IPR2024-00836

US Patent No. 10,189,294

EXHIBIT 2004

DECLARATION OF DR. MIKAEL LINDSTRAND

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GIESECKE+DEVRIENT GMBH, GIESECKE+DEVRIENT CURRENCY TECHNOLOGY GMBH, AND PAPIERFABRIK LOUISENTHAL GMBH,

Petitioners,

v.

LUMENCO, LLC,

Patent Owner

IPR2024-00836, IPR2024-00838, and IPR2024-00839
U.S. Pat. Nos. 10,189,294, 10,901,191, and 11,448,863

DECLARATION OF DR. MIKAEL LINDSTRAND

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I. INTRODUCTION

1. My name is Dr. Mikael Lindstrand. I have been retained by Patent Owner Lumenco, LLC ("Lumenco" or "Patent Owner") as an expert witness in this case with respect to U.S. Patent Nos. 10,189,294 (the "'294 patent"), 10,901,191 (the "'191 patent), and 11,448,863 (the "'863 patent") (collectively, the "Lumenco Patents").

2. I am being compensated at my standard consulting rate of $445 per hour in addition to any reasonable out of pocket expenses.

3. I have received no additional compensation for my work in this matter, and my compensation does not depend upon the content of my opinions, any testimony that I may provide, or the ultimate outcome of the matter. All of the opinions set forth in this declaration are my own.

4. My educational background, career history, publications, and other relevant qualifications can be found in my Curriculum Vitae, which is attached as **Exhibit 1** to this declaration.

II. QUALIFICATIONS AND EXPERIENCE

5. My full educational background, career history, publications, and other relevant qualifications can be found in my Curriculum Vitae, which is attached to this declaration as Exhibit 2005.

6. I am currently President and Design Executive Officer ("DEO") of gonioLabs AB, a company focused on commercializing certain aspects of my research findings in the field of paper product optical characterization.[1] Through gonioLabs, I also perform independent consulting in the field of optical document security, including optical variable devices like those used in travel documents, bank notes, and other high value documents. I founded gonioLabs in 2007.

7. I received a Master of Science in Computer Science and Engineering in 1996, a Degree of Licentiate in Technology in 2002, and a Ph.D in Computer Science in 2018, all from Linkoping University in Sweden.

8. My master's thesis project involved the development of angularly and spatially resolved measurement and characterization equipment used to characterize gloss of printing paper. Gloss of printing paper involves diffusive (scattering) reflection and is demanding to characterize. The development included the design and fabrication of a sample holder with motor control, imaging/optics and imaging capturing protocol, and a characterization method. The method and equipment was patented and the project received an award for the best Masters of Science project in the Swedish paper making industry.

[1] https://goniolabs.com/about-goniolabs/

9. My Ph.D studies focused on development of security hologram measurement, characterization and visualization systems. Writing and publishing scientific articles based on proprietary image processing methods.

10. In 2007, I was able to generalize the gloss characterization device mentioned above into an angle/spatial/chromatic resolved high dynamic range tool for analyzing optical document security materials in general, irrespective of the technique used to fabricate the substrate, including specular reflective (facets), scattering and interference-based substrates. My characterization equipment was presented at the security department at renowned central banks and at highly renowned research conferences, including the biannual Optical Document Security Conference (2008, 2010 and 2020) in San Francisco. At the January 2020 ODS Conference I was invited to and did deliver a talk titled "High-entropy multidimensional OVD characterization facilitating digital communication protocol utilization and multimodal authentication."

11. I have authored several papers in the field of diffusive light optical features. Those include "Instrumental Gloss Characterization – In the Light of Visual Evaluation: A Review," "An Angularly And Spatially Resolved Reflectometer For A Perceptually Adequate Characterization of Gloss," and "An Interactive Gloss Visualization Environment – For Measured Or Simulated Surface

Data." Each of these papers was published by the STFI, Swedish Pulp and Paper Research Institute, Stockholm, Sweden.

12. I have a long professional background in the paper making industry, including an academic research position from 1995-2007, including seven years of research and analysis work for the Swedish Paper Making Industry Research Institute in Stockholm (1995-2002), and five years at a private company, SCA Research, in Sundsvall, Sweden (2002-2007). During that time my work focused on measurement, characterization and visualization of optically demanding substrates aimed at applications in a diffusive light environment. Paper substrates are exceptionally demanding to characterize in all optical aspects observable to a human inspector. My work described above from 1995-2007 facilitated my professional transition to the domain of security documents.

13. Since 2007 I have focused my independent work in the field of optically demanding measurements, characterization, and visualization of substrates intended for human visual evaluation in diffusive ambient light environments. During the years 2007-2013, I analyzed, evaluated, and modeled the performance and characteristics of security document substrates with public and private organizations from South America, North America, Europe (including outside of Sweden), Asia, and Oceania, including currency-related work for well-respected central banks.

