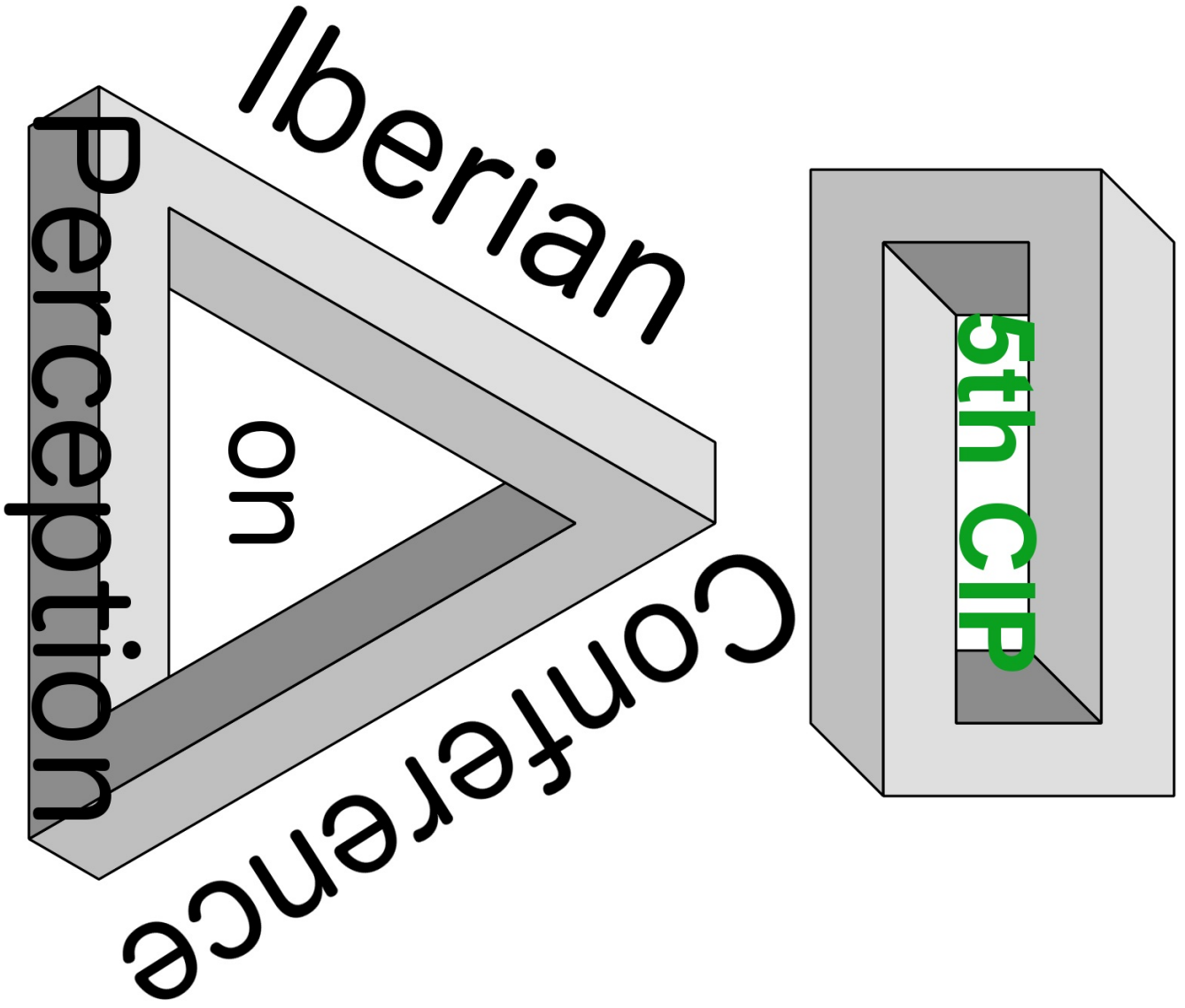
Santa Cruz, La Coruña, Spain, 27-28 June, 2013



Poster presentations:
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CONFERENCE PROGRAM

————27th of June————

9:30-10:00: Registration

10:00-11:30: SYMPOSIUM 1: COMPUTATIONAL MODELING IN VISION AND ACTION: PSYCHOPHYSICS AND NEUROPHYSIOLOGY
Chair: Ignacio Serrano-Pedraza

1 Testing the horizontal-vertical stereo anisotropy with the critical-band masking paradigm
Ignacio Serrano-Pedraza, Claire Brash, Jenny C. A. Read

2 Modelling the temporal resolution of optical variables for interceptive timing: the need for some prior assumptions
Joan López-Moliner

3 The Role of feedback in feedforward figure-ground segregation
Hans Supèr, August Romeo

4 How to Compute When it is Time to Escape: A Complete Computational Model of the Locust Visual System Which Processes Real-world Image Sequences and Videos
Matthias S. Keil

11:30-12:00 Coffee break

12:00-13:30: SYMPOSIUM 2: TIME AND ACTION
Chair: Cristina de la Malla

5 We do not really adapt to time in sensorimotor delays
Cristina de la Malla, Eli Brenner, Joan López-Moliner

6 Time-to-passage estimation on periphery: better for biological motion?
Sandra Mouta, Liliana Fontes, Jorge A. Santos, Joan López-Moliner

7 An oculomotor continuum from exploration to fixation
Susana Martínez-Conde, Jorge Otero-Millán, Stephen L. Macknik, Rachel E. Langston

8 The neural correlates of flicker fusion
Stephen L. Macknik, Hector Rieiro, Jie Cui, Manuel L. Ledo, M. Reza Afrasiabi, Susana Martínez-Conde

