Iridoglyphic complex for human functional status assessment

Darya S. Maslova
BMSTU
5-th year student

Biomedical techniques department


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Human functional status assessment

Reducibility

State of organism systems — Functional status — State of organs

Ability to adapt
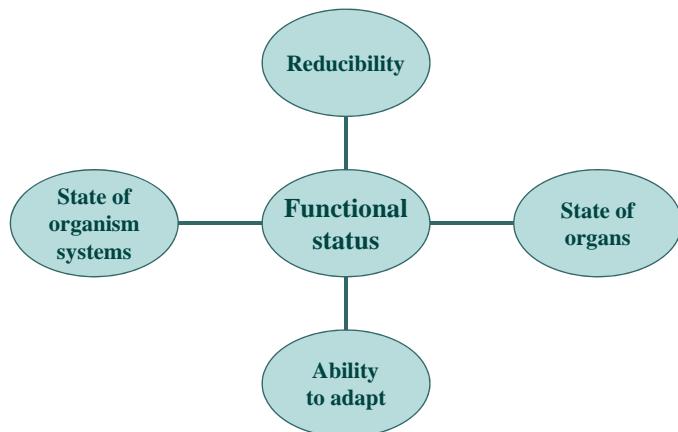
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Human functional status assessment

METHODS
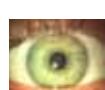
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Iridoglyphics principles

Iridoglyphic research = Iris signs analysis

Sclera

IRIS

Cornea

Pupil

Crystalline lens

Conjunctiva

Vitreous body

Vascular membrane

Ophthalmic nerve

Macula

Retina
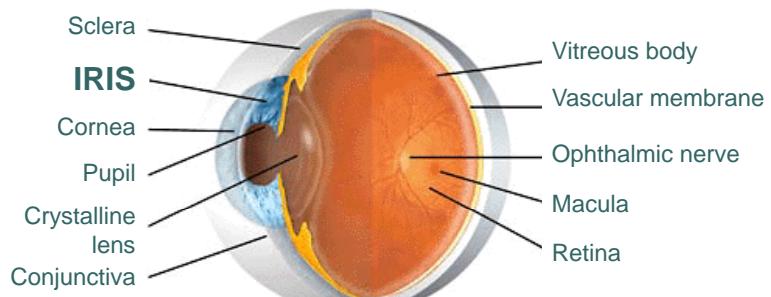
Integral iris signs

✔ **Pupil state**

✔ **Stroma density**

✔ **Color**

✔ **Autonomous ring state**
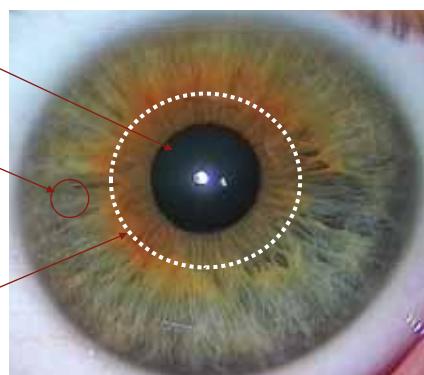
Integral iris signs

Shape of autonomous ring:
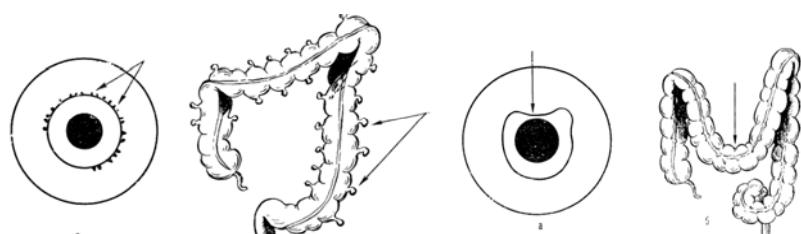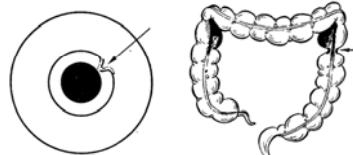
Local iris signs

- ✔ **Lacunes**
- ✔ **Toxic radiance**
- ✔ **Stress ring**
- ✔ **Pigmented spot**
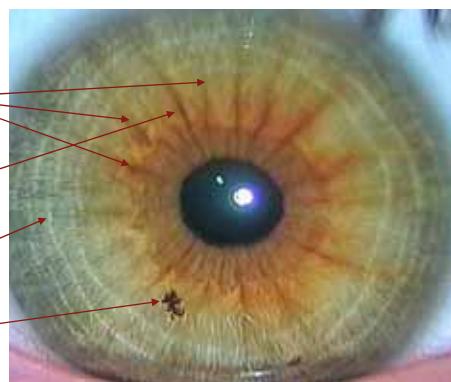
Local iris signs

Topographic iris map
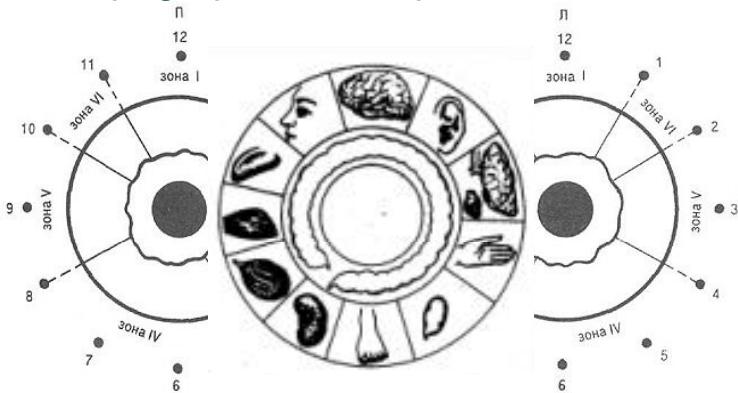
Integral and local iris signs

