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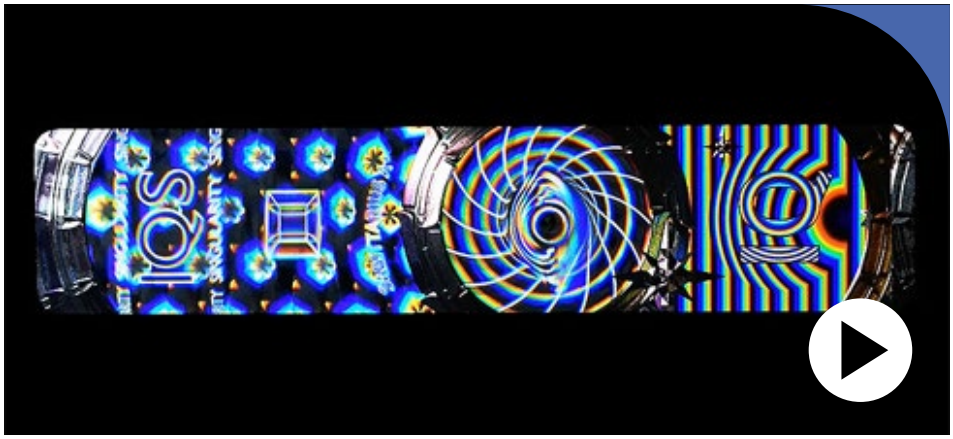
Singularity Hologram – the Mastering Winner



The process of holographic mastering can be a combination of art and science, which makes it interesting to explore the thinking behind the subject matter chosen by the originator.

In the case of the Singularity hologram – which won the Excellence in Holography Award 2022 for Best Origination – the motivation was the scientific event last May, when an international team of researchers published the first image of the supermassive black hole Sagittarius A*[1], located at the centre of the Milky Way.

'The singularity can be explained as a point that is completely different from everything around it and where the rules of the outside world do not apply. Figuratively, as a waterfall in a desert, a tulip in an ice field, or a black hole in the middle of the Milky Way. And it is this symbolism that our hologram carries,' stated IQ Structures Managing Director Robert Dvořák.

Picking up on the idea of the singularity as a specific point beyond which the known laws of physics break down, the hologram is a single graphic unit in which the following elements play a key role:

Animated 3D microtext – the upper and lower 'SINGULARITY' microtexts rotate in opposite directions when the hologram is tilted up and down.

3D text IQS covering its background – several objects in the hologram (notably: the IQS text, hypercube[2] and black hole) have the ability to cover its background when moving in both left/right and up/down directions. This is difficult to achieve in full 3D computer-generated holography (CGH), which makes it a security feature that is difficult to replicate.

3D depiction of 4D hypercube – the main motif of the upper part of the hologram is a 3D projection of a 4D hypercube. The resulting 3D object is animated as the hypercube rotates in 4D. This object has a feature of selective obscuration. The 3D shape is transparent and does not cover itself, yet it does cover the background behind it.

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1 https://news.mit.edu/2022/first-supermassive-black-hole-sagitarrius-0512

2 A hypercube, or n-cube, can have any number of dimensions, but most commonly refers to a four-dimensional cube.

Centro Grafico Joins All4Labels Group

Centro Grafico DG was founded in 1970 and since then has established a reputation for quality and reliability in commercial holography. Its progressive manufacturing technology and flexible approach has allowed it to integrate its security printing knowledge with holographic films and foils production technology.

All4Labels Global Packaging Group is one of the world's leading label and packaging companies and is planning to continue its global growth strategy by acquiring Centro Grafico DG.

Centro Grafico DG specialises in the formulation, production, and delivery of base foils for the holographic industry, security materials for brand protection, ID and travel documents authenticity and data protection, official documents, currency, and credentials. Dino Radice, founder of Centro Grafico DG, stated: 'Joining All4Labels Group represents a unique opportunity for Centro Grafico to reinforce its presence in the Italian market and beyond, as well as to start a new path within the Group to offer an ever-widening range of innovative solutions to guarantee protection of identity and authenticity'.

Antonio Iannone, President of All4Labels Italy, added: 'We are sincerely proud to add another important milestone to our path of growth by welcoming Centro Grafico DG as a new member of the All4Labels Global Packaging Group. Centro Grafico DG is at the forefront in the development and research of new solutions for security printing and brand protection. Together we aim at consolidating our portfolio of smart and secure solutions complying with the highest quality standards on the market.'

Predictions for 2023 – a Very Personal Take on the Year Ahead

By Francis Tuffy

If the industry needed further evidence that holographic technology is in a strong and healthy condition, it need look no further than the range and quality of nominations for the 'Excellence in Holography 2022 Awards' which were presented at The Holography Conference Online (THCO) in December 2022.

Within the pool of nominations, you could find examples of superb quality originations for printing banknotes and ID cards, innovative combinations of holography with other optical phenomena in the displays sector and stunning advances in computer generated holograms.