9 Perceptual-motor learning and sensory substitution
L. Lobo, D. Travieso, A. Barrientos, D.M. Jacobs

14:00-16:00: Lunch on your own

————- 16:30-18:00 Invited address ————

MARC ERNST, UNIVERSITY OF BIELEFELD, GERMANY

THE BENEFITS AND COSTS OF MULTISENSORY PERCEPTION

Poster Session: 18:00-20:30

10 Seeing and hearing: The (simultaneous) use of affective sounds and pictures as stimuli in human pavlovian conditioning
Isabel Padrón, Miguel Alcaraz, Jaime Redondo

11 Electrophysiological correlates of performance monitoring in a perceptual discrimination task
I. Padrón, J.L. Pardo-Vázquez, J. Fernández-Rey, C. Acuña

12 The importance of local phase in image identification revealed using visual chimaeras from the monogenic scale-space
Vicente Sierra Vázquez

13 Hearing peaks and valleys The spatial encoding of auditory pitchmodulates the electrophysiological response to visual stimuli
Irune Fernández-Prieto, Fátima Vera-Constán, Jordi Navarra

————-28th of June————-

10:00-11:30: SYMPOSIUM 3: COLOR AND OBJECT PERCEPTION
Chair: Sergio Nascimento and Julio Lillo

11:30-12:00 Coffee break

12:00-13:30: SYMPOSIUM 4: FACTORS INFLUENCING HUMAN TIME PERCEPTION: INTRA- AND INTER-INDIVIDUAL DIFFERENCE PERSPECTIVES
Chair: Alejandro Vasquez and Isabell Winkler

14:00-16:00: Lunch on your own

———— *16:30-18:00 Invited address* ————
SEPEX CONFERENCE

DAVID SOTO, IMPERIAL COLLEGE, UK

WORKING MEMORY BIASES IN HUMAN VISION

Poster Session: 18:00-19:30

19:30-20:00: Technical matters for future meetings. Open to all participants

21:00-24:00: The CIP dinner (included in your registration), and farewell address

List of authors

Testing the horizontal-vertical stereo anisotropy with the critical-band masking paradigm

Ignacio Serrano-Pedraza(1,2), Claire Brash(2), Jenny C. A. Read(2)
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There is a well-known anisotropy in stereovision: at low frequencies, horizontally-oriented sinusoidal depth corrugations are easier to detect than vertically-oriented corrugations (where both are defined by horizontal disparity). In a previous study, Serrano-Pedraza & Read (2010, Journal of Vision, 10(12)) suggested that this stereo anisotropy may arise because the stereo system uses multiple spatial-frequency disparity channels for detecting horizontally-oriented modulations, but only one for vertically-oriented modulations. In this work we tested this hypothesis using the power-spectrum model of masking (imported from audition and luminance studies) in order to measure the bandwidth of channels and to examine whether there are one or several channels. In the first experiment (4 subjects), we used Bayesian adaptive staircases to measure disparity thresholds for horizontal and vertical sinusoids near the peak of the disparity sensitivity function (0.4 c/deg), both in the presence of white noise with five different power levels, and in the presence of notched noise with 6 different bandwidths. The use of white noise and notched noise avoids off-frequency looking. We fitted the power- masking model to our results assuming a channel centred on 0.4 c/deg and we estimated channel bandwidths of 2.95 octaves for horizontal corrugations and 2.62 octaves for vertical corrugations. In our second experiment (8 subjects), we measured disparity thresholds for horizontal and vertical sinusoids of 0.1 c/deg in the presence of band-pass noise centred on 0.4 c/deg with a bandwidth of 0.5 octaves. This mask had a small effect on the disparity threshold at 0.1 c/deg, for either horizontal or vertical corrugations. We simulated the detection thresholds using the power-spectrum model with the parameters obtained in the first experiment and assuming two types of detection, single channel detection and multiple channel detection. The multiple-channel model predicted the thresholds better for both horizontal and vertical corrugations. We conclude that, contradicting our earlier hypothesis, the human stereo system must contain (at least) two channels for detecting horizontally-oriented and vertically-oriented depth modulations and that the channels at 0.1 and 0.4 c/deg must be operating almost totally independently.
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Modelling the temporal resolution of optical variables for interceptive timing: the need for some prior assumptions

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The models that specify time-to-contact (TTC) traditionally rely on optical variables. Their validity is therefore based on how accurately these variables (or combinations among them) signal the TTC irrespective of the noise in the sensors. For example, tau is the most known model which combines visual angle and rate of expansion and signals TTC accurately under some assumptions. However, both visual angle and rate of expansion produce activity in the sensors (e.g. looming detectors) that can be noisy (e.g. for small values of rate of expansion). This fact is often neglected by these models which are based on optical variables. Here I propose a model that specifies TTC for parabolic trajectories. The model combines optical variables and prior knowledge of physical properties of the environment (i.e. size of the object and gravity). I will report the results from simulations that show that the model is viable as a general purpose model for TTC computation due to its efficiency to deal with noise along all the trajectory.

