INVITED TALKS

"Illusions of motion perception"

Stuart Anstis
(Dept of Psychology, University of California, San Diego, USA)

Abstract:
I have discovered various illusions that demonstrate how luminance, contrast, size and context influence perceived motion.
Reverse phi illusion: objects that reverse their polarity in successive movie frames appear to move backwards.
Footsteps illusion: a light and a dark square move at constant speed across stationary black and white stripes appear to move alternately faster and slower. Reason: low-contrast motion looks slower.
Flying bugs illusion: the perceived orbits of circling bugs depend upon their motion relative to the background, not upon absolute motion.
Zigzag illusion: a field of random dots appears to move the right when viewed from close up, but downwards when viewed from a distance.
Peripheral motion: Disks moving across static stripes backgrounds look strongly distorted in the periphery.
Global versus local organization: Ambiguously moving spots spontaneously re-group perceptually into large or small groups that move in different directions.
Chopsticks illusion: when orthogonal lines slide across each other, the intersection of the lines actually moves clockwise but it appear to move strongly counterclockwise.
Flash-grab illusion: the positions of flashed targets are strongly distorted by nearby moving objects.

"Motion illusions as a tool to understand brain mechanisms in typical developing individuals and in clinical populations."

Simone Gori

(Developmental and Cognitive Neuroscience lab, Department of General Psychology, University of Padua; Developmental Neuropsychology Unit, Scientific Institute "E. Medea," Italy)

Abstract:
Motion illusions act as a non-invasive window into the neurobiology of our visual system. Motion illusion refers to a perception of motion that is absent or different in the physical stimulus. Motion illusions are non-veridical percepts that uncover the processes by which veridical perception mediates our representation of motion. These phenomena are exceptions able to reveal the brain signature superimposed on the stimulus: the constraints of the visual system itself. I will present some motion illusions that are able to reveal information about how the motion is processed and elaborated by our visual system. Moreover, I will show how motion illusions can shed light on the peculiar visual systems of clinical populations.

"Motion capture in terms of illusory motion signal obtained from oblique lines"

Makoto Ichikawa
(Department of Psychology, Chiba University, Japan)

Abstract:
When observers move the head backwards and forwards while fixating on the center of the concentric circles that consist of oblique lines, they see illusory rotation of those circles. If several dots are superimposed on the concentric circles, observers see the illusory rotation not only for the circles, but also for those dots. This illusory rotation of the dots is based on motion capture. We examined how the amount of dots affects the motion capture, and found that the motion capture was facilitated by the increment of the dots. In addition, we found that, if observers see both expansion/contraction and rotation of the circles, the direction of motion capture tended to be the same with that of the inner circle while, if observers see only rotation of the circles, the direction of the motion capture was frequently opposite to that of the inner circle. These results suggest that the motion capture depends upon the local leakage of motion

signal from the circles, and upon the accumulation of the motion signal within the groups of dots, especially when the direction of the motion is complex.

"A model for explaining the anomalous motion illusion"

Masanori Idesawa
(UEC Museum of Communications, UEC Tokyo (University of Electro-Communications), Japan)

Abstract:
Anomalous motion illusion observed in still figures and in swinging figures is a fascinating topic in the study of the human visual system and one which attract strong interest from not only scientists but also artists, image creators and CG researchers. Many models for explaining the anomalous motion illusion have been proposed, however, none of them could explain the phenomena consistently. Almost all of them are relied only on the mechanisms in cortical system and disregarding the features of retinal mechanisms.
A potential model to explain the anomalous motion illusion is proposed by postulating the retinal features such as the retinal visual reset (periodical ground level renewing), the spatial filtering and the response time differences between stimulation and relaxation in retinal image forming; moreover, the features in cortical system such as the velocity threshold and the apparent motion perception are taking in account; then almost all of the features of anomalous motion perception can be explained and simulated successfully. It is considered that the postulated features are physiologically plausible and a similar mechanism is expected in the human visual system; the proposed model can provide new insights that can contribute to revealing the mechanism of the anomalous motion illusion and to elucidating the human visual system.
In this talk I will introduce the proposed model in detail including the supporting evidences of the postulated features; then show the several examples of simulated results.

"Illusions appearing in aftereffects"

Hiroyuki Ito
(Faculty of Design, Kyushu University, Japan)

Abstract:
In this talk, I will demonstrate some illusions in relation to perceptual adaptation. 1. After viewing a visual object with steady fixation, its negative image is seen as an afterimage. However, after viewing a circle, a hexagon is seen as an afterimage and vice versa. I suggest that the phenomenon is caused by mutual inhibition between curvature and corner detectors. 2. "Enigma" causes an illusory stream with some flicker impressions in the rings on the radial pattern. When the Enigma stimulus is rotated, the perceptual flicker ceases and an illusory stream arises in a direction that is opposite to the physical rotation. Steady fixation on the center of the rotating Enigma stimulus causes an illusory stream in the same direction as the previous physical rotation after the rotation stops. Dr. Tomimatsu and I suggest that relative motion detectors are responsible for the phenomenon. 3. Finally, I will demonstrate some additional illusions that are related to the present talk, including the pursuit-pursuing illusion and motion aftereffect appearing in afterimages.

