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2nd PhDay – UCM

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INDICE

PRÓLOGO

Por segunda vez los doctorandos de la Facultad de Óptica y Optometría de la Universidad Complutense de Madrid cuentan con un congreso propio organizado por y para ellos, el 2nd PhDAY- FOO. Al igual que en la primera edición, en la que tuvimos mucho éxito, en esta edición jóvenes científicos podrán presentar sus investigaciones al resto de sus compañeros predoctorales y a toda la comunidad universitaria que quiera disfrutar de este evento.

Además de los propios estudiantes de doctorado, serán especialmente invitados los estudiantes de Máster de la Facultad por ser ellos la cantera de futuros doctorandos del multidisciplinar Programa de Doctorado en Óptica, Optometría y Visión.

En esta segunda edición del PhDAY-FOO que tendrá lugar el 22 de noviembre de 2018 en la Facultad de Óptica y Optometría de la UCM se llevarán a cabo varias sesiones de presentaciones, orales y poster, donde los doctorandos mostrarán la gran diversidad y riqueza de líneas de investigación incluidas en nuestro programa de doctorado en las que están trabajando.

Se pretende difundir el trabajo desarrollado por los doctorandos de nuestra Facultad y a la vez contribuir a mejorar sus habilidades comunicadoras como científicos. Ésta es una ocasión estupenda para promover la interacción entre los asistentes, favoreciendo el intercambio de experiencias, estrategias y sensaciones vinculadas a su actividad investigadora; quizá incluso surjan nuevas amistades, sinergias o proyectos.

Tanto si llevas varios años como doctorando, como si acabas de llegar al programa de doctorado, no debes faltar pues, tras haber conocido a otros compañeros en tu misma situación, seguro que no te sentirás tan solo cuando estés en tu laboratorio y será una estupenda toma de contacto con la que será tu labor académica-investigadora en los próximos años hasta desembocar en la presentación de tu tesis doctoral.

Si eres un estudiante de Máster, en pocos meses te encontrarás con la opción de proseguir tu trayectoria como universitario hasta alcanzar el máximo nivel de estudios y ser Doctor, y esta jornada PhDAY-FOO te puede ayudar a tomar esta decisión; ya sea porque directamente te gustaría estar en su lugar y dedicarte a la investigación o porque, al menos, sabrás a quién dirigir algunas de tus dudas.
Profesores, estudiantes de Grado, PAS de la Facultad de Óptica y Optometría seréis bienvenidos a este congreso donde podréis conocer de la mano de sus protagonistas la variada investigación que se desarrolla vinculada a nuestro Programa de Doctorado.

Desde el Equipo Decanal de la Facultad de Óptica y Optometría y en particular, desde mi papel como Vicedecana de Investigación y Tercer Ciclo y Coordinadora del Programa de Doctorado quiero agradecer la buena acogida que esta iniciativa ha tenido entre los doctorandos y en especial, agradecer al Comité Organizador toda su dedicación para que este 2nd PhDAY- FOO consiga los objetivos buscados.

Beatriz Antona Peñalba
Coordinadora del programa de doctorado en Óptica, Optometría y Visión Vicedecana de Posgrado e Investigación Facultad de Óptica y Optometría (UCM) bantona@ucm.es

AGRADECIMIENTOS

El Comité Organizador quisiera agradecer tanto a la Escuela de Doctorado de la Universidad Complutense, como a las distintas empresas patrocinadoras, el apoyo ofrecido para llevar a cabo las jornadas PhDay-FOO, sin el cual, éstas no habrían podido realizarse.

MESA REDONDA

'Movilidad en el doctorado'

¿Por qué elegimos este tema? Porque creemos que siendo estudiantes de doctorando hay dos cosas que nos interesaran o, si no es así, deberían hacerlo: las publicaciones científicas y las estancias breves.

Las estancias breves son un periodo de tiempo dentro de tu periodo de doctorando, en que te desplazas de tu laboratorio y grupo de investigación habitual a otro distinto, donde el objetivo fundamental es aprender nuevas metodologías para aplicar en el desarrollo de la tesis. Aunque seguro que hay muchas más aportaciones que nos comentaran nuestros ponentes según su experiencia.

Moderadora: Laura Batres Valdera

Ponentes por orden de intervención:

12: 50 Juana Amorós Carmona.

Vicerrectorado de Relaciones Internacionales UCM Sección de Programas Europeos. Nos hablará de las distintas opciones de Convocatorias y Convenios de Movilidad para doctorandos

13: 00 David Madrid Costa

Profesor de nuestro programa de doctorado y Coordinador del proyecto Europeo de Investigación EDEN (European Dry Eye Network) dotado con más de 2 millones de euros y perteneciente al programa *Excellent Science: Marie Sklodowska-Curie actions*; que engloba la realización

de diversas tesis doctorales en régimen de cotutela entre varias universidades e instituciones europeas.

13:10 Hanan Awad Alkozi.

Doctora con mención internacional en nuestro programa de doctorado. Con variada experiencia estancias de investigación pre y pos doctorales. Disfrutó de una beca del reino de Arabia Saudí para cursar estudio de doctorado en nuestro país.

13:40 Begoña Fonseca Vázquez

Actual doctoranda de nuestro programa de doctorado que ha realizado una estancia predoctoral en el Reino Unido. Se encuentra en su cuarto año de contrato predoctoral UCM.

13:40 Turno de preguntas

COMITÉ CIENTÍFICO

José Miguel Ezquerro Rodríguez

Licenciado en CC. Físicas por la Universidad de Zaragoza, y Doctor en Físicas por la Universidad Complutense de Madrid con una tesis en el campo de la psicofísica de la visión: "Influencia de las funciones de igualación de color en la percepción colorimétrica absoluta y relativa de estímulos de color". Profesor Contratado Doctor en la Universidad Complutense donde compagina su labor docente, investigadora y de gestión. Actualmente forma parte de Applied Optics Complutense Group en la sección de antenas ópticas en infrarrojo.