The role of feedback in feedforward figure-ground segregation

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Figure-ground segmentation refers to the assignment of visual elements to either objects or background and is a primary step in visual perception. In the brain, visual features are detected by neurons by means of their feedforward defined classical receptive field influences beyond the classical receptive field have been interpreted as the neural of figure-ground segmentation. In the primary visual cortex (V1), cortical feedback covering large parts transmit extra-classical receptive field information and are considered be critical for figure-ground segmentation. This assumption is reflected in many theoretical computational models that explain figure-ground segregation by recurrent processing horizontal and/or feedback connections. However the exact role of feedback in segregation is not clear. For instance has feedback a decisive role in the occurrence of figure-ground activity or more modulatory role in controlling the strength of the figure-ground signal? Cortical state that is characterized by the way neurons fire, i.e. burst versus tonic firing, controls the transmission of feedforward information. This differential gating of feedforward information involves inhibition by feedback projections. Taking these findings together, we therefore speculate that a possible role for feedback is to control the strength of the figure-ground signal by influencing the cortical state. To test this idea we used our feed- forward spiking model that segregates figure-ground. Our data show that without feedback, neurons respond with low-frequency (~9Hz) bursting to a figure-ground stimulus. Feedback changed this firing pattern into a tonic spiking pattern. In this state, a further enhancement of the responses to the figure and a further suppression of background responses were observed resulting in a stronger figure-ground signal. To be effective, surround inhibition must arrive after but within 100ms, the feedforward induced responses. Such push-pull effect was confirmed by comparing the figure-ground responses with the responses to a homogenous texture. In conclusion, we propose that feedback controls the segregation of figure from ground by influencing the neural firing patterns of feedforward projecting neurons.

How to compute when it is time to escape: A complete computational model of the locust visual system which processes real-world image sequences and videos

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The visual system of the locust is an excellent model for studying the neuronal circuits which detect object approaches, because it is relatively easy to link neuronal responses to behavior. Current opinion holds that a big neuron, the Lobula Giant Movement Detector (LGMD), is directly involved in triggering an evasive movement in reply to collision threads. A phenomenological model, the Eta-function, mathematically describes the response curve of the LGMD, which gradually increases to a maximum during an object approach with constant velocity. The Eta-function multiplies excitation (angular velocity) with inhibition (exponential function of the negative angular size), and predicts that the peak response will always occur at a constant angular size, which is related to the time of the escape jump in the locust. The success of Eta prompted several researchers to believe that it has a direct biophysical implementation in the LGMD. The results of a respective study were interpreted to that effect: Excitation and inhibition are logarithmically encoded, then subtracted in the LGMD, and the output is exponentiated in the LGMD axon. However, instead of an exponential function, the axon seems to compute a 3rd order power law. Furthermore, it is not clear how angular size and velocity are computed pre-synaptically to the LGMD. Here I present a biophysical model of the LGMD ("n-Psi") and report corresponding simulation results. The n-Psi model resolves many of the discrepancies (theory versus experiment) that are associated with Eta. It clarifies which biophysical operations lead to Eta-like response properties (emergence of a multiplicative operation and a power law), and predicts that noise plays a crucial role for these computations. I furthermore will show simulation results with a novel model of the locust retina, which extracts angular size and angular velocity from natural video sequences. In agreement with experimental findings, it suppresses background movement, while maintaining its sensitivity for approaching objects. Since the complete model of the locust visual system (retina + LGMD) is capable of processing real-world image sequences, it lends itself for concrete applications, like detecting possible dangerous situations during car driving. The model could, for instance, detect collisions with pedestrians or other cars, and is universal in that there are no constraints on object size or velocity, image frame rate, or spatial resolution.

We do not really adapt to time in sensorimotor delays

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Adaptive behaviour is observed to compensate for errors following perturbations of action feedback. Unlike the case of spatial distortions, where adaptation is well reported (e.g. prism adaptation), results are controversial for temporal manipulations of consequences of our actions. When dealing with moving targets, delayed visual feedback always has an associated spatial error that depends on the speed of the movements, so adaptation may occur based either on the temporal error (late/early) or on the associated spatial error (left/right). To study which error signal drives adaptation we asked participants to hit targets that moved in different directions at different speeds under delayed visual feedback of their own movements. We compared sessions in which (a) visual feedback was provided throughout the movement of the hand, (b) a brief representation of the hand as it crossed the target was shown or (c) the spatial error was displayed right after each movement. Results show that subjects can adapt to temporal delays up to 220 ms but they need feedback of the movement itself; knowing the spatial error was not enough. By observing the transfer of adaptation to new conditions, we measured how general is this adaptive mechanisms. If adaptation to a temporal delay transfers to other tasks requiring control of temporal variables, subjects would have truly adapted to the new temporal relation between their action and the feedback. If it does not transfer to other tasks, subjects would only have learnt to control the specific delayed feedback on the basis of which success is evaluated. We examined transfer to various tasks involving different goals and movements but all requiring temporal control: manual pursuit of a moving target, navigating through a moving gap, perceptual judgments of the time of a collision and synchronization between the arrival of the hand to a spatial position and an auditory tone. Adaptation transfers to new circumstances within the same task but does not transfer to new tasks, which suggests that subjects learn to handle the new temporal discrepancy locally rather than truly adapting to a new temporal relation.

Time-to-passage estimation on periphery: better for biological motion?

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In previous studies, complex motion stimuli were judged as passing sooner than rigid stimuli but reflected more uncertainty in the judgments as revealed by precision loss and longer reaction times. It is known that biological motion can be perceived in the periphery. In the everyday life people are required to interact with or to estimate motion variables of other agents located on the periphery, at different locations of the visual field. In this study, stimuli were presented in different peripheral location (16°, 32° and 48°). In a time-to-passage (TTP) task rigid (RM), biological (BM) and scrambled (SM) motion conditions were compared. Seven simulated velocities were combined with seven starting distances, resulting in 49 levels of TTP: 24 conditions that arrived before 1s and 24 that arriving after 1s. Subjects had to decide whether the point−light walker (PLW) passed the eye plane before or after a reference time (1s) signaled by a tone. Subjects could judge time to passage of PLW peripherally to an eccentricity of at least 48º. Judgments for complex motion patterns (BM and SM) showed an anticipation of the passage combined with a loss of precision when compared with RM, at eccentricity 16º. The effect of eccentricity on precision was revealed by the increase of SD along eccentricities for SM. The TTP judgment seemed to become less precise as the stimuli were displaced farther along the peripheral field. For BM, an improvement on precision was verified at eccentricity 32º, and a subsequent deterioration just at eccentricity 48º. The anticipation of the passage for BM was no longer found on periphery, while the differences on the precision between BM and RM vanished.