14. The projects varied in content but always involved measurement, characterization, and visualization of optically demanding substrates aimed for humans given diffusive light inspection conditions. My role focused on understanding and modeling as much technical information as possible about the substrate characterized.

15. My work has received praise from thought leaders in the currency industry. For example, the late authority Ruud van Renesse stated the following about the capability of the gonioLabs' measurement device, in Holography News (Volume 25, No 4, 2008): "Such visual overviews and the additional exact XYZ readings could also facilitate unambiguous communication between forensic laboratories, which in turn could be of interest for the clear presentation of facts in court." Mr. van Renesse was a well-respected researcher, teacher, and consultant in the field of optical security features for banknotes and security documents.

16. The measurement device and model I developed records the behavior of light reflecting from facets on a substrate with incoming light from a variety of angles. The model I have developed enables analysis of the information gathered from those multiple angles and allows me to model how the reflective substrate will behave in a diffusive light environment.

17. Based on my educational background, work background, professional and industry experience, I believe I am qualified to offer opinions relating to the patented technology of the Lumenco Patents.

III. LEGAL BACKGROUND

18. I have been informed that a person of ordinary skill in the art ("POSITA") is a hypothetical person who is presumed to be aware of all pertinent prior art, thinks along conventional wisdom in the art, and is a person of ordinary creativity—not an automaton.

19. I understand the level of ordinary skill in the art is evaluated based on various factors, including the level of education and work experience of persons in the field, the type of problems encountered in the field, and the sophistication of the technology at issue.

20. I have been informed and understand that, in determining whether a claimed invention is obvious, one should consider the scope and content of the prior art, the level of ordinary skill in the relevant art, the differences between the claimed invention and the prior art, and whether the claimed invention would have been obvious to one of ordinary skill in the art in light of those differences. In establishing obviousness, one must avoid the temptation to read into the prior art the teachings of the patent at issue and guard against the use of hindsight. The prior art itself, and not the teachings of the patent, must establish obviousness.

IV. PERSON OF ORDINARY SKILL IN THE ART

21. I understand that the factors to be considered in determining the level of ordinary skill in the art to be: (1) the educational level and practical experience of active workers in the field; (2) the type of problems encountered in the art; (3) prior art solutions to those problems; (4) the rapidity with which innovations are made; and (5) the sophistication of the technology in the art.

22. The Lumenco Patents describe optical security features using micro mirrors that generate multiplanar images (*i.e.*, the images appear to have optical depth) that are visible without specialized glasses or lighting and without the use of holographic imagery. *See, e.g.*, '294 patent, 1:15-23; 2:1-29; 2:59-3:9.

23. Based on my review of the Asserted Patent and on my consideration of the above-mentioned factors, a person of ordinary skill in the art (a "POSITA") at the time of the invention (i.e., the 2007-time period) in the relevant field of the Lumenco Patents would have had an undergraduate degree in electrical engineering, mechanical engineering, physics, or a similar field and at least 2 years of experience with diffusive light micro-optic security features.

24. I understand that Petitioner's expert, Dr. Hesselink, opines that a POSITA "would have had a minimum of an undergraduate degree in electrical engineering, mechanical engineering, or physics and at least 2 years of experience

in micro-optic based security features." I disagree with Dr. Hesselink's conclusion for at least two reasons.

25. First, I disagree with Dr. Hesselink's conclusion at least because he limits the relevant educational fields to electrical engineering, mechanical engineering, or physics. In my opinion, an individual obtaining a degree in a field similar to electrical or mechanical engineering would still enable an individual to be a POSITA as to the Lumenco Patents so long as the educational experience is combined with the relevant subject matter experience (discussed below). More specifically, an undergraduate degree in a field similar to the electrical or mechanical engineering or physics, which would include at least computer science degrees with engineering coursework, more accurately reflects the level of ordinary skill in the art for the Lumenco Patents. In my opinion, Dr. Hesselink's proposal is thus overly restrictive and fails to account for the fact that university degree programs vary and that degrees other than those specifically identified by Dr. Hesselink would provide appropriate subject matter training so long as that training is combined with at least two years of relevant experience in order to establish a person as a POSITA for the Lumenco Patents.

