ALGORITHMS FOR SKIASCOPY MEASUREMENT AUTOMATISATION

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Skiascopy or retinoscopy is an objective method for evaluation of eyes refractive state. In this procedure unfocused light beam is moved over the eye pupil and outcoming reflex is analyzed. Depending on the state of the eye refraction retrospective reflex is either 'with' or 'against' motion. Automatic dynamic infrared skiacope was developed, which mimics the standard procedure at much higher rate. Our system uses a USB image sensor with up to 180 Hz refresh rate equipped with long focus objective and 850 nm infrared light emitting diode as light source. Two servo motors driven by Arduino Atmega 2560 microprocessor control the rotation of semitransparent mirror and motion of skiascope chassis. Image of eye pupil reflex is captured via software and analyzed along the horizontal plane (Fig.1.). The motion of the light beam is known, therefore we use a reflex peak changes and steepness of the curve to identify the "with" or "against" motion of the reflex. Based on the steepness of the curve and speed of reflex the compensating motion of the skiascope chassis is preferred.

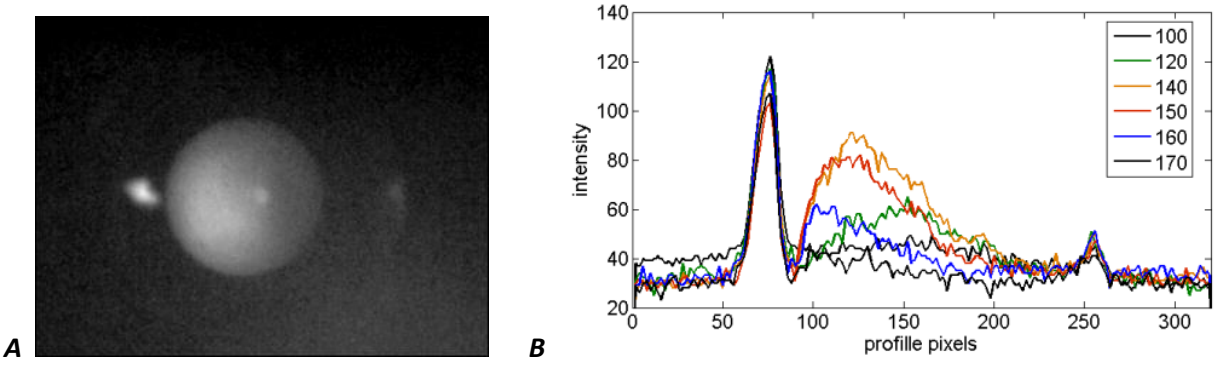

Fig.1. (A) Captured image of retrospective reflex from the artificial eye. Three small white points are the ghost reflexes of the light source form the lens of the artificial eye. (B) Profile along the image horizontal axis show intensity peak changes at indicated frames.

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References
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ELECTRO-MECHANICAL DEVICE FOR VERGENCE STEP STIMULI PRESENTATION

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During our daily activities, we have to move our eyes through the scene providing visual system with detailed information about surrounding environment. We use different eye movements: saccades, smooth pursuit, and vergence. Vergence is the main eye movement involved in depth perception. Computerized methods are used in experiments to simulate vergence step responses having some limitations: need spatial dichoptic image presentation devises (polarized or red-green glasses, LC shutter glasses, mirror stereoscope etc.), produce artificial conditions for visual system, and break down the normal interaction between accommodation and vergence. To allow more natural vergence evaluation experiments, we introduce electro-mechanical device with separate modules each devoted for one vergence stimuli. All modules are placed on the rail which ensures that all stimuli follow each other. Each module is equipped with servo motor and specially designed gear system to raise or lower stimuli if necessary. Device is provided with opportunity to change distances between modules to ensure equal conditions for most patients despite their interpupillary distances. Arduino microcontroller provides connection between device and computer programme controlling the order of stimuli that are presented during particular experimental session. Device is synchronized with iViewX Hi-Speed eye tracking device which measures vergence response during experimental procedure.

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