

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Olympus Corporation, OM Digital Solutions Corporation, FUJIFILM Corporation, FUJIFILM North America Corporation, Nikon Corporation, Panasonic Entertainment & Communication Co., Ltd.,
Petitioners,

v.

Optimum Imaging Technologies LLC,
Patent Owner.

U.S. Patent No. 10,873,685
Case No. IPR2024-01220

Petition for *Inter Partes* Review
Under 35 U.S.C. §312 and 37 C.F.R. §42.104

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Table of Exhibits

Exhibit	Description
Ex-1001	U.S. Patent No. 10,873,685 (“’685 Patent”)
Ex-1002	Prosecution History of the application that led to the ’685 Patent (excluding NPL submissions)
Ex-1003	Declaration of Expert Witness, Dr. Robert L. Stevenson
Ex-1004	Curriculum Vitae of Expert Witness, Dr. Robert L. Stevenson
Ex-1005	Certified Translation of Japanese Patent App. Pub. No. 2000-041179 (“Iwasawa”)
Ex-1006	U.S. Patent No. 7,245,319 (“Enomoto”)
Ex-1007	Certified Translation of Japanese Patent App. Pub. No. 6-113309 (“Ito”)
Ex-1008	U.S. Patent App. Pub. No. 2005/140801 (“Prilutsky”)
Ex-1009	U.S. Patent No. 6,791,608 (“Miyazawa”)
Ex-1010	Certified Translation of Japanese Patent App. Pub. No. 2004-266768 (“Matsutani”)
Ex-1011	U.S. Patent No. 6,603,885 (“Enomoto ’885”)
Ex-1012	Prosecution History of Application that Led to U.S. Patent No. 8,451,339 (“’339 Patent”), the Parent of the ’685 Patent
Ex-1013	Dkt. No. 1, Complaint, <i>Optimum Imaging Technologies LLC v. Olympus Corporation and OM Digital Solutions</i> , 4:23-CV-00924-ALM (E.D. Tex. Oct. 18, 2023) (“Complaint”)
Ex-1014	Japanese Patent App. Pub. No. 2000-041179 (“Iwasawa-JP”)
Ex-1015	Japanese Patent App. Pub. No. 6-113309 (“Ito-JP”)
Ex-1016	U.S. Patent No. 5,522,832 (“Kawasaki”)
Ex-1017	U.S. Patent App. Pub. No. 2002/0135688 (“Niikawa”)

Ex-1018	Certified Translation of Japanese Patent App. Pub. No. 2005-25703 (“Yamada”)
Ex-1019	Japanese Patent App. Pub. No. 2005-25703 (“Yamada-JP”)
Ex-1020	U.S. Patent App. Pub. No. 2007/0080280 (“Havens”)
Ex-1021	U.S. Patent No. 7,738,015 (“Steinberg”)
Ex-1022	U.S. Patent No. 7,936,392 (“Ng”)
Ex-1023	U.S. Patent App. Pub. No. 2004/0150726 (“Gallagher”)
Ex-1024	Japanese Patent App. Pub. No. 2004-266768 (“Matsutani-JP”)
Ex-1025	Sotera Stipulation
Ex-1026	“The Filmmaker’s Handbook: A Comprehensive Guide for the Digital Age,” Steven Ascher and Edward Pincus (1999), p. 103
Ex-1027	“Wiley Electrical Electronics Engineering Dictionary,” Steven M. Kaplan (2004), pp. 169, 840
Ex-1028	U.S. Patent App. Pub. No. 2004-264918 (“Turner”)
Ex-1029	U.S. Patent No. 5,280,354 (“Nakamura”)
Ex-1030	U.S. Patent App. Pub. No. 2003/0179948 (“Gindele”)
Ex-1031	Certified Translation of Japanese Patent App. Pub. No. 5-3568 (“Shiomi”)
Ex-1032	Japanese Patent App. Pub. No. 5-3568 (“Shiomi-JP”)
Ex-1033	Certified Translation of Japanese Patent App. Pub. No. 11-205652 (“Ichiyama”)
Ex-1034	Japanese Patent App. Pub. No. 11-205652 (“Ichiyama-JP”)
Ex-1035	“Digital Image Correcting Method for Digital Camera,” Guan <i>et al.</i> (2005)
Ex-1036	Declaration of Kiyoto Nagai (July 15, 2020)

1. Introduction

The '685 Patent sought to solve the purported problem of a lack of ability to correct image aberrations in-camera. Ex-1001, 6:63-67. But that problem was solved years prior, including by Iwasawa. The Patent Office did not have the benefit of Iwasawa during prosecution and the '685 Patent issued after a single double-patenting rejection, all without an opportunity to consider the references presented herein. *See* Ex-1002, 125-138.