26. Second, I disagree with Dr. Hesselink's opinion that the correct subject matter experience is "experience in micro-optic based security features." In my opinion, a POSITA would need to have at least two years of experience

specifically with diffusive light micro-optic security features. Experience in micro-optic security features more broadly, without specific diffusive light experience, would not qualify a person as skilled in the art of the Lumenco Patents. Diffusive light and the behavior of reflected ambient light presents challenges, especially when considering how the human observer perceives light reflected from a security feature. Diffusive light systems, like those disclosed in the Lumenco Patents are designed to work with ambient light. These light sources present technical challenges not present with collimated light source systems because, simply put, ambient light is diffuse and not collimated. Instead, ambient light creates multiple areas of difficulty and challenges because the light energy is not transmitted in parallel rays, but instead is diffusive in nature and bounce around. Considerations such as light conservation are important because an image created with ambient light must direct light in the right place. Ambient light also often ends up in the wrong place due to its diffusive nature, and thus may light up an area intended to be dark. As set forth in more detail below, these challenges and considerations must be familiar to a POSITA when designing or considering a security document substrate that works in diffusive or ambient light, and are not presented in general experience with typical micro-optic security features.

27. A discussion of the design differences and considerations of targeted light systems (e.g., lasers) versus diffusive light systems further exemplifies this

point. Targeted light systems using lasers or other focused light sources are fundamentally different and involve different considerations from systems relating to security features like those described in the Lumenco Patents (which operate by reflecting diffuse ambient light). Lasers are high intensity collimated light sources and, in such systems, rays of light are parallel to each other and the direction and angle of those rays of light are controlled and predictable. Such systems are ideal for well-defined problems in highly controlled environments with small and well-characterized sources of disturbance. Rays of light from lasers are high-intensity and efficient, making their behavior more predictable than light in diffusive systems. In collimated light source systems, the designer knows exactly where the light is coming from and can manipulate and control variables like intensity, beam size, etc. Thus, the challenges and considerations in designing diffusive light systems differ greatly from those involved in designing systems that operate with focused, collimated light sources such as lasers.

28. Diffusive light systems like those disclosed in the Lumenco Patents are designed to work with ambient light, such as ambient outdoor light or light from indoor diffuse light sources, e.g., overhead lights or lamps. The light rays from these sources are not collimated and present technical challenges not present with collimated light source systems. Diffusive light scattering causes unintended light rays in positions and directions not desired. This presents a number of

challenges, e.g. positions that should appear deeply black appear instead be grayish. Achieving high intensity and high contrast images in diffusive light systems is much more difficult than in collimated light source systems due to interference, diffraction, and scattering effects from untargeted light rays.

29. Thus, a person who had experience mainly or only with focused, collimated light systems would not fully understand the principles and challenges in diffusive light systems.

30. I have reviewed Dr. Hesselink's declaration and I see no indication that he has any experience working with diffusive light systems like those disclosed by the Lumenco Patents.

31. Dr. Hesselink states that his "expertise is in ultra-high density optical data storage, and optical information systems generally, as well as optical communication components, nano photonics, optics and optical systems, and optical interconnects." This high-level summary of experience does not include any specific mention of experience with diffusive or ambient light features and does not mention optical security features.

32. Diffusive light micro mirror features are, broadly speaking, "optical systems. But collimated light systems and a variety of other technologies also fall under that broad category. I do not understand a disclosure of general experience in "optics" to necessarily include experience with diffusive light systems.

33. Dr. Hesselink provides several more specific examples of his experience with optical systems. He states that he has experience with "3-D displays, including autostereoscopic holographic displays, 3-D up conversion display, 3-D displays for security applications, grating-based displays, as well as data analysis of complex 3-D flow visualizations using scanning laser systems, tomography, and mathematical topology," as well as "3-D display and storage devices" and the use of "interferometry to determine the 3-shape of objects using optical and X-ray scanners." None of the specific technologies detailed by Dr. Hesselink are diffusive light systems. For example, autostereoscopic holographic, 3-D up conversion, and grating-based display systems all use collimated light or other focused light sources, not ambient or diffusive light sources.

34. Dr. Hesselink states that he has a "broad knowledge of optics." In my opinion, a broad general knowledge of optics does not qualify Dr. Hesselink as a POSITA as to the Lumenco Patents. Specific knowledge of diffusive light micro-optic security features is required.

35. Dr. Hesselink opines that "[i]n the patent, ambient light refers to parallel light, i.e., all the rays coming from the source are parallel to each other." That statement is false.

36. A POSITA would understand that "ambient light" as used in the art and in the Lumenco Patents specifically refers to a non-collimated light

environment, i.e., an environment where light rays are scattered and diffused.

37. Ambient light environments often involve light rays from multiple sources and light from those sources is often intentionally diffused. Ambient light refers to, for example, the lighting conditions in an indoor office environment with multiple overhead light sources, natural light entering through windows, etc. In ambient light systems, light rays engage security features from a variety of directions—the rays are not all parallel to each other.

V. OPINIONS REGARDING FUHSE262

38. I understand that Dr. Hesselink has provided opinions regarding how a POSITA would interpret and understand DE102010048262A1 to Fuhse et al. ("Fuhse262").

39. I have reviewed and analyzed the official English translation of Fuhse262 that was submitted with the Petitions as Ex. 1006.