María Ulagares de la Orden Hernández

Catedrática de Universidad en el Departamento de Química Orgánica de la Facultad de Óptica y Optometría de la Universidad Complutense de Madrid. Profesora de la asignatura Materiales en Óptica Oftálmica y Lentes de Contacto en el grado de Óptica y Optometría. Su investigación siempre ha estado centrada en el campo de los materiales poliméricos. En la actualidad estudia la viabilidad del reciclado mecánico de bioplásticos, como poli(ácido láctico) (PLA), y la optimización de sus propiedades ópticas, mecánicas, térmicas, de barrera y de resistencia a la hidrólisis.

María Cinta Puell

Doctora en Farmacia, profesora titular de la Universidad Complutense y directora del Grupo de Investigación "Visión Aplicada". Ha dirigido varios proyectos de investigación competitivos que han dado lugar a numerosas publicaciones en revistas del área de Oftalmología con alto factor de impacto y relativas a los mecanismos ópticos y neuronales

implicados en los cambios de la función visual, medidos con métodos psicofísicos, en el ojo sano envejecido y con enfermedad ocular.

Juan José Salazar Corral

Doctor en Ciencias Biológicas por la UCM en 1994. Desde el año 2008 es Profesor Titular de la Facultad de Óptica y Optometría, y en la actualidad desde diciembre del 2016 es el Subdirector del IIORC. Desde su incorporación a la Universidad ha sido responsable de la organización docente del departamento de Oftalmología siendo el Coordinador-UCM de la docencia posgrado del mismo (Doctorado y Máster Interuniversitarios en CC de la Visión). Su actividad investigadora está enfocada en el estudio de las patologías más prevalentes, en cuanto a deterioro visual irreversible, que tienen la isquemia y la inflamación como base común en el desarrollo de su patogenia (la degeneración macular asociada a la edad (DMAE), el glaucoma, la retinopatía diabética, y la neuropatía óptica isquémica anterior.

Yolanda Martín Pérez

Doctora en Optometría y visión. Profesora de las asignaturas de "Optometría III", "Clínica" y "Atención optométrica en condiciones especiales", en la Facultad de Óptica y Optometría. La trayectoria se centra en el tratamiento de problemas visuales a través de programas de terapia visual y la evaluación optométrica a personas con discapacidad intelectual y diversidad funcional. Compagina la docencia en la Facultad con la colaboración en la asociación "Abre sus Ojos" y en la fundación "Para que veas". Ambas entidades se dedican a prestar atención visual a personas con necesidades especiales.

COMITÉ ORGANIZADOR

Laura Rico Del Viejo

Graduada en Óptica y Optometría por la Universidad de Granada
Máster en Optometría Avanzada por la Universidad de Minho

Sara El Aissati Aissati

Graduada en Óptica y Optometría por la Universidad Complutense de Madrid
Master en Tecnologías Ópticas y de la imagen por la Universidad Complutense de Madrid

Laura Batres Valderas

Graduada en Óptica y Optometría por la Universidad Complutense
Máster en Óptica, Optometría y Visión por la Universidad Complutense de Madrid

PROGRAMA

9:00 Entrega de documentación

9:30 Presentación y bienvenida:

Mª Isabel Sánchez Pérez
Decana de la Facultad de Óptica y Optometría

Ignacio Lizasoain Hernández
Vicerrector de Política Científica, Investigación y Doctorado

Emilio Javier Peral Vega
Director de la Escuela de Doctorado

9:50 Sesión 1: Ponencias

Moderadora: Laura Rico del Viejo

- Detection of ice by means of fibre optic based sensors
  Ana Belén Fernández Medina

- Visual simulations of bifocal contact lenses in young myopic adults for myopia progression control
  Shrilekha Vedhakrishnan

- Measuring the absorption coefficient of non-conventional shaped materials with low absorption
  José María Serrano Barranco

- Differences between anterior surface wettability of scleral contact lens and after eight hours of wearing a scleral lens in patients with irregular corneal surface
  María Serramito Blanco

- Implementing a transverse chromatic aberration measurement channel in an adaptive optics system
  Sara El Aissati Aissati

10:50-11:00 Haz tus preguntas

11:00-11:40 Sesión 2: Pósters + Coffee Break

- Translation and Adaptation into Spanish of CISS
  Carlos Perez Garmendia

- Rotation of retinal vascular arcades in the assessment of cycloposition: validity and reliability.
  Elena Piedrahíta Alonso

- Effect of Ap4A on ARPE-19 cells
  Begoña Fonseca Vazquez

- Measurement of intraocular pressure during the creation of a corneal flap with a femtosecond laser system.
  Gorka Laucirica Saez

- Binocular and accommodative function in the controlled randomized clinical trial MiSight® Assessment Study Spain (MASS)
  Francisco Luis Prieto Garrido

- Ocular surface in pediatric patients
  Beatriz Martin Garcia

- Factors associated with visual and ocular symptoms related to the use of screen devices in schoolchildren aged 9 to 18 years
  Anahí González Bergaz

- Detection system with gold nanoparticles
  Cristina Pastrana Robles

11:40 Sesión 3: Ponencias

Moderadora: Sara El Aissati Aissati

- A LIBS method to measure simultaneously the impurities and the hydrogen composition present in the wall of the TJ-II stellarator.
  Belen Lopez Miranda

- Machine learning segmentation and classification of hyperspectral larynx imagery
  Juan Luis Méndez González

- Short-term effects of orthokeratology on total and corneal spherical aberration and its relation to accommodative response
  Laura Batres Valderas

- Freeform optics adapted to the design of spatial instrumentation
  Andrea García Moreno

- Blur discrimination with Adaptive Optic System
  Clara Benedí García

12:40-12:50 Haz tus preguntas

12:50 - 13:50 Mesa redonda "Movilidad en el doctorado “

Moderadora: Laura Batres Valderas

14:00 Clausura y entrega de premios

PONENCIAS ORALES

Detection of ice by means of fibre optic based sensors

Ana Fernández-Medina[1], Malte Frövel [1], * Raquel López Heredero [1], *Tomás Belenguer[1]
[1]*National Institute for Aerospace Technology (INTA)*