But what does 2023 have in store for imagery that uses wavefront reconstruction, either in part or as a whole, to manipulate light? Here are some of my predictions for the year ahead.

High security print

2022 saw holography being used in conjunction with other non-holographic techniques to expand the palette of colour, movement and dynamic shapes used to help the public and investigators differentiate between real and fake documents of value.

Inside this Issue

Most of the vertically integrated high security printers now have in-house holographic as well as micro- and nano-optics capabilities or have long standing relationships with specialist originators.

The trend to bring origination capabilities in-house is set to increase in 2023 as the innovation cycle time decreases and printers try to find ways to get their technologies specified in tender documents for banknotes.

ID document producers are similarly using hybrid optical technologies to protect against fraud. I fully expect the trend of using colour personalisation and optically variable image devices to protect the secondary portrait on ID and travel documents to continue through 2023 as the threat of portrait morphing becomes more common.

I see this trend of hybrid optical deterrence, where different technologies engineer the surface and volume of a substrate, not as evidence of holography being ousted from its position as the premier optical anti-counterfeit technology, but as testament to its flexibility and the innovation of optical engineers.

Look out, also, for a possible return of true-3D features. There is a feeling amongst some high security print suppliers that the combination of movement, colour and dynamic shapes, whilst being eye-catching, is getting too complex for the public to authenticate with casual inspection. An alternative might be the return to 'solid' three-dimensional holograms using video, computer graphics or virtual reality (VR) input to holographic printers that create scenes of universally recognisable people and objects.

Brand protection

As countries started to emerge from lockdowns in 2022, the pent-up demand for branded products was, to some extent, released and many countries witnessed an uptick in economic activity. This, in turn produced a growth, or re-emergence, of fraud in all its guises for products and brands as demand increased, supply chains were stretched, and companies struggled to fulfil their order books.

Holography has always played a leading role in brand protection labelling. In 2023, the technology is set to become even more integrated with other technologies to create intuitive brand engagement programmes that will attract end users to actively engage with the holographic label, rotating and tilting it to discover hidden features.

At the same time, authentication through scanning a QR code on the label will act as a secondary product verification method and provide a simple platform for brands to interact and engage with their customers.

The hologram on labelling will also become part of a wider function to track a product throughout its life, and post-life, cycle. This combination of authentication and tracking will give brand owners complete visibility and control from sourcing raw materials through to recycling.

Holopresence

Like it or loathe it, the term 'holo' has become the preferred prefix for technologies that can display or transmit people or objects as images that appear solid to the viewer. Within the pages of HN, these technologies are collectively referred to as 'holopresence', as they provide a range of the variety of optical cues necessary to convince a viewer that the person/object is present.

These holopresence technologies are divided into two camps:

- Theatre based – where projection images might be pre-recorded and then played back in a theatre, concert hall or other venue, under controlled lighting and audience conditions.
- Transmitted – where optics, digital graphics and fast telecommunications are combined to send (close to) real time images of people across continents.

Up until now, theatre based holopresence performances have been able to provide more convincing 3D images of people in a theatre compared with transmitted images over a telecoms network onto a device.

But with the roll out of 5G networks due to accelerate in 2023, that is going to change. The higher-speed, larger bandwidth and low-latency communications that 5G networks promise will deliver smooth, seamless holopresence along with the ability for verbal communication between the sender and receiver – adding to the convincing sense of presence.

Art

Not to be outdone by the commandeering of the term 'holo' by providers of holopresence, holographic artists will make further strides to mix holography with digital media to create 3D works of art.

This merger between holographic and other media will be exemplified by the Virtual Museum of Holography (VMOH), an initiative of the HoloCenter in Kingston, New York.

The VMOH will be home to two different ways of accessing information about holography. Anchored by a conventional website built on a database of information, it will contain 2D images, 2D video, and text forming the foundational archive. This record of the history of holography will tell the stories of the pioneers who have contributed to the medium and become a gateway to accessing a library of scientific and artistic information.

In addition, the VMOH is partnering with a technology company to create immersive experiences of holograms. You will soon be able to enter the VMOH through a portal on the conventional website and by wearing a VR headset you will find yourself in the virtual museum, where you can explore exhibitions of holograms recorded using Light Field Technology.

My own foray into creating holographic sculptures from VR created imagery (see HN March 2022) has convinced me that this approach releases the holographic artist from the constraints of 2D visualisation and offers boundless opportunities for collaboration between holographers and digital artists. Whether these opportunities will be fully realised by the end of 2023, I am less sure.

Sustainability

Set to be one of the biggest topics for all business sectors in 2023, the issue of industrial sustainability is one that the International Hologram Manufacturers Association (IHMA) will be championing in 2023.

Many IHMA members are already reporting on their sustainability efforts as part of their corporate responsibility strategies. The role of the IHMA Sustainability Working Group will be to encourage member organisations to encourage best practice by sharing information, within the working group, about their high-level commitments and companywide initiatives.