40. I have also reviewed and analyzed Dr. Hesselink's declarations (Ex. 1003 to each Petition) and the Petitions challenging each of the Lumenco Patents.

41. I have been asked to provide an opinion on whether Fuhse262 discloses or suggests the claims of the Lumenco Patents.

a. "wherein a voxel is created at each of the points on the plane via intersection of two or more beams of the reflected ambient light"

42. Element [1b.5] of the '294 patent recites: "and wherein a voxel is created at each of the points on the plane via intersection of two or more beams of the reflected ambient light." I understand that element [1b.5] of the '836 patent is substantially identical to element [1b.5] of the '294 patent, and my opinion below applies equally to that limitation in view of Fuhse262. I understand that other claims of the '294 and '836 patents also include substantially similar limitations, and my opinion below applies equally to those limitations.

43. It is my opinion that a POSITA would not have understood Fuhse262 to disclose creating a voxel, nor that creating a voxel is obvious in light of Fuhse262.

44. Claim 1 of the '294 patent is directed to "an array of micro mirrors receiving ambient light and, in response, displaying an image." Ex. 1001 to '294 Petition, claim 1. The array uses voxels created by reflection of the ambient light on the micro mirrors to create the image, which is useful for security elements on paper and coin currency. *Id.*

45. Creation of a voxel in an ambient light environment using a micro mirror array is a highly technical endeavor. One cannot simply aim mirrors towards each other and obtain a three-dimensional voxel that assists in creating an

image for a security feature.

46. More specifically, creation of a voxel involves technical challenges and considerations above and beyond those required to create a pixel. Less information in the form of reflected light is necessary to create a pixel as compared with creation a 3-D voxel because a 3-D voxel adds another dimension.

47. In ambient light environments, where light rays hit a security feature from many angles at once instead of in parallel to each other, light rays reflected from a micro mirror encounters interference from incoming light rays and potentially from light rays reflected from other mirrors in the array.

48. That interference degrades the quality and shape of the light rays as they move toward an intersection point. Because creating a pixel requires less information than creating a voxel, a security feature in which only pixels need to be produced requires less refinement and complexity.

49. A pixel can be displayed at the intersection of light rays even when there has been substantial degradation of those rays due to interference. In contrast, creating a voxel requires more focused and intense light rays that are less susceptible to degradation from interference in the ambient light environment.

50. Creation of the more intense rays needed for the resulting voxel adds layers of complexity, as well as substantial additional design costs, to a system. In my opinion, a POSITA would not expend the time and money to achieve the

higher-level design required to produce a voxel if only pixels were necessary to achieve a desired image goal.

51. In certain applications, the extra computational and storage pay-load of 3-D voxels is justified because creation of a 3-D voxel provides heightened benefits for security. This is because, in the art of security features, the more difficult it is to replicate a feature the more valuable and secure that feature is.

52. Dr. Hesselink does not acknowledge or address any of these concerns. This may stem from Dr. Hesselink's misunderstanding about the nature of ambient light environments (see above, discussing Dr. Hesselink's misunderstanding that ambient light involves parallel rays of light). As I discuss above, Dr. Hesselink does not identify any specific experience with diffusive light systems like those described in the Lumenco Patents and his opinions are based on an incorrect understanding of the technology described in the Lumenco Patents.

53. In ambient light environments, light rays engage the security features from a variety of directions—the rays are most certainly not all parallel to each other and, as a result, there is much more interference in ambient light environments.

54. More specifically, the interference that does occur with parallel rays, which is indeed challenging to mitigate, including unwanted speckle patterns, is principally different from the interference of diffusive light conditions that can

deteriorate the desired features of Lumenco Patents. The means and tools for addressing and mitigating these principally different types of interferences are substantially different from each other.

55. In my opinion, a person with experience focused mostly on collimated light source environments, would not understand the complexities involved in creating a voxel in an ambient of diffusive light features.

56. I also note that Fuhse262 does not mention voxels or 3-D pixels or provide any other suggestion to a POSITA that it intends to or can create a voxel useful to create an image for an optical security feature. It is also my opinion that a POSITA would not consider Fuhse262 to relate to the scope, content, or design considerations of element [1.b.5] of the Lumenco Patent for the reasons set forth above.

57. It is therefore my opinion that a POSITA would not understand Fuhse262 to teach or suggest the creation of voxels. Nor would a POSITA be motivated to modify Fuhse262 to create a voxel instead of a pixel because doing so would only add unnecessary cost and complexity to the Fuhse262 system.

58. I also note that, if the Fuhse262 system created three-dimensional voxels instead of the two-dimensional pixels or image points expressly disclosed by Fuhse262, all of the images produced by Fuhse262 would also necessarily be three-dimensional because they would have all have a volume. It is therefore my

opinion that the teachings of Fuhse262 confirm that creation of voxels is not the natural result of the Fuhse262 system.

b. "further in response to the receiving of the ambient light, the array of micro mirrors displays a second image in a second plane spaced a distance apart from the plane displaying the image."