As discussed in Section 4, and summarized in the table below, claims 1-30 (the “Challenged Claims”) are obvious primarily in view of Iwasawa’s in-camera aberration-correction system, with secondary references teaching use of fast Fourier transform (Ito) or correcting for well-known types of aberrations (Enomoto, Prilutsky, Miyazawa, and Matsutani). *See also* Ex-1003 ¶¶70-392.

No.	Argument
1	Claims 1, 3, 6, 11-14, 17, and 19 are unpatentable under 35 U.S.C. §103 in view of Iwasawa
2	Claims 1-3, 5-7, 10-15, 17-19, 23, 24, 27, 28, and 30 are unpatentable under 35 U.S.C. §103 in view of Iwasawa and Enomoto
3	Claims 4, 8, 9, and 16 are unpatentable under 35 U.S.C. §103 in view of Iwasawa and Ito
4	Claims 4, 8, 9, and 16 are unpatentable under 35 U.S.C. §103 in view of Iwasawa, Enomoto, and Ito
5	Claim 20 is unpatentable under 35 U.S.C. §103 in view of Iwasawa and Prilutsky
6	Claim 20 is unpatentable under 35 U.S.C. §103 in view of Iwasawa, Enomoto, and Prilutsky

- | | |
|----|--|
| 7 | Claim 21 is unpatentable under 35 U.S.C. §103 in view of Iwasawa and Miyazawa |
| 8 | Claim 21 is unpatentable under 35 U.S.C. §103 in view of Iwasawa, Enomoto, and Miyazawa |
| 9 | Claims 22, 25, 26, and 29 are unpatentable under 35 U.S.C. §103 in view of Iwasawa and Matsutani |
| 10 | Claims 22, 25, 26 and 29 are unpatentable under 35 U.S.C. §103 in view of Iwasawa, Enomoto and Matsutani |

2. Grounds for Standing

Petitioners certify that the '685 Patent is available for IPR and that Petitioners are not barred or estopped from requesting IPR of the Challenged Claims on the aforementioned grounds.