Introduction

During take-off and landing aircrafts could be involved in atmospheric icing conditions. Atmospheric super-cooled droplets are liquid droplets with temperature below 0ºC. Super-cooled droplets that impact against the fuselage of aircrafts turn into accreted ice on the aircraft surface [1]. The ice can modified the aerodynamic profile of critical parts of the plane. The consequence of accreted ice could be fatal in some cases. The accident of the American Eagle Flight 4184 [2] is an example. The experiment presents the performance of three icing sensors subjected to icing condition according JAR-25 [3] to demonstrate viability of the technology for detecting in flight icing processes. The sensors under test are involved in a patent process, for this reason few details of the sensor can be disclose.

Method

Continuous maximum icing [3] is defined by effective droplet diameter, cloud liquid water content and temperature. The wind icing tunnel is able to control previously mentioned parameters. During the experiment were set following conditions: droplet size (20 micros), liquid water content (LWC: 0.64 g/m3), external temperature (-4ºC) and wind speed (50 m/s). Two sensors have been installed in a wing profile. One of them in the leading edge and the other in the upper surface. An extra sensor has been manufacturing in a plate and is located in the shaft of the profile. The interrogation system is a Micron Optics Hyperion SI155. During calibration, wavelength detected by the interrogator is translated into Celsius degrees. The signal provided by the icing sensors (also in Celsius degrees) is indicative of accretion of ice in the profile. Five consecutive measurements are performed within one experiment. A measurement consist of spraying water in the air flow. The sprayed

water and the formation of the ice in the profile can be observe through a window located in the icing wind tunnel.

Results

Figure 1 presents the results of the experiment. The reading of the icing sensor for no-water content is zero. If water content is introduced in the air flow the water is super-cooled below 0ºC but without forming ice. When splashing against the aerodynamic profile, an increase of 4ºC in the icing detection signal is presented. If the water content in the air flow stops the reading of the three ice sensor come back zero. After a pause water content is applied again. This produce a new increase of the signal and so on four times more. The formation of the ice layer can be observe from the tunnel window. Period of accretion of ice match with the high value of the icing detection signal.

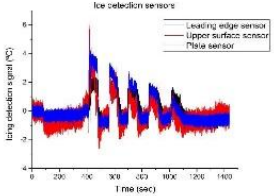

Figure 1: Icing detection signal.

Conclusions

Icing fiber optics based sensors have been tested in an icing wind tunnel. Strong atmospheric icing condition has been explored. The sensors present good performance for a continuous maximum icing.

References

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[2] In-flight Icing Encounter and Loss of Control Simmons Airlines, American Eagle Flight 4184 National Transportation Safety Board, http://www.ntsb.gov/investigations/AccidentReports/Pages/AAR9601.aspx

[3].Join Aviation Requirements JAR-25: Large aeroplanes.

Visual simulations of bifocal contact lenses in young myopic adults for myopia progression control

Shrilekha Vedhakrishnan[1,2], Maria Vinas[1], Mercedes Romero[1], Carlos Dorronsoro[1], Sara el Aissati[1,2], Clara Benedi[1], Susana Marcos[1]
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[2]*Universidad Complutense Madrid, Spain*
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Introduction
Soft bifocal CLs have shown to be effective in slowing myopia progression [1]. Multifocal CLs work by decreasing accommodative effort, and therefore foveal myopic blur [1]. The goal of this study is to use an Adaptive Optics Visual Simulator to evaluate to evaluate the effect of multifocal contact lens designs on perceived vision and visual performance.

Methods
Measurements were performed in a custom made polychromatic AO system. Four multifocal designs were selected based on the lenses, which were commercially available. The energy was not equally distributed between the far and near zones they include two and four zone designs. Visual acuity, Scoring and Pattern preference test were done. VA and Pattern preference were done only for two zone center near and distance designs.

Results
Scoring: The scoring was done for all the patterns. The least scored patterns were given a negative score. Overall the most scored pattern for far was Pattern 3(center near 2zone) and for near it was Pattern 4(center near 4zone). Individually with respect to addition the most scored pattern was Pattern 1(center distance 4zone) with addition +1D, for near it was Pattern 1(center distance 4zone) with +1.5D.
Pattern Preference: For Pattern preference only Pattern 2 and 3 were tested (2 zone center distance and near). For pattern 2(2zone center

distance) far all the additions were preferred except +1.5D and 2D, for near there was no distinct addition preferred. For pattern 3(2zone center near) far majority of the additions were rejected and for near there was no distinct result. On average for both patterns near was better than far. Visual acuity: For Visual acuity only Pattern 2 and 3 were tested (2 zone center distance and near). For far those subjects who had less visual acuity with pattern 2 had better visual acuity with pattern 3. The near visual acuity for both patterns was better than far. On average Pattern 2(2zone center distance) had better visual acuity than Pattern 3(2zone center near).

Conclusions

There is a high inter-subject variability in the optimal pattern and addition, indicating that the most suitable correction must be searched at the individual level. The selection should take into account performance and perceived judgments from patients.

Reference

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[2]Vinas.M, Dorronsoro C.Radhakrishnan A, Benedi-Garcia C, LaVilla E.A, Schwiegerling J, & Marcos (2017)
Comparison of vision through surface modulated and spatial light modulated multifocal optics. Biomedical
Optics Express: 8(4): p.2055-2068.