59. Element [35b.5] of the '294 patent recites: "further in response to the receiving of the ambient light, the array of micro mirrors displays a second image in a second plane spaced a distance apart from the plane displaying the image."

60. It is my opinion that a POSITA would not understand Fuhse262 to teach or suggest this element, nor that element [35b.5] is otherwise rendered obvious in light of Fuhse262.

61. In Dr. Hesselink's opinion, Fuhse262 discloses displaying two images that "are in the 'foreground' and 'background' of each other." Ex. 1003 to '294 patent, ¶ 221 (citing EX1006, ¶¶ [0117]). I do not disagree that Fuhse262 uses those words, but I disagree with the conclusions drawn by Dr. Hesselink.

62. I note that the cited paragraph of Fuhse262 discloses a single light-spot image that contains both a 3-D motif and a 2-D motif. EX1006, ¶ [0117] ("It may also be advisable to combine a three-dimensional motif with a two-dimensional motif in the light-spot image.").

63. A POSITA would understand that planes, like images, can be 2-D or

they can be 3-D, i.e., they can have depth in addition to length and width. 3-D planes are sometimes referred to as "hyper planes."

64. A POSITA describing the position of a 3-D image in terms of the plane on which that image is displayed would refer to the 3-D plane containing the full length, width, and depth of that 3-D image. When describing the position of a 2-D image in terms of the plane on which that image is displayed, a POSITA would refer to the 2-D plane containing the full length and width of that 2-D image.

65. Based on Fuhse262's disclosure of a single light-spot image that combines a 3-D motif and a 2-D motif, a POSITA would understand that the 3-D motif and the 2-D motif are both displayed within the same three-dimensional plane or hyper plane. *See* EX1006, ¶ [0117]. If the two motifs were in two separate, non-overlapping planes spaced a distance apart from one another, then a POSITA would not understand them to be part of the same light spot image. They would instead appear as two separate, distinct light-spot images.

66. Fuhse262 explains that "if a two-dimensional foreground motif is combined with a three-dimensional background motif, the light-spot image does not disappear completely, even in poor illumination conditions, but is simply reduced to the more robust two-dimensional foreground motif. An authenticity check is therefore still possible even in poor illumination conditions." EX1006, ¶

[0117].

67. This disclosure teaches a POSITA that the 3-D motif portion of the disclosed light-spot image extends into the background of the 2-D motif but that the two motifs must appear within the same 3-D plane, consistent with Fuhse262's teaching that both motifs appear within the same light-spot image. If the two motifs were indeed in entirely different, nonoverlapping planes, then the light spot image would not reduce into the 2-D motif in poor lighting conditions. The 3-D motif would simply disappear, leaving the separate 2-D image visible in a different location.

68. It is therefore my opinion that a POSITA would understand that the 3-D motif and the 2-D motif of Fuhse62 are both displayed within the same 3-D plane.

69. It is further my opinion that even if a POSITA would have understood Fuhse262 to disclose a 3-D motif in a 3-D plane and a 2-D motif in a 2-D plane, it still would not teach or suggest that the 3-D plane and the 2-D plane are spaced a distance apart from one another.

70. Fuhse262's use of the term "reduce" indicates to a POSITA that the 2-D motif is contained within the bounds of the 3-D motif. For that reason, even if the 2-D motif were considered to be on its own 2-D plane, that 2-D plane would overlap or be contained within the 3-D plane on which the 3-D motif is

displayed—the two planes would not be spaced a distance apart from one another. For these reasons and those discussed above, it is also my opinion that a POSITA would not consider Fuhse262 to relate to the scope, content or design considerations of element [35b.5] of the Lumenco Patent.

71. It is therefore my opinion that Fuhse262 does not disclose or suggest displaying a second image in a second plane spaced a distance apart from the plane displaying the image. Nor would a POSITA be motivated to modify Fuhse262 to display a second image in a second plane spaced a distance apart from the plane displaying the image.

VI. OPINIONS REGARDING FUHSE925

72. I understand that Dr. Hesselink has provided opinions regarding how a POSITA would interpret and understand U.S. Patent No. 10,639,925 to Fuhse et al. ("Fuhse925").

73. I have reviewed and analyzed the Fuhse925 reference and Dr. Hesselink's declaration (Ex. 1003 to the '863 Petition), as well as the '863 Petition.