An oculomotor continuum from exploration to fixation

Susana Martínez-Conde(1), Jorge Otero-Millán(1,2), Stephen L. Macknik(1), and Rachel E. Langston(1,3)

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During visual exploration, saccadic eye movements scan the scene for objects of interest. During attempted fixation, the eyes are relatively still but often produce microsaccades. Saccadic rates during exploration are higher than those of microsaccades during fixation, reinforcing the classic view that exploration and fixation are two distinct oculomotor behaviors. An alternative model is that fixation and exploration are not dichotomous, but are instead two extremes of a functional continuum. Here, we measured the eye movements of human observers as they either fixed their gaze on a small spot or scanned natural scenes of varying sizes. As scene size diminished, so did saccade rates, until they were continuous with microsaccadic rates during fixation. Other saccadic properties varied as function of image size as well, forming a continuum with microsaccadic parameters during fixation. This saccadic continuum extended to nonrestrictive, ecological viewing conditions that allowed all types of saccades and fixation positions. Eye movement simulations moreover showed that a single model of oculomotor behavior can explain the saccadic continuum from exploration to fixation, for images of all sizes. These findings challenge the notion that exploration and fixation are dichotomous, suggesting instead that visual fixation is functionally equivalent to visual exploration on a spatially focused scale.

The neural correlates of flicker fusion

Stephen L. Macknik(1), Hector Rieiro(1,2), Jie Cui(1), Manuel L. Ledo(1), M. Reza Afrasiabi(1,3), Susana Martínez-Conde(1)

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Artificial lighting and computer and TV displays rank among the most significant of all of modern society's innovations, and they all use flickering light, yet the neural mechanisms of flicker perception are unknown. Although each flash of a flickering stimulus in lighting devices are generally emitted for only a fraction of each flicker cycle, they appear as continuous and stable because we perceptually integrate successive flashes in a process called "flicker fusion". We determined the neural mechanisms for flicker fusion using single-unit recording of extracellular activity in area V1 of awake rhesus monkeys. Our stimuli were double-flashed gabor patches optimized to the orientation and position of the each receptive field tested, with varying flicker frequency and interstimulus interval. We found that the onset response to the second flash is suppressed in conditions where the interstimulus interval is very short, and it gradually recovers as this interval grows longer, irrespective of the flicker rate, implying that the interstimulus interval is more important parameter to flicker fusion than frequency. Likewise, human psychophysical experiments reveal that interstimulus interval likewise contributes to perception of flicker fusion more than flicker rate, representing a paradigm shift in our understanding of flicker fusion. Based on our hypothesis we predicted a new illusion "Temporal Fusion" in which we present a double-flash with a long interstimulus interval of 100 msec and suppress the target's termination-response using a spatially and temporally non-overlapping mask, followed by the suppression of the second flash's onset-response with the same mask. The illusory perception is that the double-flash is fused, despite the long interstimulus interval, into a single long flash. This confirms that stimulus transients from the mask not only mutually suppress target transients (as we have previously found in visual masking experiments), but that long-term temporal filling-in occurs between stimulus on- and termination transients stimulus (in the absence of intervening transients), and that this is the fundamental neural correlate of flicker fusion.

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Perceptual-Motor Learning and Sensory Substitution

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Introduction

Sensory substitution devices are designed to transform information of one perceptual system into information for another perceptual system. Most of these devices use visual to tactile transformations and are directed towards visually-impaired people. Earlier devices such as the TVSS were aimed at object recognition but later most devices have been developed to solve the mobility problem in the blind. With a visual to tactile device, Díaz et al. [1] showed, first, that it is possible to detect a platform one meter away and second, that exploratory movements allow more accurate performance. The main goal of the experiment presented here is to know: (1) if it is possible to step on a ground-level target wearing a partly-virtual sensory substitution device on the leg, (2) if performance increases with training, and (3) if different training conditions have a different effect on performance.

Methods

The sample was composed of twenty participants divided into two groups. They wore a device on the lower leg, consisting of a vertical array of 32 actuators that vibrated as a function of the distance to the first-encountered object. A four cameras motion tracking system (Qualisys, Inc.) detected the position and orientation of participants. The task consisted of walking through an exploration area until participant encountered and stepped on the target obstacle. Six distances and six heights were used for the obstacles. Both groups performed the pretest and the posttest blindfolded. One group could see during the four training sessions but the other group trained also blindfolded.

Results

The percentages of successful trials were of about 50% or higher for all groups, in pretest and posttest. The amount of successful trials increased after training and kinematic variables such as the average velocity and fluidity during the last step improved from pretest to posttest ($F(1) = 17.644$, $p < .001$ and $F(1) = 5.031$, $p = .038$; respectively). In the posttest, the amount of errors was greater in the vision training group.

Discussion

We conclude that it is possible to answer affirmatively to (1), (2) and (3). Although our device is useful for performing the task, technological features have to be improved (portability, accuracy, etc.) to be an extended aid to mobility for the blind.