[3]Vinas M, Dorronsoro C, Gonzalez V, Cortes D, Radhakrishnan A, Benedi-Garcia, & Marcos S, (2017) Testing vision with angular and radial multifocal designs using Adaptive Optics. Vision Research: 132:p.85-96

Measuring the absorption coefficient of non-conventional shaped materials with low absorption

José Mª Serrano Barranco [1]
[1] *Complutense University of Madrid*

Introduction

For some applications related to illumination, the control and measure of the absorption coefficient are critical in materials such as illumination light guides, concentrators of light. The characterization of the absorption before and after the fabrication process, and over time by environmental effect is essential because of the characteristics of them will change and the result won´t be the expected. Nowadays, the classical methods for measuring it are based on samples with plane parallel faces and a collimated light beam [1], which are useless for illumination light guides or concentrators due to its arbitrary shape and low absorption. Alternatively, it´s possible to measure it using an integrating sphere [2] with a perfectly lambertian illuminating light field.

Method

The method used is based on simulate optical designs with a ray tracing program called TracePro and in this way estimate the absorption of a solid piece situated within an integrating sphere, analyse the obtained results and compare it with a theoretical and experimental model developed for solid and gaseous materials using an integrating sphere.

Results

Through simulations, different results have been obtained for a lot of designs inside an integrating sphere. They have been compared with the developed model for the optical characterization of the absorption on pieces and it has been proved that the results are adapted very well with the model of absorption of materials weakly absorbent.

Conclusions

The integrating sphere spectroscopy is a new and useful method for measuring the optical absorption of solid and gaseous optical materials with arbitrary shape and low absorption.

References

[1] C.H. Huang, G. Zhang, Z.Q. Chen, X.J. Huang, H.Y. Shen, "Calculation of the absorption coefficients of optical materials by measuring the transmissivities and refractive indices", Optics & Laser Technology 34 209 – 211 (2002).
[2] Labsphere Inc. A guide to integrating sphere theory and applications. 1994.

Differences between anterior surface wettability of scleral contact lens and after eight hours of wearing a scleral lens in patients with irregular corneal surface

María Serramito Blanco MSc[1]
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Introduction

The tear film is the outermost refractive surface of the eye, and it plays an important role in the quality of vision (Montes-Mico, 2007) changes in the tear film it may cause changes in vision.

Contact lenses in the eye are well known to alter the structure of the tear film by dividing the precorneal tear film into prelens and postlens tear film layers. A variety of changes in the quality of the tear film with contact lens wear are noted by unstable tear film, decreased tear film breakup time (TBUT) and increased evaporation and thinning rates (Nichols, Mitchell, & King-Smith, 2005). The tear alterations can develop symptoms of dryness and it has been found to be a primary reason for contact lens intolerance. Nowadays, scleral contact lens can be used as a therapeutic treatment of dry eyes improving the patient´s symptoms of dryness.(Sonsino & Mathe, 2013) Scleral contact lenses are rigid gas permeable with a large diameter designed to rest on the sclera and vault over the entire corneal surface. The aim of this study was to evaluate the anterior surface wettability of scleral contact lens and ocular surface wettability just scleral lens wear and after eight hours of wearing a scleral lens in patients with irregular corneal surface.

Method

A prospective short-term study was designed, developed, and conducted. Forty-nine (49) subjects with keratoconus were recruited for the study. Inclusion criterion was keratoconus grade I or II (according to Amsler–Krumeich classification) with or without ICRS. Exclusion criteria were presence of ocular or lid disease, allergies, and atopy. The

sample was divided into 2 groups: 19 subjects with ICRS (KCICRS group), and 30 subjects without ICRS (KC group).
All subjects were fit with ICD 16.5 with an overall diameter of 16.5 mm and centre thickness of 300 microns.
Tear film surface quality (TFSQ), Schirmer test, OSDI questionnaire, VAS questionnaire, fluorescein TBUT and corneal stainning were evaluated before lens wear and immediately after lens removal after 8 hours of wear. Also, TFSQ were evaluated at the moment lens wear and after 8 hours with the lens wear.

Results

The TFSQ results in the two groups, KC group and KCICRS group, there were statistically significant measured without scleral contact lens, before and after eight hours wearing. Schirmer test results not were statistically significant instead TBUT and OSDI values were statistically significant being lower values after 8 hours with the lens wear.

Conclusions

Scleral contact lens keeps wettability their anterior surface after wearing, but the ocular surface loses stability and tear volume. It might be advisable to recommend tear instillation to our patients after wear scleral contact lenses.

References

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[2] Nichols, J. J., Mitchell, G. L., & King-Smith, P. E. (2005). Thinning rate of the precorneal and prelens tear films. Invest Ophthalmol Vis Sci, 46(7), 2353-2361. doi:10.1167/iovs.05-0094

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Implementing a transverse chromatic aberration measurement channel in an adaptive optics system

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Introduction

In polychromatic light, the retinal image is affected by both monochromatic and chromatic aberrations of the ocular optics. Both, longitudinal (LCA) [1] and transverse (TCA) chromatic aberrations, play a role in polychromatic eye's image quality. LCA and TCA may also change upon ophthalmic corrections. However, the combined impact of LCA & TCA on vision is not well understood. It has been shown that monochromatic aberrations may be in fact protect the eye against chromatic blur [2]. While LCA is typically measured either using objective or psychophysical techniques, measurements of the TCA are scarcer, and the impact of all those factors on vision seldom investigated. In this study, we implemented a new psychophysical channel in a polychromatic Adaptive Optics (AO) visual simulator aimed at measuring TCA in human eyes in vivo.

Method

The TCA channel was implanted in a custom developed AO system [1]. It consisted on a two-dimensional version of the two-color (red and blue) Vernier alignment technique proposed by Thibos et al. [3]. The stimulus contained two concentric colored squares with a central cross (Fig. 1a). The external square is blue, and contains, as a static reference, the periphery of the cross. The central square is red, and contains the central part of the cross in a position adjustable by the subject [4]. The cross is projected in a Digital Micro-Mirror Device (DMD) illuminated simultaneously with two wavelengths (480 and 650 nm) coming from a supercontinuum laser source [1]. A photographic slide acts as a compound filter to create the two colored squares, filtering one wavelengths in each region. The tasks were designed such that subjects

performed a Vernier acuity task simultaneously in the horizontal and vertical directions to align the position of the central cross to the reference, using a keyboard.

