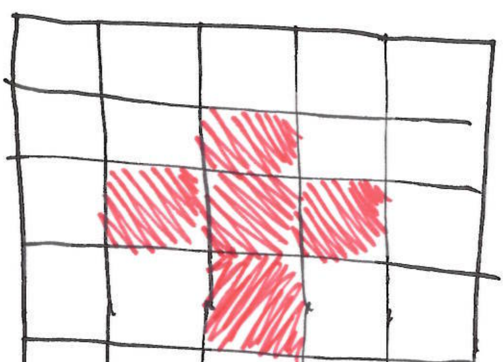
INF4300 - Solution to exercises ①

Week 5 by Ole Marius Hoel Rindal

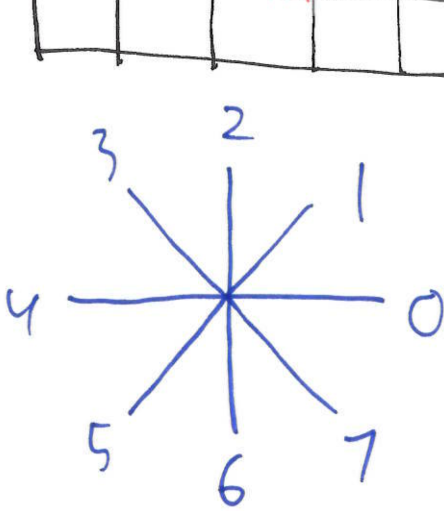
## 11.1 in G&W

a) We want to show that redefining the starting point of a chain code so that the resulting sequence of numbers forms an integer of minimum magnitude makes the code independent of the initial starting point

Lets look at a simple example



| Starting point | Chain code | Rot CC |
|---|---|---|
| Left | 1-7-5-3 | 1-7-5-3 |
| Top | 7-5-3-1 | 1-7-5-3 |
| Right | 5-3-1-7 | 1-7-5-3 |
| Bottom | 3-1-7-5 | 1-7-5-3 |




b) Find the normalized starting point of:

11076765543322

⇓

07676554332211

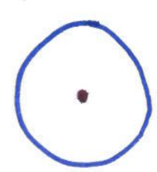
11.8 ~~x~~) The medial axis, or "skeleton", of an object is defined by:

1. For a region R with border B, for every point p in R find the closest neighbor in B

2. If p has more than one such neighbour, it belongs to the medial axis.

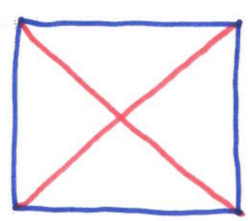
NB! This is dependant on the distance measure. We will use Eucledian distance in this case.

a) A circle:

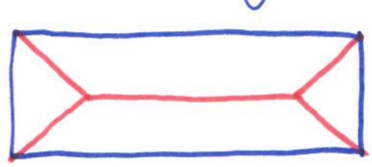


Only the center point of the circle has more than one "closest neighbour"

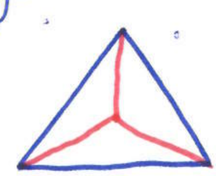
b) A square:



c) A rectangle:



d) An equilateral triangle



11.9) We are given a few examples and are asked to discuss the action taken at point $p$ by Step 1 of the skeletonizing algorithm presented in Section 11.1.7.

Lets list the neighborhood arrangements

| | | |
|---|---|---|
| $p_9$ | $p_2$ | $p_3$ |
| $p_8$ | $p_1$ | $p_4$ |
| $p_7$ | $p_6$ | $p_5$ |

Step 1.

Flag a contour point $p_1$ for ~~deletion~~ deletion if the following conditions are satisfied:

(a) $2 \leq N(p_1) \leq 6$

(b) $T(p_1) = 1$

(c) $p_2 \cdot p_4 \cdot p_6 = 0$

(d) $p_4 \cdot p_6 \cdot p_8 = 0$

when $N(p_1)$ is the ~~number~~ number of nonzero neighbours

$N(p_1) = p_2 + p_3 + \ldots + p_8 + p_9,$

and $T(p_1)$ is the number of 0-1 transitions in the ordered sequence $p_2, p_3, p_4 \ldots p_8, p_9, p_2$

Step 2

conditions (a) and (b) remain the same, but (c) and (d) are changed to

(c') $p_2 \cdot p_4 \cdot p_8 = 0$

(d') $p_2 \cdot p_6 \cdot p_8 = 0$

11.9a) Step 1 for:

1

| | | |
|---|---|---|
| 1 | 1 | 0 |
| 1 | p | 0 |
| 1 | 1 | 0 |

a $N(p) = 5$ $\Rightarrow$ ok!

b $T(p) = 1$ $\Rightarrow$ ok!

c $p_4 = 0$ so $p_2 \cdot p_4 \cdot p_6 = 0$ $\Rightarrow$ ok!

d $p_4 = 0$ so $p_4 p_6 p_8 = 0$ $\Rightarrow$ ok!