References

[1]. Díaz, A., Jacobs, D. M., Travieso, D., & Barrientos, A. (2012). Action-contingent vibrotactile flow facilitates the detection of ground-level obstacles with a partly-virtual sensory substitution device. HUM MOVEMENT SCI, 31(6), 1571-1584.

The research reported here was supported by the Spanish Ministry of Economy and Competitiveness via project FFI2009-13416-C02-02.

Seeing and hearing: The (simultaneous) use of affective sounds and pictures as stimuli in human pavlovian conditioning

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The principal goal of this study was to verify whether it was possible to obtain aversive as well as appetitive electrodermal classical conditioning using a combination of pictures and sounds as conditioned stimuli (CS) and unconditioned stimuli (US). With this aim, stimuli developed at the Center of the Study of Emotion and Attention (University of Florida) were used. Concretely, we selected as CS and US, IAPS ("International Affective Picture System") pictures, and IADS ("International Affective Digitized Sounds") sounds. As aversive CS (CSav) and appetitive CS (CSap) a combination of pictures and sounds with intermediate values of valence and arousal was used. Preliminary results point to the possibility of obtaining aversive and appetitive conditioning with these types of stimuli.

Electrophysiological correlates of performance monitoring in a perceptual discrimination task

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Performance monitoring is an executive function, which we depend on for detecting and evaluating the consequences of our behavior. Electrophysiological recordings in human participants have allowed the identification of two event-related potentials (ERPs) components that have been interpreted as brain correlates of performance monitoring. The first one is called error-related negativity (ERN) and peaks about 80-100 ms after human subjects make errors in a reaction time task. This component is often followed by a positive deflection, called error positivity (Pe), which peaks about 200–450 ms after an incorrect response. One property of the ERN is that it can be elicited following presentation of error feedback. This waveform, named feedback-related negativity (FRN), is a fronto-central negative deflection that occurs at approximately 250-350 ms after negative feedback stimuli. Despite major advances in cognitive neuroscience, there are still unresolved issues about these performance-related components. Since most works are based on averaging large number of trials, it is not known whether these components represent the outcomes of previous actions on a trial-by-trial basis. Moreover, despite some theoretical proposals for the negative component, it is still not clear what the functional meaning of these performance-related components. To address these issues we conducted two experiments in which ERPs were recorded. In these experiments, participants performed a perceptual discrimination task and received feedback about their performance. We applied ROC analysis, which allowed us to study, trial by trial, the relationship between the ERPs and the outcomes (correct or incorrect) of the decisions. We also manipulated a set of behavioral variables, such as the task difficulty, the type of feedback, the magnitude of the reward (i.e., amount of gains and losses associated with the feedback), and the delay between the behavioral response and the presentation of feedback, to study their effects on feedback-related ERPs. Our results reveal the existence of a reliable, trial-by-trial relationship between two ERP components, one negative (FRN) followed by a positive one (which we will call feedback related positivity or FRP), and the outcomes of current decisions. This provides strong evidence supporting that FRN and FRP represent cognitive processes related to performance monitoring. Furthermore, as behavioral variables have differential effects on the FRN and the FRP, our results suggest that these components represent different cognitive processes: the error detection (FRN) and the subsequent assessment of the outcomes (FRP), allowing us to move one step further in understanding the functional meaning of performance-related ERPs.

The importance of local phase in image identification revealed using visual chimaeras from the monogenic scale-space

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The importance of global phase refers to two facts: the physical fact that the phase from the Fourier transform of any image contains more spatial information concerning the image than its Fourier amplitude, and the perceptual fact that any image can be recognized using only the information present in its phase spectrum. However, an image can be analyzed using its local amplitude and local phase obtained with a variety of formal procedures. Some studies have shown that tasks such as image identification can be performed using local amplitude information at fine scales and local phase at coarse scales. The relative importance of local amplitude and local phase for image identification can be shown by means of visual chimaeras, hybrid stimuli made by combining the local phase from one image with the local amplitude from another (Sierra-Vázquez & Serrano-Pedraza, 2011, Perception, 40). Here, we have used visual chimaeras in a number of scales computing the local amplitude and phase using the Riesz transform in the framework of the 2D monogenic Poisson scale-space representation. Results showed that at any scale the correlation between an original image and a visual chimaera containing its local phase information was higher than the correlation with a visual chimaera containing its local amplitude information. In addition, the appearance of a visual chimaera was similar to that of the original image when both contained the same local phase, irrespective of spatial scale. Our results allow us to conclude that when image local amplitude and local phase are properly defined local phase dominates over local amplitude and there is no evidence of local-amplitude dominance in image identification.

Hearing peaks and valleys: The spatial encoding of auditory pitchmodulates the electrophysiological response to visual stimuli

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Can listening to music influence how we see the world outside? Several studies suggest that pitch can be encoded in spatial/vertical coordinates (arguably in right parietal regions of the brain). In the present study, we investigated whether the possible spatial (up down)representation of high and low tones embedded in melodies can influence the spatial processing of visual stimuli. Event-related potentials to visual targets that could appear either above or below a centrally-presented fixation point were recorded. All of the experimental trials started with an isochronous 'melodic' stream including eleven tones. Each auditory stream (or melody) included 11 presentations of 2 different tones (one high and the other low frequency) arranged in a particular way. The visual target appeared after the last tone in a congruent or incongruent vertical position with respect to the 'spatial encoding prediction' generated by the auditory stream (e.g., "…low-high-low-high-low-UP" or "…low-high-low-high-low-DOWN", respectively). The results revealed that the amplitude of the fronto-central N1 and the parieto-occipital P3 components was significantly larger for incongruent than for congruent trials, demonstrating that the melodic 'ups and downs' were remapped into spatial coordinates that influenced the posterior processing of visual stimuli.