74. I have been asked to provide an opinion on whether Fuhse925 discloses or suggests the claims of the '863 patent.

a. "wherein each of the sets of micro mirrors are selected randomly from a plurality of the micro mirrors located in a base of a cone on a surface containing the array of micro mirrors"

75. This element appears in claim 3 of the '863 patent. Substantially the same element appears in claim 7 of the '863 patent and is referred to in the Petition as element [7d]. These elements recite "wherein each of the sets of micro mirrors are selected randomly from a plurality of the micro mirrors located in a base of a cone on a surface containing the array of micro mirrors."

76. I note that, the "sets of micromirrors" referenced by this element were first introduced in element [1b] of the '863 patent. That element recites that "an array design module that operates to select a set of micro mirrors in an array of the micro mirrors to display each of the pixels of the first object in the first image display plane and to display each of the pixels of the second object in the second image display plane." In other words, each pixel of the first object and each pixel of the second object is created by a set of micro mirrors. So, when read in context, claim 3 requires that each of the micro mirrors that form each set of pixel-producing micro mirrors is selected randomly from the available micromirrors located within the base of a cone for that particular set of micromirrors.

77. I understand that Dr. Hesselink opines that Fuhse925 suggests this "selected randomly" element. Ex. 1003 to '863 Petition, ¶¶ 337-343. It is my opinion that Fuhse925 does not disclose or suggest such a feature.

78. I understand that Fuhse925 discloses that the normal component $N_{\perp}$ "increases or decreases monotonically, with the distance of the respective facet from the target curve. Fuhse925, 10:64-11:1, FIG. 4 (showing the $N_{\perp}$ angle component of the facets 30 increasing from the midpoint of motif region 20 toward the edges of that region). Fuhse925 further discloses that the parallel component $N_{\parallel}$ of each facet can vary randomly. *Id*., 11:14-18; Petition, p. 59. Dr. Hesselink cites to this disclosure of random variation of the parallel component $N_{\parallel}$. Ex. 1003 to '863 Petition, ¶¶ 340-341.

79. I agree that Fuhse925 discloses that the $N_{\parallel}$ inclination component can vary randomly throughout the entire field of mirrors. But I disagree with Dr. Hesselink's opinion that. Fuhse925 teaches or suggests random selection of mirrors.

80. FIG. 4 of Fuhse925 shows that each of the mirrors of Fuhse925 are the same width and are arranged in even increments, one next to the other. This is also shown in FIG. 3, which shows facets 30 laid out in a regular grid with each facet 30 having identical lengths and widths of 15 micro meters.

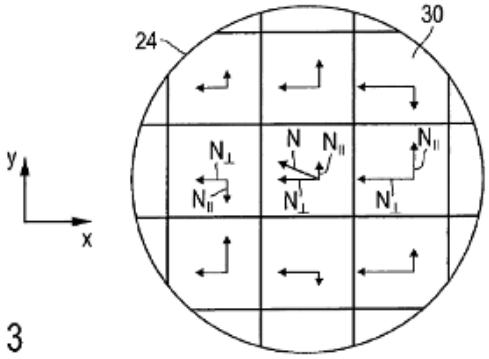


Fig. 3

Fuhse925, 7:33-36; FIG. 3.

81. The height of the facets can vary, but a POSITA would understand that the facets are arranged in a regular, obvious, grid pattern. *Id*., 7:33-36. I therefore find no support in Fuhse925 for Dr. Hesselink's opinion that "[a] POSITA would understand that it therefore follows that the randomness of the orientation vector N of each reflective facet 30 is the result of a random pattern of the reflective facets 30." *See* Ex. 1003 to '863 Petition, ¶ 340.

82. I agree that Fuhse925 discloses that the $N_{\parallel}$ inclination component can vary randomly throughout the entire field of mirrors. But I disagree with Dr. Hesselink's opinion that. Fuhse925 teaches or suggests random selection of mirrors.

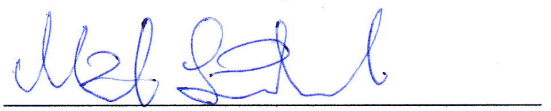
83. I also note that every one of the mirrors of Fuhse925 is used to reflect light for the images created by Fuhse925's optical security feature. Fuhse925 does

not disclose any selection of a subset of the micromirrors, whether random or otherwise. *See generally* EX1008.

84. It is therefore my opinion that Fuhse925 does not teach or suggest claim 3 or claim element [7d] of the '863 patent. I have also reviewed Fuhse847 and the Rich reference and in my opinion, neither remedies the deficiencies of Fuhse925 with respect to claim 3. To the contrary, in my opinion, a POSITA would have found Fuhse847 and Rich to be directed different considerations and would not have found it logical or otherwise desirable to combine their teachings with Fuhse925 for the purpose of randomly selecting sets of micro mirrors as disclosed in the claim elements. Thus, it is my opinion that none of these references, either alone or in combination, teaches or suggests claim 3.

