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BMT1-101

Nevus recognition algorithm

Introduction

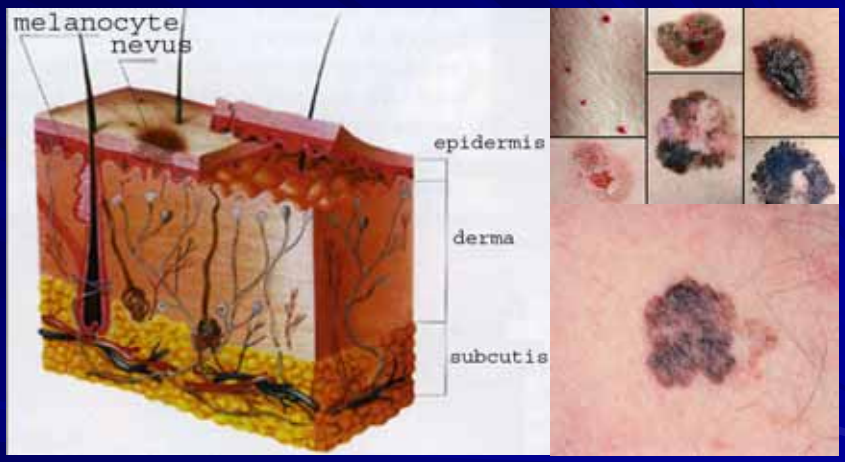


Fig. 1. Skin melanoma

SMHSC “Rhodonite”

Fig. 2. Skin mapping hardware and software complex “Rhodonite” (SMHSC “Rhodonite”)

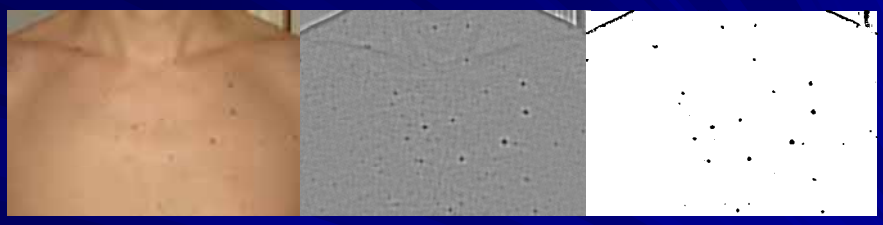
SMHSC “Rhodonite”

Skin mapping procedure

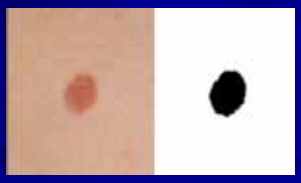
- Skin surface registration
- Images stitching
- Nevuses detecting
- Nevuses’ diagnostic parameters measurement

SMHSC “Rhodonite”

Segmentation algorithm



Initial image | Blurred mask application | Binarization and threshold filtering



Result of segmentation

Nevus recognition algorithm

Basic kinds of artifacts

1. ***too bright artifacts (their borders were not determined)***
2. ***folds of skin and shadows (their borders were outside the image)***
3. ***clothes (their integral color was brighter then integral color of skin)***
4. ***skin inhomogeneity***
5. ***hair***

Nevus recognition algorithm

***R**ecognition criterion*

$$C = \frac{L_2 - L_1}{L_{\max}}$$

$L_{max} = \max \{ L_1, L_2 \}$

$L_1 = (Maxo + Mino) / 2$

$Maxo = \max\{Ro, Go, Bo\}$
$Mino = \min\{Ro, Go, Bo\}$

$L_2 = (Maxs + Mins) / 2,$

$Maxs = \max\{Rs, Gs, Bs\}$
$Mins = \min\{Rs, Gs, Bs\}$

Nearest-neighbor method

Optimal number of nearest neighbors.

Nearest neighbors number	K=1	K=3	K=5	K=7	K=9	K=11
Error of first kind	0.085	0.041	0.029	0.025	0.023	0.0179
Error of second kind	0.083	0.145	0.179	0.211	0.241	0.2614

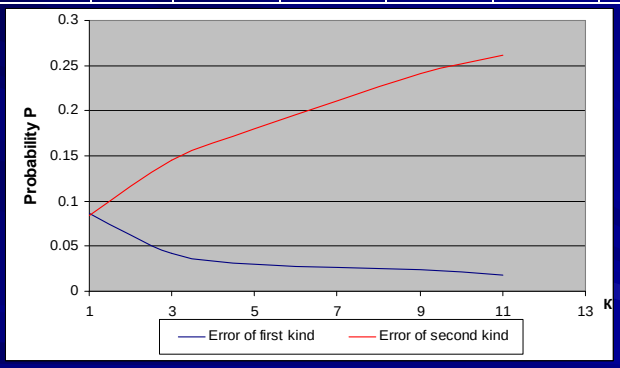


Fig. 3. Errors of first and second kind dependence on nearest-neighbors number

Bayesian classifier

Color contrast

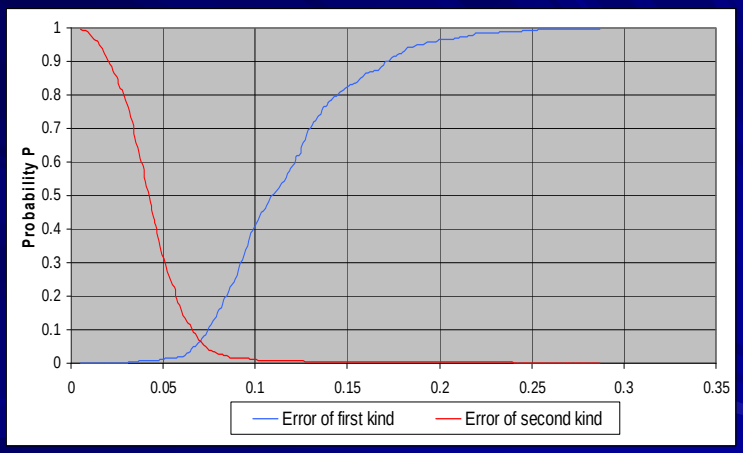


Fig. 4. Errors of first and secon kind dependence on threshold contrast value

Results

- *The preprocessing procedure efficiency is 18.6%*

Nearest-neighbor method :

- optimal number of nearest neighbors is 3
- error of first kind is 3.2%
- error of second kind is 14.0%

Bayesian classifier:

- chosen threshold contrast value is 0.069
- error of first kind is 4.6%
- error of second kind is 7.2%

Summary

- *Preprocessing procedure is d*eveloped and approbated
- errors of first and second kind dependence on nearest neighbors number was analyzed
- nearest-neighbor method is approbated
- Bayesian classifier is educated and approbated