Taking a lead on the formation of the IHMA Sustainability Working Group will be John Winchcombe (convener of Reconnaissance's Cash & Payments Sustainability Forum™ in Edinburgh) who ended his presentation at THCO with a clarion call for 2023 – Volunteers Needed!

If you would like to get involved in the IHMA Sustainability Working Group, please contact John at **john@recon-intl.com**.

ISDH and the CHIMERA™ Hologram Contest

The International Symposium on Display Holography (ISDH) was postponed due to COVID-19 but, as Philippe Gentet of the Hologram Forum announced at the Holography Conference Online last month, the 12th ISDN is now scheduled to take place at the Ambassador Seoul, Korea, from 26 June to 1 July 2023.

The first ISDH was convened by Professor Tung H Jeong in 1982 at Lake Forest College in Illinois, USA. The aim of ISDH is to synthesise history, education, art, science and economic developments that involve holography. It is organised by Kwangwoon University and the Hologram Forum, which includes over 20 organisations and was established to create a hologram business ecosystem between companies, universities, research institutes and the Korean government.

Within the framework of the ISDH2023 conference, a hologram contest will be run by the Hologram Forum in collaboration with Yves Gentet (Ultimate Holography) and Kwangwoon University to find the best projects submitted using the CHIMERA™ recording technique. CHIMERA is a digital holographic printing system jointly developed by Ultimate Holography and Kwangwoon University.

How to create a CHIMERA

In the CHIMERA printer, three low power continuous wave RGB lasers, with wavelengths of 640, 532 and 460 nm, are used to deliver good colour balanced images with full parallax across a 120 degree field of view. The hogel size of 250 µm results in a display that, to the human eye, appears seamless.

The CHIMERA print is first created by recording a series of 768 horizontal images – points of view of the scene – on a 120-degree arc of a circle for a half-parallax hologram. A full-parallax display keeps the same requirements, but the procedure is repeated at 178 levels of elevation, creating a cylinder of points of view.

A CHIMERA can be created with a 3D model and a virtual camera in a 3D computer graphics programme like 3ds Max and Unreal Engine or a physical model and a camera.

Contest details

The project can be realised using a 3D model or from a real model. The final CHIMERA hologram will be recorded with dimensions of 30x40 cm, with a hogel resolution of 250 µm and can be either full or half parallax.

The 10 best projects will be recorded and exhibited during the conference and an official jury will award the prize for best hologram. There will also be a prize to be voted on by the participants of the conference.

The contest organisers say they are expecting new, innovative, artistic, and technical projects... but above all surprising ones.

For more information visit **https://isdh2023.kr**.

Singularity Hologram *(Continued)*

Colour kinetic effect on a white background and 3D microtext outline – the decorative background goes through a shape and colour transformation when the hologram is tilted up and down. The background is a full 3D object. The microtext Sagittarius A has a colour kinetic effect when tilted up and down.

Black hole curving space around itself – the view from the left and right and up and down positions.

It's important to remember, though, that these effects are not an end in themselves, but rather that they are part of one intertwined complex with a unified philosophy. The entire hologram is a true 3D full parallax!

'We honoured this technologically demanding scientific act by creating a highly technically-demanding hologram using complex mathematical calculations and nanoengineered structures,' Robert Dvořák said.

News in Brief

Powerful Laser May Lead to Cutting-Edge Hologram Technology

Chinese scientists have developed a powerful laser that could be the key to cutting-edge hologram technology, as reported by Interesting Engineering. The laser pen can write in the air to produce patterns.

To burn or write in the air, the pen emits high-intensity laser pulses to create ionised gas or plasma. In turn, this emits energy in the form of light. The laser has been created by researchers at the Hongtuo Joint Laboratory in Wuhan, China. The peak power of the laser pen can reach a million megawatts due to the incredibly brief pulse duration, which is comparable to the whole utility-scale electricity producing capacity of the US, but only for a few femtoseconds.

'With the brand new device, we can draw in the air without using paper and ink,' Cao Xiangdong, lead scientist at the Hongtuo Laboratory of Ultra-Fast Laser in Wuhan's optics valley, told Science and Technology Daily, as reported by the South China Morning Post.

The scientists claim that they arranged pixels using 3D imaging to create Chinese characters in mid-air but, although pressed on the subject, they did not fully describe the method.

La Liga Uses Holopresence Technology

Back in 2021, Spanish football league LaLiga and media group MEDIAPRO incorporated a new state-of-the-art pitch-side camera into their broadcasts, providing viewers with an image quality similar to that of a film or a video game. At the time, it was described as an 'ultra-realistic experience that makes you feel like you are actually in the stands or just a few metres away from the players on the field.'

But earlier this month, La Liga went one step further in bringing heightened realism to the post-match analysis of the game between Barcelona and Athletico Madrid. Barcelona's manager, Xavi, was transported live from pitch-side into the studio, using holopresence technology to explain his thought process behind his team selection and tactics.