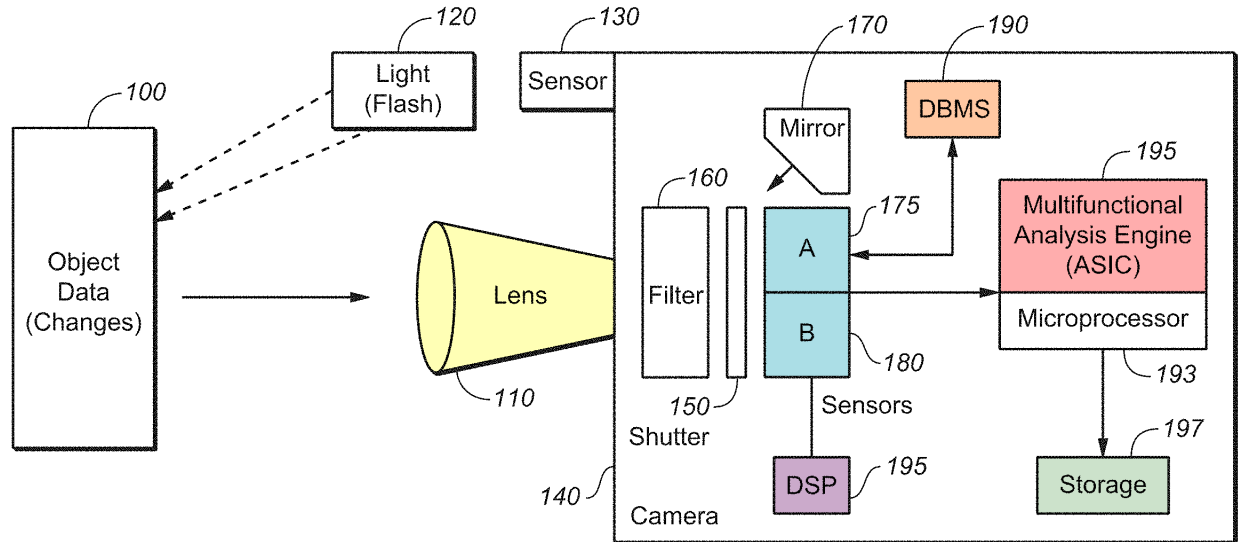
3. The '685 Patent

3.1 Summary

The '685 Patent admits that existing optical technologies reliably corrected for imaging aberrations, asserting that those technologies lacked “in-camera modification capabilit[ies] for each specific image problem.” Ex-1001, 6:63-67.

The '685 Patent describes a digital video camera capable of identifying and correcting for optical image aberrations using well-known components: (i) an optical lens mechanism (*e.g.*, lens 110, yellow), (ii) a digital sensor (*e.g.*, digital sensors 175 or 180, blue), (iii) an integrated circuit (*e.g.*, ASIC 195, red) with a digital signal processor (*e.g.*, DSP 195, purple) for accessing a database management

system (e.g., DBMS 190, orange), and (iv) a memory storage sub-system (e.g., storage 197, green). *See id.*, claim 1; *see also* Ex-1003 ¶58.



Ex-1001, fig. 1.

3.2 Prosecution History

The single rejection for obviousness-type double patenting indicated the then-pending claims were the same as those of U.S. Patent App. No. 12/586,221 (“Parent Application”), with the “only difference” being the substitution of “an integrated circuit” for “a microprocessor.” Ex-1002, 129.

Following the rejections, a terminal disclaimer was filed and the claims were amended, allegedly “for consistency,” “to correct antecedent basis [issues],” and “to [add] a zoom lens option,” despite substantive changes and the addition of 11 new claims. *Id.*, 230-236. After an initial allowance, two requests for continued examination (RCE) and four additional IDS papers adding almost 100 new

references post-allowance were submitted. A third NOA followed, and the '685 Patent issued on December 22, 2020.

The prosecution history has no substantive discussion of the references cited here. Iwasawa, as well as supplemental references Ito, Prilutsky, Miyazawa, and Matsutani, were never cited. Enomoto was merely cited in an IDS filed after issuance of the double-patenting rejection. *Id.*, 237; *see also* Ex-1003 ¶59.

3.3 Priority Date

For this proceeding only, Petitioners assume that the provisional application's filing date, July 11, 2006, is the priority date ("Priority Date"). This is before March 16, 2013, so the pre-AIA statute applies.

3.4 Ordinary Skill in the Art

A person having ordinary skill in the art ("POSA") would have had a bachelor's degree in electrical engineering, physics, or a related field, with at least two years of industry experience and/or research, both concerning digital camera system design and image processing. Ex-1003 ¶54.

3.5 Claim Construction

Petitioners believe that the plain and ordinary meanings suffice and no further constructions are needed to resolve the issues presented herein.