- Dimensions
- Localization
- Shape
- Structure
- Relief

Item	Symbol	Size of changes, mm
Pupil diameter	D_p	2,3..7,7
Autonomous ring diameter	D_{ar}	3,4..9,2
Iris external diameter		9,5..13,7
Local sign's radial size	h_{ls}	-
Local sign's tangential size	L_{ls}	-

Iridoglyphics system

Iridoglyphics system

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┌──────┐      ┌──────────┐      ┌──────────────────┐      ┌──────────┐
│ IRIS │─────▶│ Optical  │─────▶│     Image        │─────▶│ Software │
│      │      │ system   │      │ registrating unit│      │          │
└──────┘      └──────────┘      └──────────────────┘      └──────────┘
    ▲
    │
┌──────────────┐
│ Illumination │
│   system     │
└──────────────┘
```

Signs registration conditions

Local contrast:
$$C = \frac{L_1 - L_2}{L_{max}}, \qquad L_1, L_2 \in [0; L_{max}]$$

where L1 and L2 – brightness of image elements

Integrated contrast:
$$C_{int} = \frac{1}{2L_{max}} \int_0^\infty [2(L - \overline{L}) + L_{max} - |\, 2(L - \overline{L}) - L_{max}\,|] \cdot H(L)dL$$

where **L** - brightness of image elements, $\overline{L}$ - brightness level arithmetical mean

H(L)- distribution bar chart of image elements brightness

Signs registration conditions

Measured parameter	Size of changing					
	620-700nm	568-575nm	400-450nm	White	860	910
Integrated iris contrast	0,261..0,299	0,238..0,302	0,212..0,285	0,276..0,315	0,199..0,362	0,261..0,284
Iris-sclera contrast	0,004..0,009	0,005..0,044	0,008..0,042	0,05..0,77	0,009..0,069	0,009..0,087
Pupil-iris contrast	0,07..0,053	0,017..0,048	0,049..0,109	0,019..0,085	0,012..0,068	0,062..0,092/
Lacuna-iris contrast	0,038..0,044	0,021..0,049	0,019..0,026	0,014..0,029	0,07..0,031	0,017..0,022
Pigmented spot-iris contrast	0,015..0,03	0,017..0,029	0,005..0,074	0,011..0,055	0,017..0,038	0,026..0,044

Exogenous pigment | Lacunes and trabecules | Stroma atrophy | Pupil boundary

Wavelength, nm

400   440   540   580   620   700   840   860
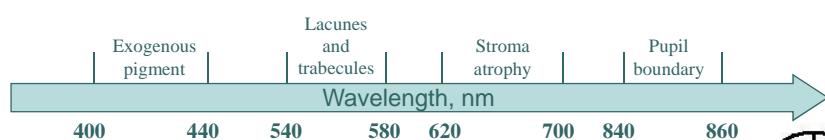
Signs registration conditions

**Local contrast with illumination
in different spectral region**

Pigmented spot-iris contrast
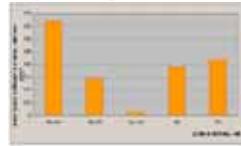
Iris-sclera contrast
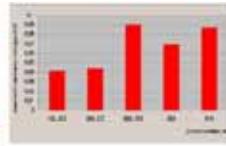
Lacuna-iris contrast
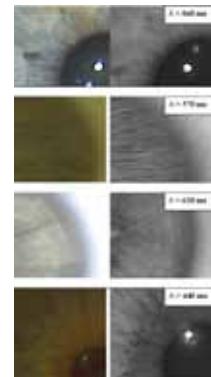
Pupil-iris contrast

Iris color classification

Color

| Gray | Light-brown | Brown |

Iris color classification

Spectral reflection coefficient
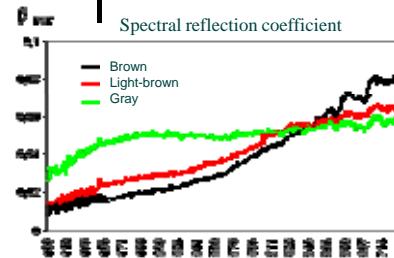
Tristimulus values distribution of color body

RGB-space
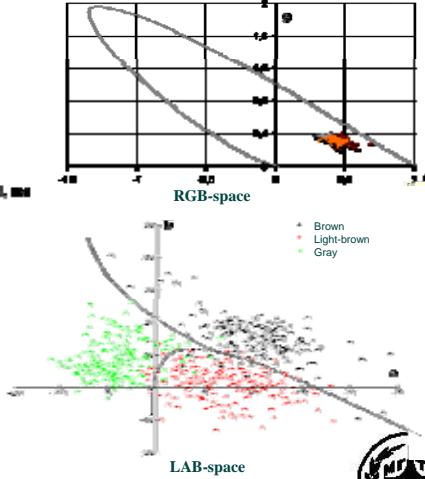
Classification results: alpha and beta error probability

		Eye color		
		Brown	**Light-brown**	**Gray**
Result	**1**	93	5	0
	2	7	92	3
	3	0	3	94

Brown
Light-brown
Gray

LAB-space

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Conclusions

- Iridoglyphics research is a complex method of human functional status assessment with a glance of genetic features;
- Change of iris illumination simplifies selecting and enables to find hidden sings;
- Developed color classification enables to estimate human reparative possibilities which are important for treatment and occupational selection.

Probability of Functional status assessment coincidence

Functional status assessment	Iridoglyphics assessment (M.D. Gallimulin)		
	High	**Medium**	**Low**
High	91	9	0
Medium	8	82	10
Low	1	10	89

Disability days per 3 years for one patient

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