Its not the first time that holopresence technology has been used at a major sporting event. During the performance of the NFL Super Bowl half-time show in 2018, Justin Timberlake was seen singing alongside a hologram of the music legend Prince, who had passed away two years earlier (see HN February 2021).

What made this different to the theatre-based pre-recorded holopresence rendition of Prince is that Xavi is very much alive and was transmitted into the studio in real-time to answer unscripted questions from fans calling in by phone.

And what are the viewing public making of this increased use of technology? One fan commented: 'Hologram Xavi has blown my mind before I've even had my first coffee of the day,' while another wrote: 'Hologram tactical interviews with managers/players along with 8K cameras and pitch-side reporters with live inputs during games. This is some great production value from the league.'

Editor's prediction for 2023: Look out for holopresence adoption by the Premier League in England and Wales and the Bundesliga in Germany.

Look – No Glasses

Computer manufacturer, ASUS, has debuted what it claims to be the world's first glasses-free 3D OLED display on two of its models.

ASUS calls its new display technology 'Spatial Vision' and it will be available first on the ProArt Studiobook 16 3D OLED (H7604) and the Zenbook Pro 16X OLED (UX7602BZ).

With Spatial Vision, users should be able to easily switch between 2D and 3D, with 3D imagery appearing to lift off the screen. The glasses-free (autostereoscopic) 3D OLED technology uses a lenticular lens and eye-tracking camera technology. This allows the display to create distinct images for each eye, which is what creates the 3D effect without the assistance of any wearables.

The OLED displays offer a 1,000,000:1 contrast ratio, a 0.2ms response time, and a 120Hz refresh rate for seamless visuals. To help users get started with the displays, ASUS offers apps in the ASUS Spatial Vision Hub for watching 3D videos and movies, playing 3D games, and enjoying 3D model visualisation and content creation.

According to ASUS, the new technology has the potential to change creator workflows, as users will be able to see the details of 3D objects and effects directly on the screen without needing to review physical prototypes, which should make their workflow more efficient. Spatial Vision also provides development tools built on SR (Simulated Reality) from their partner Dimenco, with supporting materials and guidelines to equip developers with greater powers by covering gesture control, and interactive learning to build a visionary ecosystem around 3D technologies.

The glasses-free 3D display allows content creators and gamers to view 3D photos, videos and games – without cumbersome glasses or headsets. Creating 3D visual content is made faster and more intuitive, and ASUS Spatial Vision technology allows 2D visual content to be converted to immersive 3D in real time with the flick of a switch.

Holographic Security Company Spreads its Wings

Korean company RMG, which specialises in hologram security, is taking its e-authentication technology to the US market.

Having recently established a joint venture subsidiary in the US, the company plans to begin marketing its key patented product, SWEBS (which stands for Security Web Certification System), an authentication platform that integrates hologram-encrypted QR codes.

SWEBS syncs together hologram labels, an app, and a web authentication system, and encrypts a non-replicable QR code into a hologram to combat any attempted forgery or falsification. According to RMG, with the platform, clients can protect their brand by tracking the authentication status in real time, all while managing distribution, AS, and warranty. Moreover, the solution can be utilised as a marketing tool, based on accumulated data.

RMG's US joint venture, SWEBS, is eponymous with its product name and was founded last September.

'Holograms evolve through ongoing R&D so they're difficult to replicate and offer strong security. This technology was patented for the first time in Korea by RMG, and is also patented in the US,' said Alicia Heejung Kim, CEO of RMG.

RMG's product offerings also include Secutech, an anti-tamper hologram, and Sealticker, a combination of a seal and a sticker which leaves a mark or message when it is removed, showing that the product has been opened.

RMG was founded in 2016, and claims that around 1,000 companies in industries such as pharmaceutical, cosmetics, as well as public institutions, are using its holograms. It was the first company in Korea to apply for a patent for the combination of hologram technology and encrypted IT technology, and has received the Republic of Korea Enterprise Grand Award for six consecutive years in the security solution sector (2016-2021).

3D Zero Order Imaging – the People's Choice

As is the tradition, the winners of the Excellence in Holography 2022 Awards were judged by Board members of the International Hologram Manufacturers Association (IHMA) and presented as part of The Holography Conference Online.

But, also following tradition, it is the IHMA membership and conference attendees who get to vote online for their favourite technical advance in holography during the year. The 'People's Choice' for 2022 was won by the Computer Holography Centre for a new holographic principle, called 3D Zero Order Imaging.

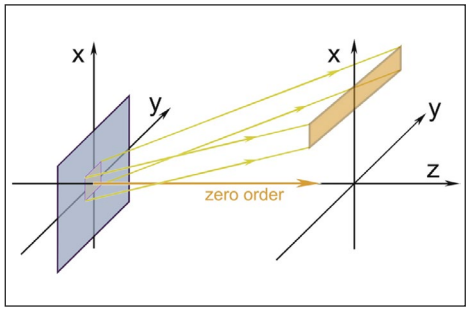


Fig 1: Benton's viewing scheme.