4. The Challenged Claims Are Unpatentable

4.1 Ground 1: Iwasawa Renders Obvious Claims 1, 3, 6, 11-14, 17, and 19

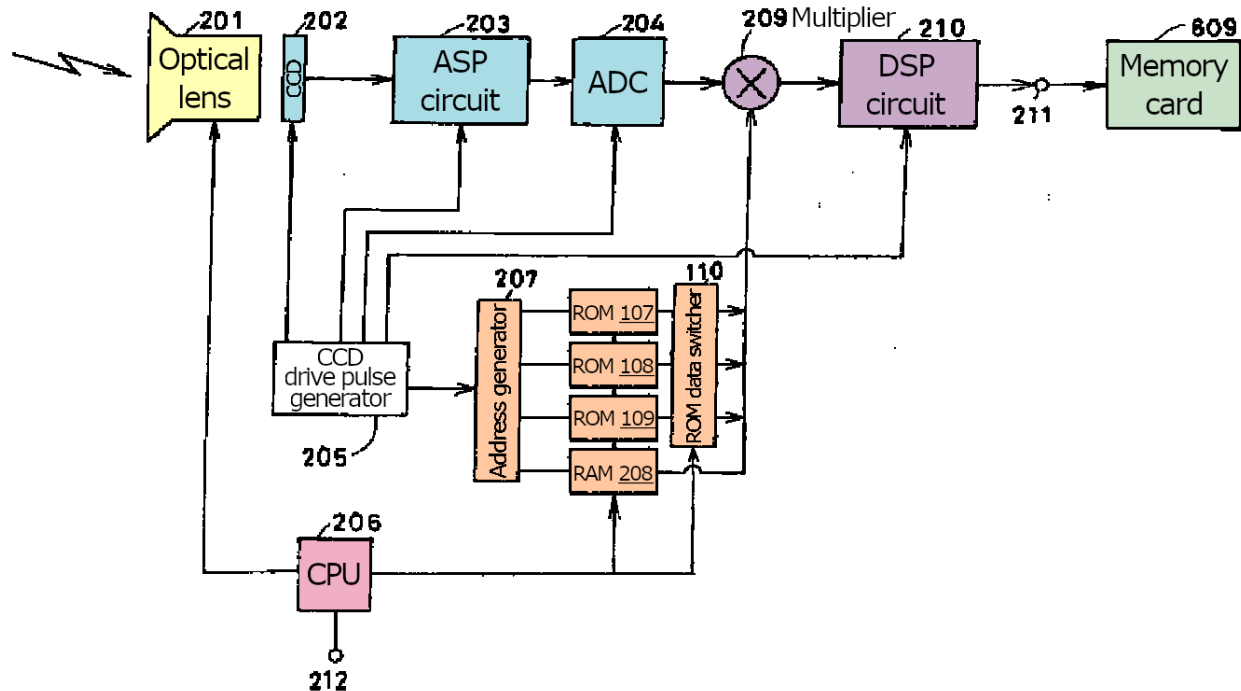
4.1.1 Overview of Iwasawa

Iwasawa published on February 8, 2000 and therefore qualifies as prior art under §102(b). Iwasawa regards “image input devices” (IIDs) configured to capture video and correct for “shading characteristics,” including vignetting, present in individual frames. Ex-1005 ¶¶1, 4, 7.

Figure 2 of Iwasawa illustrates an IID that includes optical lens 201, charge-coupled device (CCD) 202, CPU 206, RAM 208, multiplier 209, and digital signal processing (DSP) circuit 210. *Id.* ¶¶1, 19. Together, these and other components of the IID operate to capture and digitize an imaging signal, obtain correction data corresponding to parameters of the lens, and correct for aberrations accordingly. *Id.* ¶¶19-22. Figure 1 of Iwasawa illustrates an IID like Figure 2, but with read-only memories (ROMs) 107-109 and ROM data switcher 110. *Id.* ¶15. ROMs 107-109 store correction data and the ROM data switcher 110 selects a ROM according to a lens control signal. *Id.* ¶16. Figure 6 of Iwasawa illustrates a “conventional[]” IID that includes memory card 609 for storing imaging signals. *Id.* ¶2.

Below is an illustration of Figure 2’s IID, modified to depict an example of the straightforward combination of ROMs 107-109 and ROM data switcher 110

of Figure 1, as well as the memory card 609 of Figure 6. This petition refers to the combination as a “Combined IID.” See Ex-1003 ¶¶60-64.



Combined IID.

4.1.2 Motivation to Combine Iwasawa's Embodiments

Iwasawa is available for use in an obviousness combination because it is analogous art. It is in the same field of endeavor as the '685 Patent—namely, digital signal processing techniques, such as aberration correction, for imaging systems like digital and video cameras. Additionally, it is reasonably pertinent to the alleged problem of providing a camera capable of performing onboard aberration correction, and uses a similar correction data storage scheme. Compare Ex-1001, 1:18-21 with Ex-1005 Abstract ¶¶1, 16; see also Ex-1003 ¶¶71-72.

Pre-Stored Correction Data. A POSA would have been motivated to include prestored correction data, as in Figure 1’s IID, in Figure 2’s IID. Ex-1003 ¶¶73-84.