The role of acoustic cues in time-to-passage judgments: Judging time-to-passage of looming sounds

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Estimating the arrival of a moving sound is part of people's everyday tasks, such as when crossing a street with cars coming from both sides (eg. Winer, 1980 in Rosenblum, Wuestefeld, Saldaña, 1993). Given equal distances, the beginning and ending positions of a moving sound's source are perceived as closer when moving towards the observer than when moving away (Neuhoff, 2001).This phenomenon called overestimation of looming sounds has been recently studied with a wide range of tasks, from discrete measures of loudness change to Time-to-Arrival (TTA).

The aim of this study is to explore the ability of subjects to make time-to-passage (TTP) judgements in an auditory perception task. White-noise (binaural sound based on interpolated HRTF in free-field) was presented moving orthogonal to the frontal plane along a line that passed 1 meter to the right of the participant's shoulder. Seven constant velocities were combined with seven initial distances, resulting into 49 levels of TTP, 24 arriving one second before passage and 24 after (see Mouta, Santos, López-Moliner, 2012). Subjects had to decide whether an approaching sound passed by the ear plane before or after the reference time (1s). In a first experiment we intended to analyse whether the overestimation of looming sounds would occur. Following previous studies on this phenomenon with loudness change (Neuhoff, 2001) and with a TTA task (Rosenblum, Wuestefeld, Saldaña, 1993) we also expected to find overestimation. Results showed that subjects were able to judge TTP (R^2= 0.95). Although, regarding overestimation, a clear pattern was not found on individual data. We also raised the question of whether participants could make judgements when the stimuli would not be completely presented, using an occlusion period (at 0.5, 0.7 and 0.9s of stimulus presentation). Participants were instructed to estimate passage, at the moment signalized by a temporal marker (a beep, always presented 1s after the beginning of the stimulus presentation), assuming that velocity and trajectory remained constant. Our expectation was to find a deterioration pattern as the occlusion period increased. Results did not verify this last hypothesis. Accuracy and precision did not vary with different occlusion periods, although adjustment values were lower for the condition with higher occlusion period (R^2= 0.73) and higher for the one with lower occlusion period (R^2= 0.86).

All in all, we did not find the overestimation pattern reported in the literature, even with stimulus occlusion, at least with this kind of task and stimuli.

New evidences about the brain asymmetry in the perception of facial expressions

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The approach-withdrawal hypothesis states that positive emotions would be recognized faster than negative emotions. In the present study, we conducted two experiments using the motion after-effect (MAE) technique. Previous research reported that prolonged unidirectional rotation of a spiral produces a negative MAE. An exposition about 30 seconds produces a primary motion after-effect in the tracking direction. After, MAE induces an illusory movement in a stationary image in the opposite direction. According to the approach-withdrawal hypothesis, when MAE induced an approach movement, reaction times (RT) for a stationary image of a negative emotion (e.g., an angry face) will be shorter than those for positive emotion (e.g., a happy face). Thirty volunteers took part in Experiment 1. Experimental design followed a mixed factorial ANOVA, with the 3 Emotions (happiness, anger and neutral) x 2 MAE (approach or withdrawal) x 2 sexes of the face. Results showed a significant main effect of the factors "Emotion" and "MAE", with no interaction between them. However, judgments for the two types of emotional expressions were equivalent, suggesting that participants no experienced after-effect, or that approach-withdrawal theory is not consistent with MAE predictions. Eighteen volunteers took part in Experiment 2. Participant's eye movements of vergence were recorded and submitted to an ANOVA following model 3 Emotions x 2 Vergences (convergence, divergence). Analysis showed a significant main effect of the factor "Emotion" and an interaction between "Emotion x Vergence". Simple effects of "Vergence" and "Sex" were not significant. Results showed that reaction times were greater to recognize negative emotion, compared to positive emotion, when participants did hypo-convergence (approach, but not withdrawal). Results of the two experiments reveals that negative emotions can produce a motor inhibition. In general, data tend to support the approach-withdrawal hypothesis.

Visual discomfort in watching 3-D cinema

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To accomplish precision and efficiency in 3-D vision at least three mechanisms must be adjusted: Accommodation, convergence and stereopsis. The zone of clear single binocular vision (ZCSBV) informs one about an observer's ability to uncouple accommodation from convergence. Observers who are able to uncouple them have a greater flexibility to perceive 3-D stimuli (stereogram). But since such dissociation does usually not apply to normal viewing conditions, it is not automatically triggered. We studied the uncoupling of accommodation from convergence in the context of 3-D cinema. We hypothesized that if an observer has a more eccentric view on a 3-D projection screen, will need more effort to perceive a 3-D effect, and as a consequence he or she will experience a greater visual discomfort. We have designed a model - based on geometrical optics - that predicts Visual Discomfort. The model predicts the extent of visual discomfort, depending on the position of each seat. It visualizes the relation between Stereo Visual Acuity (SVA) and the ratio convergence/accommodation, when a stereogram was projected in the center of the screen. To empirically verify this model, we designed an experiment in which we evaluated the SVA of 12 observers before and after viewing a 3D movie. Participants saw the film and did the tests in a cinema room (15m x 9m x 6m, length width, and height). The model showed a good fit to the data from all observers. We also recorded a subjective assessment of the observers' visual discomfort, corresponding to the different seats of the cinema. These results showed that the more relevant factor causing discomfort was the visual direction of the subjects, particularly when the viewing point was very eccentric (< 25 °). From the empirical validation of the model, we furthermore propose a price computation scheme for each seat, as a function of the degree of discomfort and the location of the seat in the cinema.