"Filling in illusory appearances"

Rob van Lier (Donders Institute for Brain, Cognition and Behaviour,Radboud University Nijmegen, The Netherlands)

Abstract:
Visual illusions provide a unique window on brain processes that transform the eye's retinal signals into a 3D world full of colors and forms. A remarkable aspect of vision is its capacity to fill in visual properties for which no direct evidence is present in the retinal image. This filling-in process may result in percepts with varying degrees of 'phenomenological presence' - ranging from actually seeing the filled-in properties (as with neon color filling-in), to merely assuming the presence of these properties (as with the perception of certain

partly occluded objects). In this talk, I will review recent studies on various illusory appearances, with a focus on so-called modal and amodal filling-in phenomena, and discuss how they help to understand the underlying mechanisms of perception.

"What is shape? New phenomena in the light of a new approach"

Baingio Pinna (Dept. of Humanities and Social Sciences, University of Sassari, Italy)

Abstract:
The aim of this work is to answer the following questions: what is shape? What is its meaning? Shape perception and its meaning were studied starting from the square/ diamond illusion and according to the phenomenological approach traced by gestalt psychologists. The role of frame of reference in determining shape perception was discussed and largely weakened or refuted in the light of a high number of new illusions, based on some phenomenal meta-shape properties useful and necessary to define the meaning of shape. These effects are based on the accentuation of some meta-shape attributes. The phenomenal results demonstrate that the accentuation of the meta-shape properties operates like Euclidean vectors. On the basis of these results we suggest that the meaning of shape could be understood on the basis of a multiplicity of meta-shape attributes operating like meaningful primitives of the complex language of shape perception.

"The concept of illusion and a new classification"

Brian Rogers
(Department of Experimental Psychology, University of Oxford, Oxford, UK.
Department of Psychology, St Petersburg State University, St Petersburg, Russia)

Abstract:

The idea that our perceptions can be incorrect can be traced back to the ancient Greeks. In the 11th century, Al-Haytham drew a distinction between errors of sight (illusions) in "pure sensation", in "recognition" and in "inference". More recently, Gregory (1994) has made a similar distinction between three causes of illusions - "physical", "physiological" and "cognitive". Robinson (1972) attempted to group illusions according to the sensory dimension involved e.g. movement, depth, brightness and shape. What these different classifications have in common is that they all assume there is meaningful distinction between those aspects of perception we label as 'illusory' and those labelled 'veridical'. However, this assumes there is an appropriate way to define the 'physical reality' used to assess the veridicality our perceptions. I would like to argue that there is no meaningful way of distinguishing between those perceptual effects we label as 'illusory' and those labelled as 'veridical' - all of our perceptions depend on the particular characteristics of the underlying mechanisms. As a consequence, I would like to propose a new way of classifying perceptual effects that is based on a set of characteristics common to all perceptual mechanisms.

"The dual role of perceptual boundaries as unifiers and dividers"

Sergio Roncato
(Dipartimento di Psicologia Generale, Universita di Padova, Italia)

Abstract:
The dual role of perceptual boundaries as unifiers and dividers
The organization of the perceptual world results from the interaction of the visual units at different complexity levels. Here the exploration is focused on a particular set of interactions that arise when dark and light surfaces are perceived against a midgrey background. In these conditions illusory distorting effects are often observed in the form of orientation misperception, apparent motion, misalignment. When a light and a dark edge are drawn close nearby, both the geometric and the photometric dimensions may be altered: the edges tend to illusory conjoin and the brightness of the surround is misperceived.

In a pattern where collinear, or near to colinearity edges, alternate in contrast polarity the events may replicate several times giving rise to illusory contours.
These ones interact in different ways with similar integrated units that origin in the same space or in proximity. On the lights of these interactions the events are retraced that underpin the formation of complex perceptual patters such those split into different layers: for example an opaque surface seen behind a translucent film. The visual system once again demonstrate its ﷺgabilityﷺh as a problem solver.

"Illusions generated by conflicts between color, color contrast, spatial scale and position."