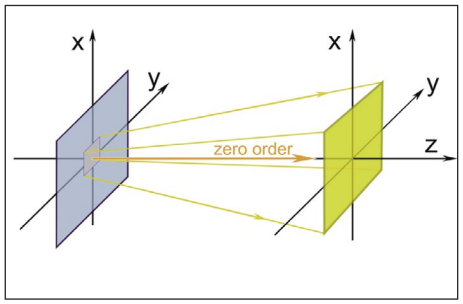


Fig 2: 3D zero order observation scheme.

The new technology was presented during the conference by Anton Goncharsky, CHC General Director, providing a fascinating insight to the generation of new features that act like real 3D objects.

Rainbow, or Benton, holograms are a well-established method for forming 3D images that provide horizontal parallax but suffer chromatic aberration when inclined vertically and offer a very narrow range of viewing angles. The geometry of Benton's approach also results in the image disappearing completely when the viewing angle exceeds a certain value.

To remedy these limitations, Anton Goncharsky set himself the task to synthesise an optical element which forms 3D images that behave more like a real 3D object in that they have full parallax, stable colour and have a wide viewing angle including rotation through 360 degrees.

In Benton's observation scheme, the 3D image is formed in the first order of diffraction and the observation area is a limited narrow band.

When the optical element is slightly tilted or rotated, the observer's eyes leave the area of observation, and the 3D image is no longer visible.

In contrast, as long as the observer's eyes are within the region shown in Fig 2, an observer sees a 3D image and the image is seen over a wide range of tilt angles and even when the optical element is rotated through 360 degrees.

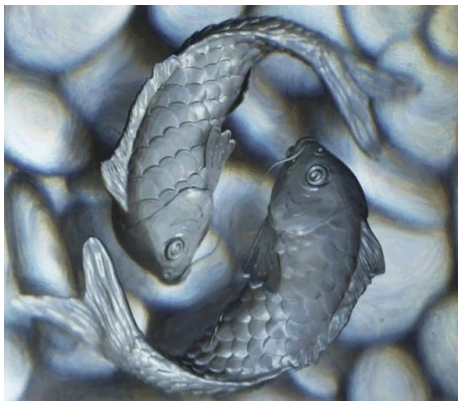
The realisation of the concept is in two steps:

1. Calculation of a phase function/ microrelief of a flat optical element. To give some idea of the processing challenge this presents, for a 100x100 nm grid, the number of points is in the order of 1012.
2. After the calculations have been processed, a high accuracy microrelief pattern is recorded on a flat optical element.

The practical implementation of the 3D Zero Order element is by microrelief structures formed by e-beam lithography. The resulting 16x16 mm^2 flat optical element is comprised of 160,000 distinct regions, each with dimensions 50x50 μm^2 and 55 horizontal and 15 vertical frames. The wavelength for calculations is 547 nm.

The 3D images created through this technique can be observed when illuminated by white light. The observer seeing the 3D image with full parallax, both when the optical element is tilted and when it is rotated through 360 degrees.

In addition, unlike rainbow holograms, the colour of the formed 3D image does not depend on the viewing angle – in other words, the 3D image behaves more like a real 3D object.


© Computer Holography Centre.

Additional 2D colour image

The structure of an optical element forming a 3D image in the zero order of diffraction can be modified so that each region is only partially, rather than completely, filled. The remaining part of each region can be filled with diffraction gratings with periods less than 0.6 μm. These diffraction gratings can form an additional 2D colour image, visible to the observer over the entire area of the optical element, at diffraction angles greater than 60 degrees.

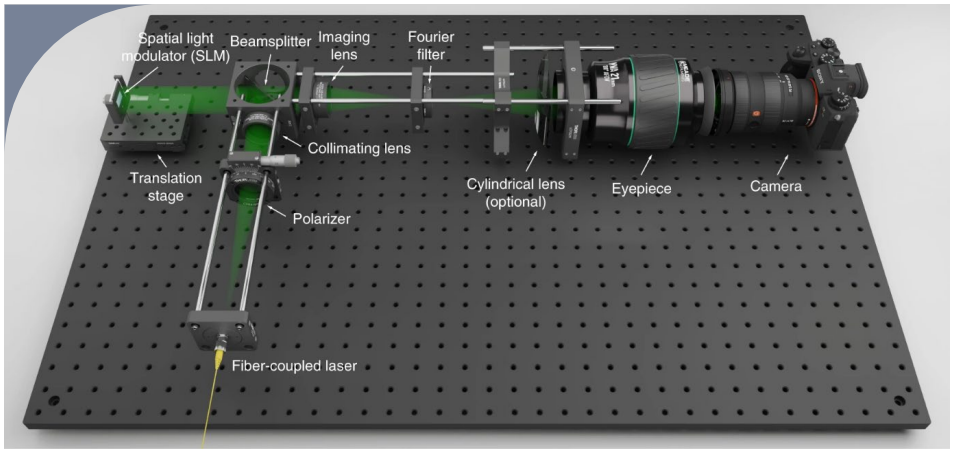
Additional 2D colour image.