Human preference for rounded shapes: exposure time and cross-cultural results

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Humans show an initial negative bias towards sharp contoured objects (Bar and Neta, 2006). Said preference has been hypothesized to result from a primitive perception of sharp transitions in contour as conveying a sense of threat (Bar and Neta, 2007). However, this contour-based liking bias was only found for objects that were positive or neutral in emotional valence, not for negative ones (Leder, Tinio and Bar, 2011). So, there are still some unresolved issues related to this preference. The aim of our research is twofold. On the one hand, we tested whether this is indeed a universal human trait and not a culturally determined one. On the other hand, we tested whether this preference is maintained during longer presentations. In order to do this, we devised a forced choice experiment employing a subset of the stimuli previously used by Bar and Neta. After replicating their findings with Spanish university students, we carried out an exploratory experiment with local population in Ghana. Our preliminary results follow the trend that would be expected if the original hypothesis were to be correct. In relation to the second aim, we used four exposure times: 80, 150, 300 and 500 ms. Despite round shapes being preferred in every condition, 80-ms was the only one to show significant differences. Therefore, according to our results, the preference for rounded shapes is also present in other cultures and restricted to very brief exposures.

Psychophysical assessment of best lighting for naturalness and preference

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Two of the most important aspects of artificial lighting are fidelity, and appeal or preference. Although there are quantitative indices describing these aspects they are based on empirical work limited to the set of existing light sources. Today it is becoming possible to obtain light sources with arbitrary spectra and therefore it becomes necessary to study lighting requirements in less spectrally constrained conditions.
The purpose of this study was to study spectral optimization for naturalness and preference with psychophysical experiments using illumination of arbitrary spectral composition. Two types of stimuli were tested. First, on a calibrated screen monitor observers adjusted the spectral composition of the illumination to render commercial food counters containing a variety of fruits, vegetables, meat, and fish. The scenes were simulated with high chromatic precision from data obtained by hyperspectral imaging in a local supermarket. The illuminants were daylight-like and their metamers, representing a set of nearly arbitrary spectra. Then, in a second experiment, scenes with a diversity of real fresh fruits and vegetables were mounted inside a light box painted in grey with N7 paint. A spectrally tunable light source based on the Digital Light Processor (DLP) technology was used as the illumination on the testing light box. The spectral composition of the light source could be tuned very fast with a spectral resolution of 20 nm using in-house software. The same two conditions were tested. In a third experiment, both configurations, on a monitor screen and in the light testing box were tested on the same (or similar) scenes.
In the first experiment it was found that the most natural colors were produced with illuminants with an average correlated color temperature (CCT) of 6400 K and the most preferred colors with an average CCT of 4400 K. In the second experiment the corresponding CCT were a bit lower, 5400 K and 3400 K, respectively. In the third experiment, a significant difference was found between the CCT for the simulated scenes on the monitor screen and that for the real scenes inside the testing box.
These experiments suggest that the CCT for preference is considerably lower than for naturalness and that the difference depends on the viewing media.

Sex differences in basic colour terms and categories use in three versions of Spanish (Castilian, Mexican and Uruguayan)

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Two experiments analysed men and women use of Basic Colour Categories (BCCs, colour groups) and Basic Colour Terms (BCTs, names for BCCs) in three versions of the Spanish: Castilian, Mexican and Uruguayan. First experiment obtained elicited lists from 201 university students (66 men, 135 women). In the second one 90 students (45 men and 45 women): (1) named a stimuli set where all the BCCs were accurately represented and (2) selected the most representative stimuli for the boundaries between pairs of BCCs. The names provided by experiment 2 allowed checking links between the BCTs identified in the first experiment. For example, as most of the browns were named “marrones” by Spanish and Uruguayans and “cafés” by Mexicans, then we concluded that these two BCTs (“marrón” and “café”) identified the same BCC.

Three variables were computed in the first experiment for the three versions: (1) number of terms in each individual list. (2) Frequency of occurrence (number of lists including a colour term and (3) relative order (position occupied by a BCT considering the length of the list). Men and women produced similar number of primary (red, green, yellow, blue, white and black) and derived (brown, pink, purple, orange, grey and sky) BCTs. Main similarities between the BCTs of the three versions were: (1) primary chromatics (red, green, blue and yellow) were more frequent (significantly more than derived ones) and appeared very soon (significantly sooner than any other kind of BCT). (2) Primary achromatics (black and white) were similar to primary chromatics on frequency and to derived ones (orange, pink, purple, brown, sky and grey) on relative order. Main differences between the three versions were: (1) Two derived BCCs were named using different BCTs: “morado” or “violeta” for purple and “marrón” or “café” for brown. (2) We can talk about “the Mexican exception of white”. Only in this version its frequency was similar to derived BCCs and no to primary ones. (3) Sky (“celeste”) only appeared on Uruguayan version. Experiment 2 showed that although there were strong similarities between men and women related to inter-categories mean boundaries (their mean adjustments were very similar), there were less variance in women adjustments. Sex and primary-derived differences were analysed in the framework of the universalism-relativism debate.