Arthur Shapiro
(American University Washington D.C., USA)

Abstract:
Many visual phenomena illustrate that the perceived appearance of a visual object depends on the context in which the object is presented. Explanations of such phenomena, however, concentrate on the color of the object while giving little attention to the perceived contrast of the object relative to the background. Here I will present a class of visual stimuli ("contrast asynchronies") that uses temporal phase to separate the perception of color from the perception of color contrast (Shapiro, 2008; journalofvision.org/8/1/8). Experiments with contrast asynchronies have led to a model of color vision that posits separate color and color contrast pathways, and to the creation of many dramatic visual demonstrations. The principle behind contrast asynchronies can be generalized to create illusions concerning the interpretation of spatial scale, to novel variants of motion illusions, and to illusions related to spatial organization and perceptual binding. I will show that most simultaneous contrast illusions (such as Adelson's checker shadow and snake/anti-snake illusion) can be accounted for by the reduction of blur, suggesting that many brightness illusions arise because the parts of the visual system that encode brightness act like an adaptive high-pass filter that removes low spatial frequency content from the visual image.

"Being a (visual) illusionist: works and a future."

Kohske Takahashi
(Research Center for Advanced Science and Technology, the University of Tokyo, Japan)

Abstract:
Discovering, creating, and developing a novel illusion is absolutely a great pleasure for all people who are attracted by the enigma of brain as well as all vision scientists. Thus far, I have discovered a series of novel visual illusions, blurry heart illusion, scintillating lustre induced by radial fins, chroma-achroma substitution, expansion/contraction blindness, and approaching by frequency modulation. In this talk, I will briefly introduce a part of these lovely illusions, speculating the underlying mechanisms and disclosing how I discovered them. The experiences as an illusionist have taught me the possibilities and powers of illusions as a bridge between the vision science and the general public. At the end of this talk I will discuss some ideas and technologies to enjoy illusion works and build a wonderful bridge.

"A computational model of luminance contrast orientation illusions"

Dejan Todorović
(Laboratory of Experimental Psychology, Department of Psychology, University of Belgrade, Serbia)

Abstract:
Illusions are usually defined as cases of discrepancy of our perception from reality. This definition has problems, but it can be amended to cover many classical visual illusions reasonably well. Illusions of orientation are cases of discrepancy of real and perceived orientation, such as when horizontal lines are seen as tilted. One class of such illusions includes a variety of figures in which the same geometric design may or may not exhibit a tilt illusion, depending on

the luminance contrast of some of its elements. Such figures were introduced by Munsterberg, Fraser, Gregory and Heard, Kitaoka, Pinna, Roncato and others. Building on work by previous authors, I will present a simple computational model of this class of illusions, based on well-known features of cells located in the early cortical portions of the visual neural system. Simulations of the reactions of the model to a variety of figures exhibiting impressions of illusory tilt reveal the presence of specific patterns of neural activity distributions, which are also present in simulations of reactions to figures involving real tilt. Such patterns are not present in simulations of reactions to figures with the same geometry as illusory figures but with different luminance contrasts, which do not evoke illusory tilt impressions.

TALKS

"Color-dependent motion illusions in stationary images: What causes illusory motion?"

Akiyoshi Kitaoka
(Department of Psychology, Ritsumeikan University, Japan)

Abstract:
Fraser and Wilcox (1979) presented a motion illusion in a stationary image and Kitaoka and Ashida (2003) devised a new pattern to enhance the illusion. "Rotating snakes" is one of the applied works. Although the Fraser-Wilcox illusion chiefly depends on luminance, its color-dependent variant was suggested by Kitaoka (2010). The color-dependent Fraser-Wilcox illusion is produced with a combination of four elemental parts: long-wavelength part, short-wavelength part, dark part, and bright part. Kitaoka and Yanaka (2013) reported that the direction of illusory motion is reversed under a dim or dark illumination, suggesting a critical role of rods. These studies were published and discussed in Kitaoka

(2014). The present talk reports further progress in the study on the color-dependent motion illusion.

"Depth illusion due to rectangularity preference"

Kokichi Sugihara
(Meiji Institute for Advanced Study of Mathematical Sciences, Meiji University, Japan)

Abstract:
There is a class of pictures called "pictures of impossible objects". They evoke impressions of three-dimensional structures in our mind, but at the same time make us to feel that those structures cannot be constructed in the real world. From a mathematical point of view, on the other hand, the structures represented by those pictures are not necessarily impossible; some of them can be realized as three-dimensional solids. The sense of impossibility can be explained by a rectangularity-preference hypothesis, that is, we prefer rectangular interpretations of retinal images to other interpretations. Once we accept this hypothesis, we can not only explain the depth illusion phenomena, but also can design solids that evoke various kinds of new illusions, such as solids that appear impossible, solids that generate impossible motions, and solids that look quite different when seen from different viewpoints. In this talk I will show examples of those depth illusions, and will present a systematic methods to design such illusions.
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