, you must be able to explain the necessity of skeletonization and the reason for each step.

(2) You must be able to very briefly discuss the principles of the Moore boundary tracking algorithm and know why it is necessary.

(3) You must be able to discuss chain codes and shape numbers (for representation/description), know how to match shape numbers to one another, be able to explain why these descriptors are scale, translation and rotation invariant, and also be able to explain why they are robust with respect to noise.

(4) You must be able to very briefly discuss the different polygonal approximations for edge description.

(5) You must be able to discuss "signatures" as descriptors, be able to explain why these descriptors are scale, translation and rotation invariant, and also be able to explain why they are robust with respect to noise.

(6) You may leave out the extraction of edge segments (11.1.6).

(7) You must be able to discuss Fourier descriptors, be able to explain why these descriptors are scale, translation and rotation invariant, and also be able to explain why they are robust with respect to noise.

(8) You may leave out statistical moments as descriptors of boundary segments (11.2.4).

(9) You must be able to explain how texture can be described using statistical approaches and spectral techniques.

(10) You may leave out the use of principal components for description (11.4).