In summary, the new 3D Zero Order imaging technique:

- Requires a level of sophistication not commercially available as it demands high accuracy (10 nm in terms of depth) for microrelief structures formed by e-beam lithography.
- Can be replicated by using standard technologies of mass production (for instance by the embossing process).
- Has been developed, first of all, for protection against counterfeit of IDs, brands and bank notes.

Goncharsky A., Durlevich S., et al. 'Synthesis of nano-optical elements for zero order diffraction 3D imaging.' Nature Sci Rep 12, 8639 (2022). **www.nature.com/articles/s41598-022-12414-y**.

MIT Shows Strengths in Physical and Digital Holography



Schematic of the experimental set up (© MIT, Light: Science & Applications).

Researchers at the Massachusetts Institute of Technology (MIT) have built a formidable reputation for developing physical holographic origination techniques. Most recently reported in Holography News® (see August 2022) was their work on merging holographic and Lippmann photographic techniques to produce structural colour. But the team in MIT also has research strength in the area of computer-generated holography, as their recent publication in Light: Science & Applications[1] demonstrates.

Computer-generated holography (CGH) is the method of digitally generating holographic interference patterns that diffract incident light and establish 3D images in free space. This volumetric beam-shaping capability can be used to produce 3D displays, but they need to overcome significant algorithmic and computational challenges in creating holographic video systems.

Additionally, existing spatial light modulators (SLMs) add another layer of complication, by requiring either an amplitude-only or a phase-only hologram.

Challenges to overcome

Both of the challenges highlighted above are traditionally tackled by physical simulation with direct encoding or iterative optimisation. Simulation-based methods represent the scene in a variety of different ways with the resulting complex hologram directly converted to a phase-only hologram by either discarding the amplitude, or other types of information.

These methods work for continuous 3D scenes; however, the simulation step is typically time-consuming and the encoding step either works unreliably or requires manual tuning to find the optimal filtering parameters to achieve artifact-free results with minimal artificial blur.

Recently, learning-based CGH algorithms have improved and managed to bring down the high computational cost associated with simulation-based methods. In particular, deep-learning-generated holography[2] (DGH) and Tensor Holography (see HN April 2021) use simulation-based methods to synthesise a hologram dataset and employ supervised learning to train a convolutional neural network (CNN) as an efficient neural proxy of the simulator.

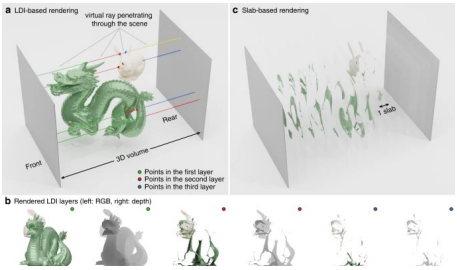
Tensor Holography uses an RGB-D (Red Green Blue – Depth) image, which only records the frontmost surface points. The lack of wavefront diffracted from the occluded points causes visible dark seams or brightness attenuation at the background side of the occlusion boundaries.

Approach

In their work, the team at MIT propose a series of techniques to resolve the challenges above, that results in a system, dubbed Tensor Holography V2, which can directly synthesise photorealistic 3D phase-only holograms end-to-end without manual parameter tuning.

It is claimed to be robust to different image statistics, depth misalignment in real-world captured inputs, and different distance configurations between the hologram plane and the 3D volume.

In the research, the MIT team advocate a layered depth image (LDI) as an efficient 3D scene representation. LDI is a classical image-based rendering technique originally developed for novel view synthesis. Unlike an RGB-D image that stores a single pixel at each spatial coordinate, it stores a sequence of RGB-D images along the line of sight originating from each spatial coordinate. Its first pixel records the first front-facing surface intersecting with the line of sight, and the second pixel records the second intersection, assuming the line of sight pierces through the scene, and so on until a maximum number of intersections (or hits) is achieved (see illustration).



Comparison of LDI to voxel grid as 3D scene representation (© MIT, Light: Science & Applications).

LDI has several advantages for holographic rendering applications.

First, it is highly configurable such that if only a single layer is rendered, an LDI is equivalent to an RGB-D image; if all layers are exhaustively rendered, it encodes the entire scene for computing a physically correct hologram without losing any depth information. In either case, or for a limited number of layers, any point in the scene is only recorded once or discarded.

Second, unlike a voxel grid, an LDI records the exact depth for every hit, decoupling the depth resolution with the number of LDI layers.

Third, the sequence of pixels is recorded in a depth-sorted manner with wavefront from further layers providing a diminishing contribution to the hologram due to the occlusion of the frontal layers. Consequently, the research group found that a few LDI layers (around five) are sufficient to produce a close-to-truth hologram, and thus it is highly data-efficient.