Results

Preliminary measurements on two subjects show that the designed test was suited for clinical measurements, as the adjustment of the cross displacement by the subject can offset (and therefore quantify), the perceived TCA. The use of a programmable DMD, controlled from a simple Matlab script (Mathworks, Inc.) allows quick adjustments of the stimulus: equiluminance of the colored squares, and position of the Vernier cross. This digital optical channel provides a simple, quick and accurate method to measure the TCA, in a set-up already used for LCA objective and subjective measurements.

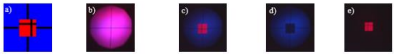

Fig 1. a) Design of the visual stimuli used to measure TCA. b) Stimulus illuminated simultaneously with two wavelengths (480 and 650nm); c) Stimulus illuminated simultaneously with two wavelengths (480 and 650 nm); d-e) Extinction of the wavelengths in each zone of the stimulus.

Conclusions

A DMD was combined with a supercontinuum laser source to construct a digital programmable polychromatic stimulus for the measurement of TCA. With this new channel the AO device can measure LCA, TCA and monochromatic aberrations of the eye, therefore allowing a direct investigation of the relative impact of each of those on retinal image quality in polychromatic light.

References

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A LIBS method to measure simultaneously the impurities and the hydrogen composition present in the wall of the TJ-II stellarator.

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Introduction

The study of plasma-wall interactions and impurity transport in magnetic confinement plasma devices is critical for the development of future fusion reactors. Laser Induced Breakdown Spectroscopy (LIBS) is a technique that can provide a suitable analysis of hydrogen composites present on the inner wall of the vacuum chamber wall of such devices while Laser Blow-off tools can be used to study impurity ion transport within the plasma created in the stellarator TJ-II. In this contribution, an experiment to perform LIBS, with some minor modifications of our laser blow-off impurity injection system [1], has been set up thus making both experiments compatible.

Method

For this a laser pulse, focused onto the TJ-II vacuum wall, evaporates a surface layer. The light radiation produced by the liberated gas is collected by two separate lens and fiber combinations to two spectrometers. One of these, with lower spectral resolution, records spectra from 200 to 900 nm while the second one, a ½ meter focal distance spectrometer with a 2400 g/mm grating, is tuned to the Balmer Hα and Dα lines in order to quantify the H:D isotopic ratio present on the wall surface.

Results

In the presentation, after outlining magnetic confinement fusion and its objectives, the stellarator TJ-II, which has operated since 1998 al the

Laboratorio Nacional de Fusión, CIEMAT, Madrid, will be described. Next, the alignment, calibration and spectral analysis methods used here for LIBS will be described. Then, representative experimental results obtained with this set-up will be shown.

Conclusions

We demonstrate the proof-of-concept of LIBS technique for use in the magnetic confinement device. In particular, we highlight how LIBS can be potentially useful for determining the degree of the oxidation of the surface of its stainless steel wall, which is coated by boron and lithium, from the presence of oxygen lines. Finally, we discuss how differences between LIBS spectra and global plasma spectra may help discriminate between local and global wall impurities useful for identifying local versus global wall impurities.

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"Machine learning segmentation and classification of hyperspectral larynx imagery"

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Introduction

Head and neck squamous cell carcinoma accounts for over 350,000 deaths and approximately 630,000 new cases every year [1] but so far, early detection is still limited to subjective white light visual inspection of the mucosa.

Newer techniques include autofluorescence, narrow band imaging and HyperSpectral Imaging (HSI) [2], which collecting spatial and spectral information has the ability to capture spectral differences that other techniques will miss. However, interpretability still remains an issue.

This study aims to review and apply machine learning techniques for segmentation and semantical classification of laryngeal HSI.

Methods

Our study comprises over 800 captures from more than 500 patients. For acquisition, the larynx was sequentially illuminated from 390 nm to 680 nm in 10 nm steps with a monochromatic-tunable light source (Polychrome V, TillPhotonics). Images were captured with a monochromatic CCD-camera (AxioCam MRm, Zeiss) while specifically dedicated software was used for synchronization (AxioVision, Zeiss). A PTFE's white pattern standard (SG 3201, Zenith Polymer) was frequently attached for calibration purposes.

For processing and analysis of the information, custom algorithms are being developed under a numerical computing environment (MatLab, Mathworks).

Results

Preliminary results show the ability to identify calibration standards and specular reflections under inhomogeneous spatial and illumination conditions. Currently we are analyzing the information obtained from these calibration targets to compensate for the effects of inhomogeneous illumination, allowing us to estimate the underlying reflectances and to move to a more consistent spatial reflectance space. Upcoming work will include splitting our database in training and testing groups and the implementation of a hierarchical classification tree for supervised training on recognition of the main spatial-spectral texture patterns.

Conclusions

Machine learning techniques are revolutionizing our way to analyze huge amounts of data, recognizing and uncovering hidden patterns behind it. What makes them specially suitable for "big data" high-variability problems such as endoscopic hyperspectral images in a real clinical environment.

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Short-term effects of orthokeratology on total and corneal spherical aberration and its relation to accommodative response

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Introduction

Myopic children have shown a tendency to greater accommodative lag. This condition is proposed as a factor in the development and progression of myopia due to axial hypermetropic blur in the retina during near vision work. High-order optical aberrations induced by ortho-k lenses have also been postulated as a factor in the reduction of axial elongation in myopia(Lopez-Gil & Fernandez-Sanchez, 2010).Different treatments are available for control the progression of myopia and axial elongation. The ortho-k has shown an effectiveness and safety in the myopia control(Swarbrick, 2006).

Our objective has been to study the changes in the corneal and internal spherical aberration (SA) and in the accommodative response in children between 6 and 17 years in myopic progression.