From Iwasawa’s disclosure, a POSA would have understood that Figure 2’s IID could include pre-stored correction data, such as by including ROMs 107-109, either alone or in conjunction with ROM data switcher 110, or pre-stored correction data in a portion of RAM 208. Ex-1005 ¶¶19-21. The motivation for this is at least threefold.¹

First, Iwasawa expressly discloses that the memory structures having the correction data “do not need to be ROMs as long as they are means that can be selected using the control signal output from the optical lens 101.” *Id.* ¶16. Iwasawa further expressly discloses that RAM 208 is a means that can be selected using the control signal output from optical lens 201. *See id.* ¶19. Thus, Iwasawa teaches that correction data can be stored in advance in other memory types, including RAM 208 of Figure 2.

Second, Iwasawa expressly discloses that Figure 2’s IID could be modified to include ROMs 107-109, with or without ROM data switcher 110. Ex-1005 ¶19.

¹ A POSA would also have been motivated to modify Figure 1’s IID to produce the Combined IID for the reasons discussed herein.

Iwasawa encourages modification of different embodiments such that they can operate in the same manner. For example, Iwasawa discloses several elements in Figure 2's embodiment are "the same as the first embodiment" with additions including CPU 206 and RAM 208. *Id.* Iwasawa also refers to the first and second embodiments as operating in the same manner. *See, e.g., id.* ¶22, figs. 3-5.

Iwasawa further provides different purposes for ROMs 107-109 and ROM data switcher 110 (which provide access to pre-stored correction data) as compared to the CPU 206 and RAM 208 (which allow for calculation of correction data as necessary). A POSA understood each of these functionalities could be combined, allowing for some correction data to be stored in advance and some to be calculated as necessary. Ex-1003 ¶76. A POSA further understood that this combination allowed for storing correction data for a manufacturer's existing lens types (*e.g.*, in the ROMs or RAM) while also allowing for additional lens types to be added and supported by the system (*e.g.*, through uploading new correction programs). *Id.* ¶77.

Third, in addition or as an alternative to Iwasawa's express motivations, a POSA would have been motivated to construct a commercially desirable digital camera. As noted above, the use of prestored correction data allowed for fast access to corrections for known lenses, such as a standard set of lenses provided by the IID manufacturer, allowing faster operation of the IID when switching between known lenses. Ex-1003 ¶78. Iwasawa discloses that calculation of correction data by the

CPU provides “flexible handling... when a different type of optical lens is adopted.” Ex-1005 ¶21. Including prestored correction data in Figure 2’s IID provides the advantages of both allowing fast access to correction data for a set of known lenses and efficient calculation of correction data when a new lens is adopted. Thus, a digital video camera is enabled to support both new and existing lenses, which has added commercial appeal for consumers. Ex-1003 ¶79.

At a minimum, modifying Figure 2’s IID to include correction data determined in advance (whether stored in RAM 208, ROMs 107-109, or some other memory structure) would have been obvious as a simple substitution of one known element (RAM 208) for another (ROMs 107-109) to obtain predictable results (pre-stored correction data in RAM 208). Ex-1003 ¶80. Additionally, or alternatively, the modification would have been obvious as a combination of prior art elements (combining ROMs 107-109 with Figure 2’s IID) according to known methods (including ROM data switcher 110 or embodying functionality in CPU 206) to yield predictable results (pre-stored correction data). Ex-1003 ¶81.

The routineness of this modification was confirmed during prosecution of the Parent Application. The inventor indicated CPUs were a known component included in digital cameras that “controls the computing functions of the camera,” and that a CPU “may use memory circuits... in order to access data to perform a set of control functions.” Ex-1012, 154-155. The inventor admitted that “these digital

circuitry components are generally accepted to be used in a digital camera.” *Id.* CPU 206 of Figure 2 of Iwasawa is one such known component that controlled the computing functions of a camera, and a POSA understood such control included accessing memory circuits, such as ROMs 107-109 of Figure 1.