Results

In the paper titled 'End-to-end learning of 3D phase-only holograms for holographic display', the researchers experimentally demonstrate their approach by creating high quality holographic 3D projection and aberration correction results. They also discuss the novel SLM calibration procedures used to achieve the demonstrated results.

1 https://www.nature.com/articles/s41377-022-00894-6

2 Horisaki, R., Takagi, R. & Tanida, J. Deep-learning-generated holography. Appl. Opt. 57, 3859–3863 (2018)

Holography Features at CES 2023

CES® is justifiably referred to as the most influential technology event in the world — the proving ground for breakthrough technologies and global innovators. This year, CES 2023 was hosted at its usual venue of the Las Vegas Convention Center from 5-8 January, running at full capacity for the first time since before the pandemic.

In amongst the electric cars, fitness gadgets and smart home merchandise, Holography News® has picked out a selection of holographic applications that caught the eye.

Proto

One of the featured technologies at CES 2023 was the 'Proto M,' a real-time holopresence technology that transmits users to virtual presentations and meetings. It comes from the Los Angeles tech firm Proto, who have already proven their technology in several high profile demonstrations (see HN October 2022).

Proto's creation is a two-time CES Innovation Awards Honoree for Digital Health, on account of its significant use in medical schools, as it is not only capable of showing people but also complex X-rays and 3D medical diagrams. The company's latest product, Proto Vision, delivers a real-time diagnosis of even the slightest symptoms that patients display when on telehealth with their physicians.

And while it is mostly used by medical schools and practitioners, there are potential applications for its M device for companies and individuals that need virtual representations for remote applications.

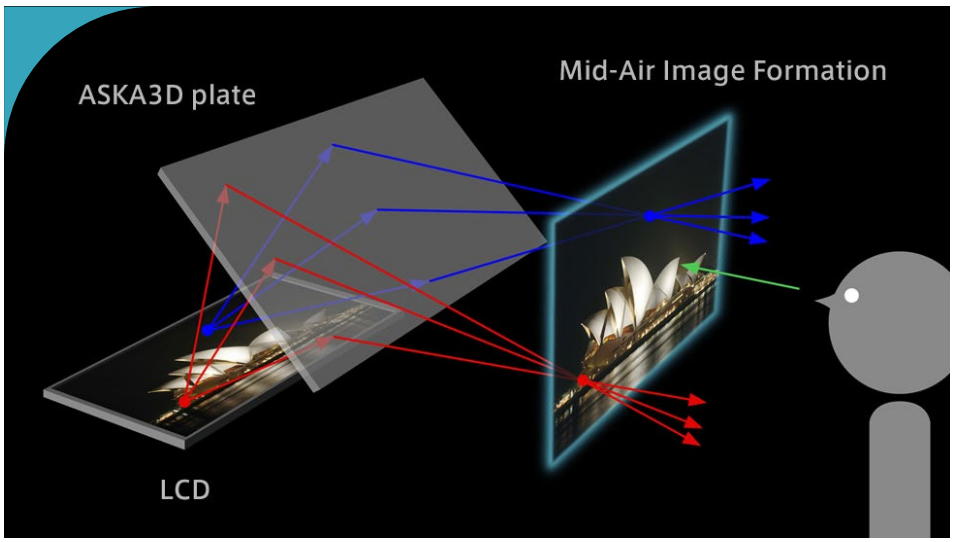
Coincidentally, Proto was also able to announce at CES 2023 that it has achieved SOC 2 Type 1 compliance in accordance with American Institute of Certified Public Accountants (AICPA) standards for SOC for Service Organizations, also known as SSAE 18. Achieving this standard serves as validation that Proto Inc. provides enterprise-level security for customers' data and communications on their platform.

HYPERVSN

The London-based Integrated 3D Holographic Display Platform manufacturer's booth featured the all-new HYPERVSN SmartV Digital Avatar and HYPERVSN Window Display, which are aimed at improving shopping experiences in retail outlets.

The HYPERVSN SmartV Digital Avatar is a brand-new solution which allows 2-way interaction with a digitally rendered human avatar. Based on the HYPERVSN Holographic Human solution, which runs on pre-recorded content, Digital Avatar takes it a step further by allowing real-time conversations with users, thanks to its interactive AI capabilities and the scalable 'human touch'.

The HYPERVSN Window Display solution uses interactive gesture-controlled 3D visuals to improve interaction with the user. With higher demand among retail customers for attention-grabbing technology, this retail-specific solution looks to increase brand awareness and make brands stand out in crowded 'phygital' spaces.



Principle of operation (© Asukanet).

Holo Industries

Holographic Touch™, from Holo Industries, is a new technology that provides accurate and responsive mid-air interaction, without special lighting, glasses or headgear.