Method

A total of 38 eyes of 19 Caucasian children were included (mean age 12.9 ± 3.2 years). The corneal and ocular aberrations and the accommodative lag were measured before wear the lenses, 1night, 1week, 1, 3 and 6 months of lens wear. The previous spherical equivalent was -3.81 ± 1.67 D. The aberrations were measured with the Oculus Pentacam (Optikgeräte GmbH, Wetzlar, Germany) to verify that there are no changes in the posterior surface of the cornea and to assume that the internal changes are due to the lens and the Visionix110 multidiagnostic platform (Visionix-Luneau, Chartres, France) to obtain comparable measurements between the anterior and total corneal

surface. The accommodative lag was measured with the Nott retinoscopy.

Results

A statistically significant difference was found in SA. The values of corneal SA increased its positive value and the internal SA increased its negative value (p-value <0.05). The accommodative lag changed significantly at six months, decreasing to a lead of +0.50 D. In addition, a positive correlation was found between the internal SA and the accommodative response after 6 months of treatment.

Conclusions

In agreement with our findings, no aberrometric changes were found in the posterior corneal surface. During the treatment of ortho-k, the negative SA of the lens increases its magnitude and compensates for the increase in positive SA of the anterior surface of the cornea, in addition to increasing the accommodative response. There is a correlation between the internal SA and the accommodative response at 6 months. This accommodative excess can cause a shift in defocus towards more myopic values, which could explain why orthokeratology slows myopic progression.

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Freeform optics adapted to the design of spatial instrumentation

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Introduction

The main topic of the work I am developing is the study of freeform optics based on the break of rotational symmetry and its implementation in spatial instrumentation. Thus, the consequent first step is the performance of a comprehensive bibliographic search of the state of the art of freeform optics. In the last years, the manufacturing and measuring capabilities of topologically complex surfaces have been greatly improved so, the applications fields of freeform optics has exponentially increased [1].

Method

Freeform optics introduced the break of the rotational symmetry in an optical system to achieve the high quality that is not reachable while preserving that symmetry. A whole aberration theory has been developed for this kind of systems and it allows the analytical evaluation of the optical aberrations behavior in the presence of any freeform surface. This theory is known as Nodal Aberration Theory (NAT). NAT stablishes that the break of rotational symmetry in an optical system does not create any new kind of aberrations but it generates a new distribution of these aberrations at the image plane in terms of the angular field. Specifically, it generates the appearance of one or more nodes of aberrations that are not located at the optical axis anymore [2, 3].

Results

The first step in the production of a freeform system is its optical design so, the deep learning of the use of an optical design software is essential. In this case, we took in consideration Code V and Zemax Opticstudio

and we evaluated the tools they both provide for the specific design of freeform surfaces. The important features are the options for describing the freeform surface mathematically and how it is adapted for the optimization of the system in terms of the parameters of the mathematical function. Both of them provide a wide range of mathematical functions to describe the freeform surface and they are all perfectly ready for being introduced in the optimization process so, the key point is to select the proper description of the freeform surface for the specific application.

Conclusions

We present here the design of a two-mirror telescope that introduces the use of freeform surfaces to achieve high optical quality at two specific points at the image plane that are far away from the optical axis. In this specific case, it is clearly shown the need of breaking rotational symmetry to achieve that high optical quality impossible to reach by preserving this symmetry. We show how the distribution of aberrations can be manipulated by selecting the proper way of breaking this symmetry and the resultant surfaces composing the optical system.

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Blur discrimination with Adaptive Optic System

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Introduction

Blur threshold has been previously studied [1]. This study incorporates the aberrations control to know their influence on blur discrimination.

Method

An Adaptive Optics System (AO) was used [2]. It has a wavefront sensor Hartmann-Shack (32x32 microlenses), woriking on a closeloop with a deformable mirror (52 actuators; MIRAO, Imagine Eye, Frace) in IR light (827 nm). Stimulus, a checkboard, was projected on a CRT screen (Mitsubishi Diamond Pro 2070, Japan). Task consisted on a comparison of two images: a reference one (pedestal) with another with a different amount of blur calculated with a Quest until threshold is found. According to the method to simulate blur, study splits in 3 experiments: (1) Convolved images con PSF's subject, (2) defocus induced with a Badal system with (2A) corrected aberrations with AO and (2B) aberrations no corrected (NoAO) and (3) conditions as experiment 1 including adaptation to pedestal. Pedestal in experiments 1 and 3 are PSFx 0 (Condition AO), PSFx 0.25, PSFx 0.50, PSFx 0.75, PSFx 1 (Condition No AO), PSFx 1.25, PSFx 1.50, PSFx 1.75, PSFx 2 and in experiment 2 -0.25D, 0D, +0.25D, +0.50D, +1D. Measurements were performance on 3 subjects (44 ±4.36 years) with a pupil size de 5 mm and paralyzed accommodation. Blur threshold (arcmin) are analyzed according to the pedestal (arcmin).

Results

Blur induced with a pure defocus (exp 2) results in a increment of the threshold of blur discrimination (average tend 0.0927 log arcmin/log arcmin), similar to previous results on literature con Gaussian blur.

Pedestal that produces minimum threshold correspond to 0-0.25 D (0.46-3.02 arcmin). On a subject, correction of aberrations decreases threshold by a factor of 0.23. Induction of blur with convolved images reveal an increase of the threshold for blurrier pedestals. Minimum threshold are on pedestals closed to natural aberrations of the subjects (x0.75-x1 PSF).

Conclusions

Adaptation to pedestal tends to decrease the threshold of blur discrimination for most of pedestals, a shift the minimum of the curves. These results suggest that blur produced by ocular aberrations and adaptation to them play a role on blur discrimination.