Furthermore, as the Federal Circuit has explained, “[c]ombining two embodiments disclosed adjacent to each other in a prior art patent does not require a leap of inventiveness.” *Boston Scientific Scimed, Inc. v. Cordis Corp.*, 554 F.3d 982, 991 (Fed. Cir. 2009). Here, Iwasawa’s disclosed embodiments are adjacent and are combinable for the reasons provided earlier. Combining Iwasawa’s embodiments as indicated above is well within the skill level of a POSA (*e.g.*, incorporating prestored correction data and newly calculated correction data were simple and straightforward modifications well within a POSA’s skillset). Thus, combining elements from Iwasawa’s embodiments would have been a “predictable variation” that would not “require a leap of inventiveness.” *Boston Sci.*, 554 F.3d at 991; Ex-1003 ¶¶84.

Memory Storage Sub-System. A POSA would have been motivated to incorporate memory card 609 of Figure 6 into Figure 2’s IID. Ex-1003 ¶¶85-93.

A POSA understood video signal output 211 generated by the DSP 210 would inherently need to be stored, *e.g.*, to allow for retrieval of such data from the IID. Iwasawa teaches that storage of a processed digital imaging signal was part of

conventional IID systems. Ex-1005 ¶2. Iwasawa further discloses that the problems identified in conventional IIDs, specifically the requirement to change the reference voltage output from A/D converter 604 and wait for stabilization of the A/D convertor 604, is solved by introducing multiplier 209 to apply corrections to the digital signal output of A/D convertor 204. *Id.* ¶7. The DSP 605 and the DSP 210 are each configured to synchronize a digital imaging signal initially obtained from a CCD to output an imaging signal obtained in digital signal processing. *Compare id.* ¶2 with ¶15, 21. Thus, A POSA would have understood that the output of DSP 210, like the output of DSP 605, would inherently be stored in a memory structure of some kind. Ex-1003 ¶87.

Even in embodiments of Iwasawa where the IID does not expressly depict a memory structure, a POSA had ample motivation to add one. Iwasawa provides express motivation for this modification, stating that memory card 609 is “for storing an imaging signal obtained in digital signal processing....” Ex-1005 ¶2. Iwasawa uses the same terms for DSP 605 and DSP 210 and each output a signal after signal processing, indicating that the output of each is an imaging signal obtained in digital signal processing for later in-camera storage. *See id.* ¶¶2, 21. Without storage, commercial desirability of Iwasawa’s camera would have been reduced, as consumers in the time period desired captured videos to be available for later viewing, not for ephemeral purposes. This further confirms the motivation to

include a memory structure for storing corrected video files in Iwasawa (to the extent this was not already inherent). Ex-1003 ¶¶88-89.

Further, in addition to Iwasawa's express motivation for combining its embodiments, modifying Figure 2's IID to include memory card 609 would have been a combination of prior art elements (*e.g.*, Figure 2 and memory card 609) according to known methods (including a memory card for image and video storage) to yield predictable results (*e.g.*, memory card configured to store an imaging signal obtained from in digital signal processing). Ex-1003 ¶90. As noted above, the output of each of the DSPs 605, 210 is an imaging signal and a POSA understood the output of DSP 210 could be stored in memory card 609. *Id.* ¶91.

The embodiments of Iwasawa are combinable for the reasons provided earlier, as a POSA would have had a reasonable expectation of success in combining embodiments, and the combination is well within the skill level of a POSA (*e.g.*, incorporating prestored correction data and adding a memory card were simple and straightforward modifications well within a POSA's skillset). *Id.* ¶93. Such modification would have been a "predictable variation" that would not "require a leap of inventiveness." *Boston Sci.*, 554 F.3d at 991; Ex-1003 ¶¶71-93.