All is ok, so flag p for deletion

2

| | | |
|---|---|---|
| 0 | 0 | 0 |
| 1 | p | 0 |
| 0 | 0 | 0 |

a $N(p) = 1$ $\Rightarrow$ not ok!

b $T(p) = 1$ $\Rightarrow$ ok!

c $p_2 \cdot p_4 \cdot p_6 = 0$ $\Rightarrow$ ok!

d $p_4 \cdot p_6 \cdot p_8 = 0$ $\Rightarrow$ ok!

All is not ok, keep this point

3

| | | |
|---|---|---|
| 0 | 1 | 0 |
| 1 | p | 1 |
| 0 | 1 | 0 |

a $N(p) = 4$ $\Rightarrow$ ok!

b $T(p) = 4$ $\Rightarrow$ not ok!

c $p_2 \cdot p_4 \cdot p_6 = 1$ $\Rightarrow$ not ok!

d $p_4 \cdot p_6 \cdot p_8 = 1$ $\Rightarrow$ not ok!

All is not ok, keep this point

4

| | | |
|---|---|---|
| 1 | 1 | 0 |
| 0 | p | 1 |
| 0 | 0 | 0 |

a $N(p) = 3$ $\Rightarrow$ ok!

b $T(p) = 2$ $\Rightarrow$ not ok!

c $p_2 \cdot p_4 \cdot p_6 = 0$ $\Rightarrow$ ok!

d $p_4 \cdot p_6 \cdot p_8 = 0$ $\Rightarrow$ ok

Keep this!

Step 2



1

a ok!

b ok!

c $p_2 \cdot p_4 \cdot p_8 = 0 \Rightarrow$ ok!

d $p_2 \cdot p_6 \cdot p_8 = 1 \Rightarrow$ not ok!

Keep

2

a not ok!

b ok!

c $p_2 \cdot p_4 \cdot p_8 = 0 \Rightarrow$ ok

d $p_2 \cdot p_6 \cdot p_8 = 0 \Rightarrow$ ok

Keep

3

a ok!

b not ok!

c $p_2 \cdot p_4 \cdot p_8 = 1 \Rightarrow$ not ok

d $p_2 \cdot p_6 \cdot p_8 = 1 \Rightarrow$ not ok

Keep

4

a ok!

b not ok!

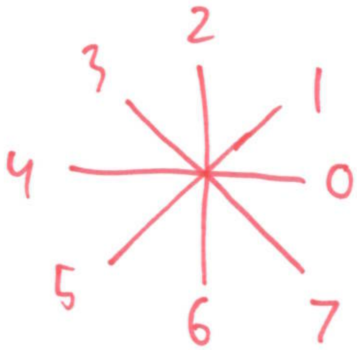
c $p_2 \cdot p_4 \cdot p_8 = 0 \Rightarrow$ not ok

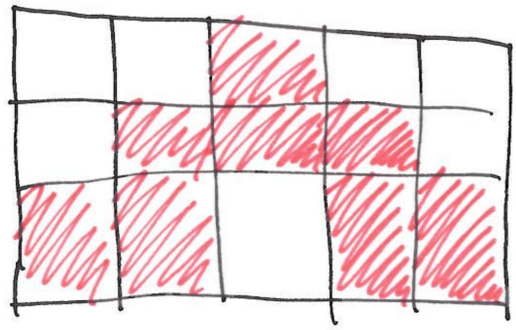
d $p_2 \cdot p_6 \cdot p_8 = 0 \Rightarrow$ not ok

Keep

Exercise from 2017 exam. Chain Codes 

We are given the 8-directional chain code and the two objects below:



a) Chain code from lower-left: 1 1 7 7 4 3 5 4

b) The absolute chain code can be made independent of starting point by treating it as a circular sequence and selecting the number with minimum magnitude:

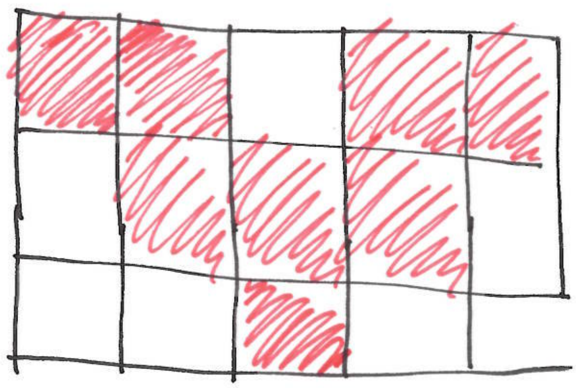
Chain code from top: 7 7 4 3 5 4 1 1

minimum: 1 1 7 7 4 3 5 4,

same as in <u>a</u>!

( ) In the relative chain code the direction is defined in relation to the direction you are moving.

7 ~~8~~



To get the same description of the two objects ~~[illegible]~~ independent of starting point we use a combination of the minimum magnitude (to make it independent of starting point) and the relative chain code (to make it independent of rotation)

Relative chain code of V-shape from upper left:

7 1 4 1 7 2 0 2

Minimum: 0 2 7 1 4 1 7 2

~~equal~~

Relative chain code of Λ-shape from top:

equal

0 2 7 1 4 1 7 2