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PÓSTERS

Translation and adaptation into Spanish of CISS

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Introduction

-This doctorate study aims the translation and adaptation to Spanish of CISS (Khadka et al., 2014) (Convergence Insufficiency symptom survey) and its validation. The main goal is to provide to the Spanish optitian and ophthalmologist professionals with a tool that can be useful on the identification of the optical factors and visual symptoms that influence the close work

-As secondary goal, it's expected to explore the likely correlations between CISS and WEMWBS (Maheswaran, Welch, Powell, & Stewart-Brown, 2012) (Warwick-Edinburgh survey) – this survey analyses the wellness perception of subjects

Method

-Translation into Spanish of CISS survey (Muñiz, Elosua, & Hambleton, 2013)

-Validation of CISS survey

-Analysis of psychometric properties of the Spanish version of CISS through Rasch analysis (Khadka et al., 2014)

-Study of possible correlation between IC symptoms and the wellness perception using stats methods to check the possible link with the outcomes of Warwick-Edinburgh Survey (WEMWBS)

-Clinic checks to get validation through field tests (Lamoureux, Pallant, Pesudovs, Hassell, & Keeffe, 2006)

Results

-Spanish version of CISS, valid as a new powerful tool suitable for Spanish populations. This is an enormous contribution to help professionals on the detection of close vision problems

-No correlations found between IC symptoms associated to a degradation of the perception of wellness (WEMWBS & CISS appear uncorrelated)

Conclusions

-Close vision problems and specially IC are high prevalence problems that can be found on study populations (Borsting E, Rouse M, Lynn M, Scheiman M, Cotter S, Cooper J, 2003)

-An Spanish version of CISS can help professionals on the early detection of IC and other close vision symptoms

-The analysis developed during this study, disregards the initial hypothesis of a likely correlation between a degradation of the wellness perception associated to IC and close vision symptoms (López et al., 2013)

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Rotation of retinal vascular arcades in the assessment of cycloposition: validity and reliability

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Introduction

Cycloposition measurement for objective torsion is a routine procedure in strabismus examination and an important parameter in differential diagnosis of paralytic deviations. The disc-fovea angle (DFA) determination is considered the gold standard method to evaluate cycloposition [1]. The rotation of the retinal vascular arcades has been described by Parsa and Kumar as an accessory sign of ocular torsion [2] The aim of this study was to assess the agreement between DFA and the retinal vascular arcades rotation to measure cycloposition. Reproducibility between observers was also evaluated.

Method

Cycloplegic fundus image was taken in 314 healthy eyes of 157 normal binocular vision patients (age 41, range 6 to 88 years). According to Parsa and Kumar proposal, two independent observers used software created specifically for the study to determine DFA, VRA (Vein Related Angle) and ARA (Artery Related Angle) in every fundus photograph. MRA (Mean value of VRA and ARA) was calculated.

Results

The three vascular methods (VRA, ARA and MRA) showed an important bias in cycloposition compared to the gold standard method, from 4º to 5º lower than DFA ($p < 0.001$). The spread of vascular data was larger, with a variation coefficient over 200%, compared to 47% in DFA. There was poor correlation between DFA and other methods (Intraclass correlation coefficient): DFA versus VRA 0.39, versus ARA 0.40, versus MRA 0.50. The Bland-Altman plots confirmed the bias between VRA, ARA and MRA, compared to DFA. The 95% limits of agreement exceeded in all cases the value of 4º, considered a priori as the maximum variability acceptable for clinical purposes. Reliability between observers was good in all methods. The multivariate analysis showed no interaction between each method and eye side, sex or observer ($p > 0.05$).

Conclusions

The rotation of retinal vascular arcades using the Parsa and Kumar technique is no substitute of DFA when assessing cycloposition in fundus photographs. Of the methods tested, MRA correlated most closely, but DFA remains the gold standard for cycloposition. The rotation of vascular arcades provides a qualitative assessment, particularly in uncertain macular location.

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Effect of Ap4A on ARPE-19 cells and microglial cells

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Introduction

Glaucoma is a leading cause of blindness worldwide, and it is defined as an optic neuropathy in which there is a death of retinal ganglion cells and loss of their axons in the optic nerve that lead to blindness [1] Elevated IOP is the major risk factor for the development of glaucoma and current treatment relies on decreasing IOP. Till date some attempts have demonstrated the role of nucleotides (such as Ap4A) modulating IOP [2]. Being a neurodegenerative pathology, the role of retinal support cells is of great interest. Microglial cells are the immunocompetent cells of the retina and activated microglia are associated with retinal pathology. They appear early in the glaucomatous process and may contribute detrimentally to the neuronal apoptosis in the later stage. The retinal pigment epithelium (RPE), has been shown to play critical roles in the physiology of the photoreceptors including recycling of photopigment and turnover of photoreceptor outer segments as well as forming the blood-retinal barrier dysfunction is associated with retinal pathology for example with a well characterised role in age-related macular degeneration, but also an emerging role in glaucoma [3]

The aim of this study was to determine if the P2Y receptors could be activated by the Ap4A in RPE and microglial cells.

Methods

Two cell lines have been used to characterise the effects of Ap4a on retinal cells: ARPE-19 (Human RPE) and BV2 (mouse microglial cell

line). The pharmacology of Ap4a has been studied in each of these cell lines by fluorimetric (FURA-2) Ca2+ assay. A range of agonists and antagonists has been used to characterise the activity of Ap4a at P2 receptors on each cell type.

Results

Ca2+ was liberated in presence of 3mM of Ap4A in BV2 cells and of 100uM in ARPE-19 cells. P2Y2 antagonist receptor reduced significantly the release of Ca2+ in ARPE-19 cells, in presence of Ap4A.

Conclusions

Ap4A was able to activate both BV2 and ARPE-19 cells, and showed to have an effect on purinergic receptors. These results indicate the possibility of studying Ap4A as an effective compound for a neuroprotective treatment of glaucoma.

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Measurement of intraocular pressure during the creation of a corneal flap with a femtosecond laser system.