Holographic imagery is provided by ASKA3D's Holographic Plates. The precision plates, manufactured by Asukanet in Japan, combined with Holo Industries' proprietary optics and software along with Neonode sensors, create Holographic Touch.

The ASKA3D Holographic Plate works on the principle of sending light emitted by an image or object through a special glass plate and collects the light on the other side of the plate at the same distance to create an image or object identical to the original.

The distance between the original and the plate is the same as the distance between the plate and the projected image. However, the size of the projected image and the distance at which an image can be projected depend on the size of the plate. A small plate will only allow you to see the projected image from a specific position in front of it. A large plate, on the other hand, increases the distance at which the image is projected, enlarging the field of vision.

Automotive

At CES 2022, BMW showcased a new in-plane holographic optical element display from Texas Instruments that projects an image onto the surface of the windscreen, unlike a traditional heads-up display which throws a smaller image out into space ahead of the driver. This year, the German car manufacturer presented a new concept car that previewed BMW i Vision Dee – standing for 'Digital emotional experience'. The company says that this is the fusion of virtual experience with physical driving, which depends on full windscreen windshield augmented reality displays.

And more

Other demonstrations on display at the show included:

- Mastercard merchant systems: holographic payment terminals for retailers.
- Hyundai automotive entertainment console: Hyundai Palisades SUV holographic entertainment console.
- Medical avatar: controlled by a virtual medical admissions agent.
- Gambling: interactive holographic gambling systems for casinos and home recreation.
- Wheelchair entry systems: contactless holographic wheelchair entry systems with audio.
- Residential entry systems: Holographic keypad for contactless entry.

For more information, visit **www.ces.tech**.

IHMA Services

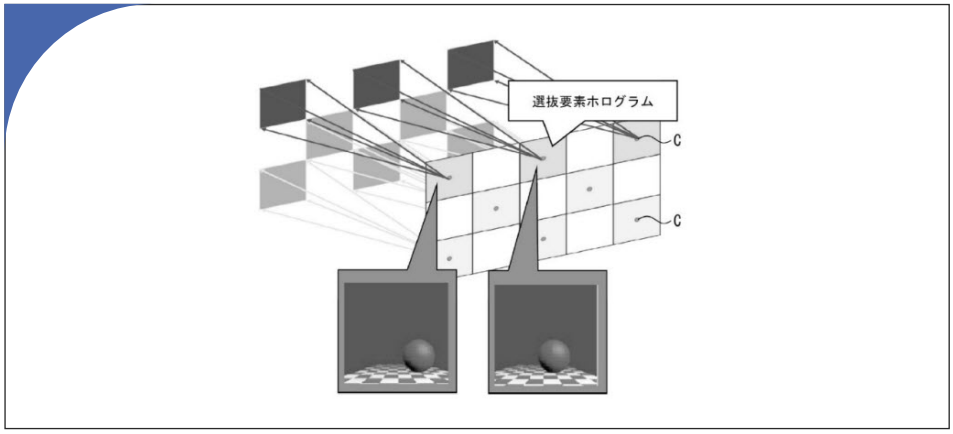
Patent of the Month

In November 2022's edition of the IHMA patent newsletter more than 100 patents are listed, including Japan telecoms service provider KDDI's patent titled 'Computer Composite Hologram generation apparatus, method and programme'. The purpose of the patent is to reduce the memory size required to generate a hologram at high speed without substantially degrading the image quality of the hologram.

A 3D model places a 3D object in virtual space. Specific elemental holograms are selected from the full array of elemental holograms The object point light source integrates light sources having the same three-dimensional coordinates from different element holograms into a common point.

The object point light source is used in the light wave propagation calculation with element holograms that are not selected. The computer calculates the light wave propagation from each point light source to each corresponding elemental hologram surface.

The interference fringes are calculated by the interference between a reference light wave and the object light wave at the surface of the hologram.



Tender Alert Service

The tender alert service sends email notifications directly to the inbox of members, giving a description of the goods or services to be supplied, the deadline for submission and the outline details of the buyer. A link on the notification takes you to the Member's Area of the IHMA website where you can learn more about the tender using the unique code that identifies each procurement.

An example of a recent notification is the international competitive bidding in Spain for the supply of ID cards, taxi licences and holograms.

The Patent Newsletter and Tender Alert Service are made available exclusively to IHMA members. To become a member visit **ihma.org/about-us/#join-us**.

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Upcoming Events

7–9 MARCH 2023
HIGH SECURITY PRINTNG EMEA
Abu Dhabi, UAE
hsp-emea.com

17–19 APRIL 2023
OPTICAL & DIGITAL DOCUMENT SECURITY
Prague, Czech Republic
opticaldigitalsecurity.com

5–7 JUNE 2023
HIGH SECURITY PRINTING LATIN AMERICA
Nassau, The Bahamas
hsp-latinamerica.com

SEPTEMBER 2023
TAX STAMP & TRACEABILITY FORUM
Tbilisi, Georgia
taxstamptraceabilityforum.com

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