Colour blindness: Theory and application

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A book on colour blindness is introduced. It provides understandable and scientifically accurate information on the topic of colour vision deficiencies. The book includes five chapters and three appendices. In the first chapter it is introduced the so-called "The erroneous common sense theory". It includes the following wrong ideas: (1) Colour is a physical property of the light detected by the visual system. (2) There are three cone types that create, respectively, the experiences of red, green and blue. (3) Because the lack of one cone type, colour blind people are blind to one specific colour (i.e. they cannot see red, but have not problems with other colours).

After showing common sense theory inaccuracy, some important concepts related with normal and defective colour vision are introduced. More specifically, the second chapter ("Light, retina and brain") describes the relations between visible stimulation, cone responses and the clinic taxonomy. The third chapter ("Chromatic experiences and perceptual mechanisms") provides some important ideas on the mechanisms that create the colour experiences (and how they work in common and colour defective observers). The fourth chapter ("Colour naming in common and defective observers") shows why it is possible to name colours in the usual way (the same words that normal people use for the same stimuli) for people with colour vision deficiencies. The last chapter ("Diagnosis, Design and Advice") describes some important applied issues. Specifically, it provides useful information for: (1) Knowing how and why we should use different diagnostic tests; (2) Designing situations where colour is relevant and, at the same time, can be accurately used both for normal and defective observes. (3) Designing and applying informational interviews where colour vision defective observers get information about their perceptual limitations and the best way to deal with them.

The three appendices included in the book introduce some useful technical information. The first one shows how colour perception depends on illumination quality ("Iluminance types and colour constancy"), and introduces two parameters frequently used to specify such quality. The second appendix ("ways to create colours") describes the two main systems for creating colours (additive and subtractive) with special emphasis in the one used in monitors. The third appendix ("chromaticity diagrams") shows a very useful way for predicting between colour confusions in colour blind people.

Perception of time: crucial and susceptible

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Magnitudes (size or extent of something such as length, speed, duration, weight and position) in different dimensions are an integral part of our everyday life. Among these dimensions, time is exceptionally important. Perception of time is one of the most essential cognitive abilities. It shapes our past, presence and futures. Without it, we cannot relate to our memories, we cannot have a good understanding of current situation and we cannot plan for future. Based on many empirical findings, an intuitive mapping of 'more A-more B' has been suggested between different dimensions, e.g. the bigger the trains are the faster they are perceived and etc. Therefore, magnitudes can sometimes interfere with each other leading to misperceptions of one dimension or another. Although accurate perception of time is crucial in everyday life, it is highly susceptible to changes in other dimensions. Many studies found a unidirectional interference of dimensions such as size, length and brightness on time and only a few studies showed the inverse relation. In this talk I will review the studies on this interaction (/ interference). I will briefly talk about neurocorrelates of perception of magnitudes in different dimensions. Then I will focus on behavioral studies on perception of time.

Perceiving time and numbers as we perceive space

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The relationship between time, space and numbers is still a debated issue in the study of cognition. However, empirical data suggest that some interactions between processing number, space and time may exist. Furthermore, in the context of visual perception, several studies have shown that in a line length comparison task, symmetry leads to underestimation of length, while asymmetry produces an overestimation (Charras & Lipañez, 2009). Following this reasoning, we conducted a series of experiments requiring subjects to compare the number of dots between two groups: one composed of two subgroups of the same quantity of dots (symmetry condition) and the other one composed of two subgroups of different quantities (asymmetry condition). Results show that symmetry affects number estimation and perceived duration. Since this effect is also present when comparisons are made with symbolic stimuli, we suggest that this could be a common rule that governs perception of magnitudes in the brain. These data suggest a cognitive link between space, time and number perception, probably due to a shared neural representation. This line of research contributes to clarify how the notion of time is acquired and how it influences our cognition and behavior.
Charras, P., & Lupiáñez, J. (2009). The relevance of symmetry in line length perception. Perception, 38, 1428-1438

The power of favorite music: How music influences the perception of time

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Music is one of the most impressive mediums influencing the experience of time. Thus, music is often used to shorten waiting time – consciously or unconsciously. In two experiments (n=156), we examined which characteristics of music are relevant to influence the experience of time. Prominent models of time perception – the Attentional Gate Model (Zakay & Block , 1997) and the Contextual Change Model (Block, 1989) – were used to deduce potential factors influencing time perception. The participants heard music of different genres, which varied in familiarity (Study 1) and likability (Study 2). Subsequently, participants judged the duration of the music pieces and how fast time was passing while listening to the music. Additionally, the participants evaluated certain characteristics of the music heard related to potential factors of time perception. The most important factor was, how much the music was liked, regardless whether the participants' attention was directed towards time (prospective time perception) or not (retrospective time perception). Other important factors were the arousal induced by the music and how much attention the music attracted. However, music familiarity had no impact on time perception. The results are discussed with respect to required modifications of the existing models of human time perception.

An unequal relationship: Sex differences in time perception and time perspective development

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Previous studies investigating inter-individual differences in time perception and time perspective revealed gender and impulsivity as important factors explaining these differences. For example, it was found that gender influences the perception of brief durations, although, effect sizes varied across the applied research designs and the measurements of time perception. One of the major explanations for the obtained inter-individual differences refers to variability in the speed of the internal clock. The functioning of the internal clock is assumed to be dependent of physical factors such as body temperature and hormone functioning, and thus, regulating the individual metabolic rate. In this presentation, I will review the data on the development of episodic foresight and other future oriented processes, and I will argue that sex differences in young children's abilities to project the self to the future, delay gratification and making plans are highly intertwined with the ability to produce valid time estimations. This relationship can be used to explain some clinically relevant phenomena (i.e., sex differences in the prevalence of ADHD, anxiety disorders, etc). Some methodological concerns for research designs will be discussed.

List of authors