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Introduction

Laser in situ keratomileusis (LASIK) has become the most frequently method to correct all types of ametropias1. Femtosecond (FS) laser used a 1,053nm of wavelength to accurately photodisrupt, in the safety way, the corneal stroma to create a corneal flap. Also it uses a suction corneal ring that rise the intraocular pressure (IOP)2. This IOP can be rise to 120-160mmHg with the microkeratome3.Up to day, there no exist studies that measure the rise IOP with FS200 (Alcon).

Method

A prospective and interventional study was carried out. We only used freshly enucleated porcine eyes. All eyes were examined in a slit lamp and those with anatomical damages were excluded. IOP changes induced by the procedure were recorded with a reusable blood pressure transducer connected to the anterior chamber by direct cannulation.

Results

9 porcine eyes were studied. The maximum pressure increase during the whole process was 57.9 ± 17.26mmHg. The total average time for the creation of the flap was 32.22 ± 3.63sec

Conclusions

The FS200 elevates the IOP moderately compared with the Moria 2 microkeratome (160mmHg), with the Intralase J&J (110mmHg) that it uses a flat cone, with the Victus B&L (96mmHg) and the LenSx Alcon (20mmHg). These last two lasers are dual systems that use curved cones.

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Binocular and accommodative function in the controlled randomized clinical trial MiSight® Assessment Study Spain (MASS)

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Purpose:
To evaluate the binocular and accommodative function in children wearing dual focus (DF) MiSight® contact lenses (CLs) for myopia control compared with children wearing single-vision (SV) spectacles.
Methods:
This was a randomized, controlled clinical trial involving subjects aged 8 to 12, with myopia ranging from - 0.75 to - 4.00D and astigmatism < 1.00D, allocated to MiSight® study CLs group or control group wearing SV. Binocularand accommodative function was determined at baseline, 12-, and 24-month visits, assessed by the following sequence of tests: distance and near horizontal phoria, accommodative convergence/accommodation (AC/A) ratio, stereopsis,accommodative amplitude (AA), and accommodative response (AR) at 33, 25 and 20 cm.
Results:
Seventy-four children completed the study: 41 in the CL group and 33 in the SV group. CLs group did not show any significant differences in binocular and accommodative measurements throughout the study. In control group, distance and near phoria, stereopsis, AC/A and AR at 20 cm did not show any significant change, but AA, AR at 33 cm and AR at 25 cm were greater at 24-month visit compared with baseline ($p < 0.05$).

Conclusions:
DF lenses do not change the binocular and accommodative function in children wearing dual focus CLs.

Ocular surface in pediatric patients

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Introduction

Dry eye disease (DED) is a multifactorial disease of the tears and the ocular surface that results in tear film instability and inflammation with potential damage to the ocular surface. It causes symptoms such as ocular discomfort, itching eyes, and visual disturbance that can significantly impact the patient´s quality of life.1

The last DED studies range the prevalence of dry eye disease from 5 to 50% that increases with age and female gender but also reveal an important lack of prevalence studies in young populations. 2

Besides systemic and ocular risk factors such as Meibomian gland dysfunction, contact lens wear, and ocular allergies, there are environmental factors such as air pollution and the use of video display terminals that could exacerbate DED.

Nowadays, children and teenagers are enthusiastic users of smartphones and computers, but they have less ability to express discomfort than adults. 3

Method

To research the real condition of the ocular surface in a pediatric population, a prospective study has been designed. This includes children from 7 to 17 years without ocular pathologies or allergies and non-contact lens users. The protocol includes measurements of the tear volume, non-invasive break-up time, slit lamp evaluation and fluorescein staining among others. Visual acuity and optical quality are also evaluated, and patients complete a specific dry eye symptoms questionnaire and some questions about the use of digitals screens.

Results

This study is still in development. The data obtained will be analyzed statistically to obtain new information about the state of the ocular surface in children as well as the possible associated symptomatology.

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Factors associated with visual and ocular symptoms related to the use of screen devices in schoolchildren aged 9 to 18 years

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Introduction

Development of validated questionnaires of high quality allows to obtain objective, valid and repeatable measures on unobservable aspects of an alteration and its treatment, reason for which it has received a great attention in recent years. In particular, the FDA developed in 2007 a series of recommendations for its preparation and use [1].

The objective of this project is to validate the CVSS17 questionnaire in the population between 9 and 18 years old.

This scale includes the symptoms related to visual tasks associated with the use of screen devices. This questionnaire is comparable to existing questionnaires of insufficient convergence or quality of life related to vision.

The result of this work will provide the clinician a high quality tool to investigate the visual and ocular symptoms associated with the use of screen devices in school patients.

Method

A group of 1219 subjects between 9 and 18 years old will be recruited. It will be necessary the participation of different samples of subjects for the different phases of the same. All participants will be informed of the objective of the study and will sign an informed consent. They will answer a series of questions to collect demographic data and check compliance with the inclusion / exclusion criteria.

Results

Preliminary results show that 7.11% of the sample of 253 school subjects had symptoms associated with work in near vision.

Conclusions

The use of this type of questionnaire is a quick and inexpensive way to detect symptoms associated with the use of screen devices in children.

References

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Detection system with gold nanoparticles

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Introduction

Over the years, the scientific importance of nanoparticles for biomedical applications has increased. The high stability and biocompatibility, together with the low toxicity of the nanoparticles developed lead to their use as targeted drug delivery systems, bioimaging systems, and biosensors.(1) The main objective of this project is the development of a detection method of ocular pathologies associated with pathogens or other markers using gold nanoparticles.

Methods

First at all, the synthesis of gold nanoparticles suitable for their functionalization is carried out to get the union between gold nanoparticles with the chosen probe for the detection.

The functionalization is checked by spectrometry as well as dynamic light scattering (DLS)

Results

We are working on the optimization of the pathogen detection method.

Conclusion

The functionalization of gold nanoparticles is a useful method for detection of pathogens in which we must continue working to achieve perfect optimization.

References

[1] Nie L, Liu F, Ma P, Xiao X. Applications of gold nanoparticles in optical biosensors. J Biomed Nanotechnol. 2014;10(10):2700-21.

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