Date: February 18, 2025

Respectfully Submitted,



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Profile

Data scientist – AI, optics and electronics ("optronics")
PhD and Master's degree in Computer Science, profile signal processing and image analysis; PhD and Master's projects on multiple patented spatially and angularly resolved optical and electronics based measurement devices with application in the context of optical document security. Extensive academic course credits in mathematics/statistics/software development. Multiple years of software development in Matlab (similar e.g. to Python and R). Independently developed AI (machine learning and other AI-methodologies) based predictive models in IBM Modeler and R, data collection in IBM Cognos and SQL.

Analyst, method development
Many years of experience in technically demanding requirement specification, requirement analysis and scientific research together forms a solid basis for method development, which has been vital in all employments and contracts.
Experience: In the role of industrial PhD-student, implies applying research and theories in practice.

Entrepreneur, commercialization of scientific research
Founder of gonioLabs; as sole responsible trains the ability to handle the unexpected, shift focus when motivated, ability to stakeholder-adapted communication, while maintaining a high delivery tempo in line with the strategy towards the defined goal.

Scientific researcher and reviewer
Independent reviewer for scientific journals (e.g. Journal of Imaging Science and Technology). The role requires the ability to review novel demanding matter, understand claimed characteristics and features but also identify apparent and non-apparent shortcomings, as a basis for suggesting refutation, amendments or acceptance, to the editor. Sole author to and reviewer of multiple scientific papers and legal documents such as patents, in the field of optics and imaging.

Delivery manager for software development
Together with the customer, defining business requirements and acceptance criteria for software development projects, communicating these to software architects. Managing intern acceptance tests and customer acceptance tests, planning and coordinating deployment procedures.

Assignments and entrepreneurial work

The following is a selection:

The Swedish Board of Student Finance (CSN) Stockholm; June 2021 – (ongoing); Analysts for AI-based fraud detection, development and implementation of model to detect attempts of fraud
Development of machine learning models based on history known frauds of applications on loans and beneficiaries, including formulation of engineered variables, training, validation and testing. Applying the model on incoming new applications to identify a short-list of high-risk applications, to be evaluated and reviewed by human case managers. Verified cases resulting police reports. This is a highly efficient and valuable procedure to limit the laborious and costly evaluation and reviewing human case manager process while achieving a high ratio of detection.

gonioLabs AB, Stockholm; May 2019 – (ongoing); Commercialization of scientific research
Commercialization and further development of a security hologram scanning system, invented by Lindstrand. Promotion through presentations at scientific conferences.

Sole author of "High-entropy Multidimensional OVD Characterization Facilitating Multimodal Authentication" presented at the "Optical Document Security" conference, January 2020, San Francisco, USA; and "High-entropy multidimensional optically variable device characterization – Facilitating multimodal authentication and capture of deep learning data" presented at the "Media Watermarking, Security, and Forensics" conference, January 2020, Burlingame, USA.

The Swedish Board of Student Finance (CSN) HQ Sundsvall; January – April 2019; Analysts for predictive analysis, implementation and further development of model for predictive analysis, based on CSN's data storage
Further development and application of the model developed at CSN in 2018, see below. Via enhanced authorization accessing CSN's full data lake – prototypes (IBM Modeler) based on machine learning and other AI-based approaches showed a high degree of predictability. Preliminary results also indicated a high level of stability for some of the models developed. The workload of the assignment: approximately 50 percent of a full-time.

CSN HQ Sundsvall; June – December 2018; Analysts with legal expertise, development of model for predictive analysis, based on CSN's data storage
In IBM SPSS Modeler, develop predictive model based on CSN's data storage using an IBM Cognos database interface. The purpose of this business supporting tool is to get improved knowledge of borrowers at higher risk of default (financial insolvency). The assignment requires the ability to capture and define the business requirements, methodology, mathematical knowledge, especially in statistics, ability to apply signal processing (including methods such as machine learning, artificial intelligence, neural networks, etc.) to develop and critically evaluate systems that meet the business requirements. The legal competence facilitated the dialog with the legal department expertise, about possible avenues of development.

Bolagsverket (Swedish Companies Registration Office) Sundsvall; September – December 2018; Data scientist, development of AI competence and ability
Within a team of IT architects, operate as a data scientist, mainly focused on image and signal processing. The team implemented Python, Tesseract, Tensorflow and other open-source based applications.

Björks Buss AB (bus transportation, including operational syndication); 2011 — 2013; Business Architecture, Business Analysis, Business Requirements, Delivery Manager, Presentation and Documentation
Head business architect in product development of case management systems with activities such as process mapping, Geo-location of 1000+ vehicles and targeted promotion of the information to the relevant multiple receivers, requirement capture; also responsible for test criteria and documentation. During the implementation phase on behalf of the customer (a product development company) RTIT's act as project manager and delivery manager at deployment sites at the end customers Björks Buss AB and SJ AB (the Swedish dominant train operating company). The project was extensive and complex as the deployed system manages all replacement traffic during disruptions, including production and information systems for all substitute traffic (bus, taxi etc.) for SJ's passenger train services. The system was in continuous operation with incremental development of functionality, so the work was conducted inspired by a LEAN methodology. The project was also technically challenging: interfaces with existing IT systems of other organizational units within SJ and other organizations (Björks, Trafikverket (The Swedish Transport Administration), Taxi-Logistik (taxi transportation, including operational syndication)). Further including also geo-location; messaging, as well as more than 2,000 geographically distributed users with partial individual business needs and profiles (permission logics), and user interfaces through both web and mobile applications. Implementation was assigned two subcontractors with associated coordination needs. The workload varied in the range of 70 - 130 percent.

Bolagsverket (Swedish Companies Registration Office); 2011 — 2012; Business Architecture, Business Analysis, Business Requirements, Presentation and Documentation
Three assignments of which the most demanding was as Method coach, process mapping and rule modeling in the "Legal Quality of Information, Communication and Decision" assignment, including more than 30 business analysis workshops with a substantial part of the law department, to characterize legally specially challenging and business critical deliverables (for stakeholders). The other two assignments had similar contents.

RTIT (An entrepreneurial company in geo-position based logistics) AB; 2010 — 2011; Business Architecture, Business Analysis, Business Requirements, Delivery Manager
Responsible for business development and deployment management. Process mapping and requirement capture for the implementation of the above-mentioned ("Björks Buss AB…; 2011...") case management system. Member of the subcontractor procurement team. Other roles, activities as described above.

gonioLabs AB; 2007 — 2009; commercialization of scientific research
Foundation of gonioLabs; invention/developing the novel scanner for optical documet security applications including security holograms and DOVID. Patent issuing. Dialog med intressenter.

References

Doctoral thesis: theis, Department of Science and Technology; Faculty of Science & Engineering; on the subject: Computer Sciences.
gonioLabs references: list of references, note e.g. late R van Renesse's reporting on "GonioLabs' novel DOVID reader", van Renesse being an renown authority in the business.
Google scholar: summary

Other experiences and Awards

gonioLabs AB; 2014 - 2018; PhD student, Method Development, Research, Presentation and Documentation
Further development of security hologram measurement, characterization and visualization systems. Writing and publishing scientific articles based on proprietary image processing methods. Degree finalized October 2018 https://doi.org/10.3384/diss.diva-151626.

SPV, Statens Tjänstepensionsverk (The National Government Employee Pensions Board); Insurance Investigator; 2009 Business Requirements, Business Analysis, Presentation and Documentation
My role: To bridge over business statistics and IT/data storage (SQL). Together with statisticians translate comprehensive, complex and difficult-to-understand data sets into information comprehensible for the staff as follow-up documents. Suggest pedagogical visualizations of information. Dynamic and interactive diagrams I introduced were appreciated as they facilitated the staff's understanding of complex and multidimensional information.

STFI/SCA (paper making industry); Research Engineer, system development and implementation; 1996-2006 Business Requirements, Business Analysis, Method Development, Presentation and Documentation
System development of signal and image processing software (in Matlab, a development platform for mathematical and science applications). Independently developed analysis and visualizations of large and complex information sets. Developing of key performance indicators - "Business intelligence".

Best Master thesis degree project; 1996 (and 1998); Bo Rydin Foundation for Scientific Research
This is an award within the Swedish paper making industry. In 1998 Mikael was the sole supervisor for a project receiving the same award.

Certified skills and experience

Academic degrees	Organization	Year
PhD in Computer science	Linköping University	2018
Degree of Licentiate in Technology	Linköping University	2002
Master of science in Computer science and engineering	Linköping University	1996

Role	Time span, years	Most recent, year
Research scientist	2	2025
Analyst, Method developer	25	2025
Business architect	9	2020
Business developer	9	2019
Entrepreneur	13	2025
Documentation manager	19	2020
Project manager	12	2018
Process mapping (business analyst)	5	2013

Other	Organization	Year
AI and digitalization, 3 credit p.	Linköpings Universitet	2019
LEAN, 6 course sections each 3 hours	Fujitsu, Sundsvall	2013
Lecturer doctoral course	KTH, Stockholm	2009
Supervisor Master's degree Project	Luleå Tekn. Högskola	1998

Customer reviews

Customer reviews have been good or very good. The most recent review was for a 12-month long business requirement assignment, review (in full completeness):

Interpersonal skills (1-5): **5** (relative weight factor according to customer (1-5): 4)
Accountability (1-5): **4** (relative weight factor according to customer (1-5): 4)
Power of initiative (1-5): **5** (relative weight factor according to customer (1-5): 3)