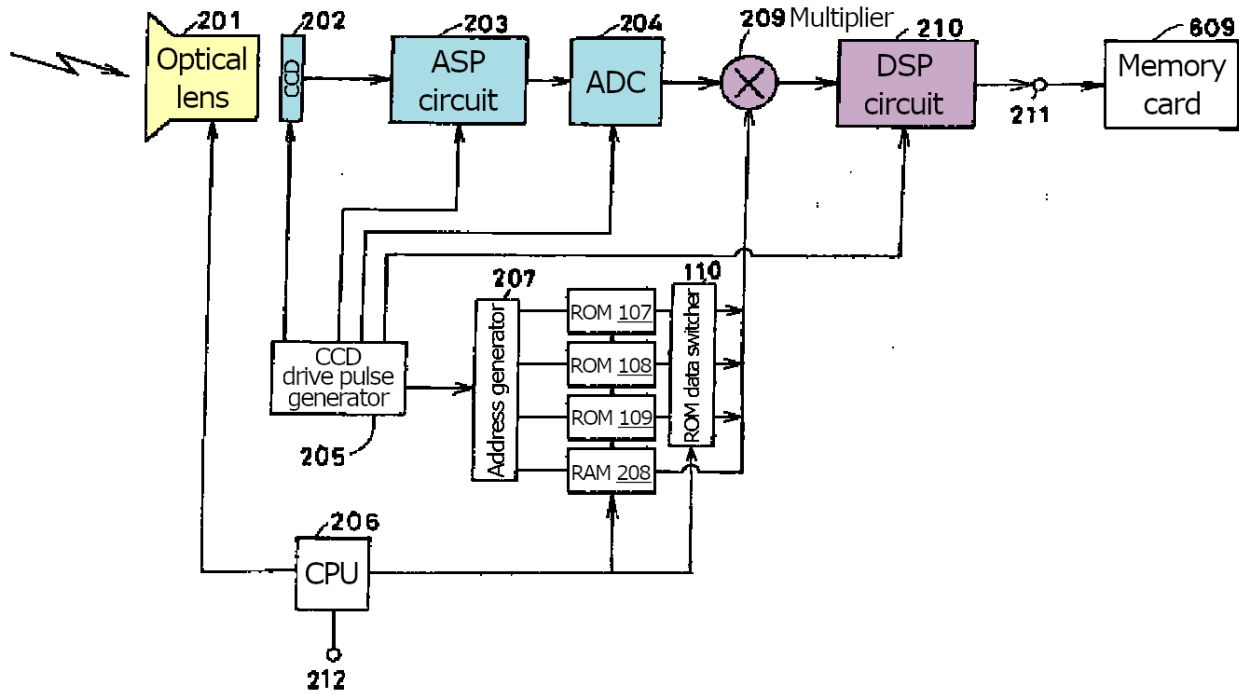
4.1.3 Claim 1

4.1.3.1 Element 1[pre]

Element 1[pre] recites a “digital imaging system” with a non-limiting intended use of “for correcting optical image aberrations in a digital video.”²

Iwasawa teaches a “digital imaging system” with its embodiments of “an image input device... such as an electronic still camera or a video camera.” Ex-1005 ¶1. Iwasawa includes optical lens 201 (yellow), charge-coupled device (CCD) 202, which operates in conjunction with an analog signal processing (ASP) circuit 203 and A/D convertor 204, (blue) for producing an imaging signal, and multiplier 209 and DSP 210 (purple) for performing correction on the imaging signal and generating video output signal 211. *Id.* ¶19-21.

² “Optical image aberrations” is non-limiting because the body of claim 1 does not rely on it for antecedent basis. Claim 1 requires correction of only “*at least one* optical image aberration.” Ex-1001, claim 1 (emphasis added).



Combined IID.

Even if some portion of the non-limiting intended use is found limiting, Iwasawa renders it obvious. Iwasawa corrects optical image aberrations by correcting shading characteristics (e.g., vignetting) for different lenses, aperture values, and zoom levels. Iwasawa discloses “a shading correction method of an [IID] for correcting shading characteristics of [a] lens.” *Id.* ¶¶1, 16, 19. In Iwasawa, correction of shading characteristics includes correction of a decrease in the amount of light input through an optical lens in the digital sensor closer to the edges of the lens (e.g., farther away from the center of the lens). Ex-1005 ¶4. A decrease in light farther away from a center of a lens is known as vignetting. Ex-1003 ¶97.

Iwasawa teaches that correction of shading characteristics is based on lens parameters, with correction data being selected for a particular aperture value, zoom position, and lens type. Ex-1005 ¶7. A lens having an adjustable aperture value and/or an adjustable zoom position would have different vignetting at each adjustment of the aperture value and/or zoom position. Ex-1003 ¶99. Thus, Iwasawa discloses multiple aberrations in the form of vignetting at each pairing of aperture and zoom value for a single lens.

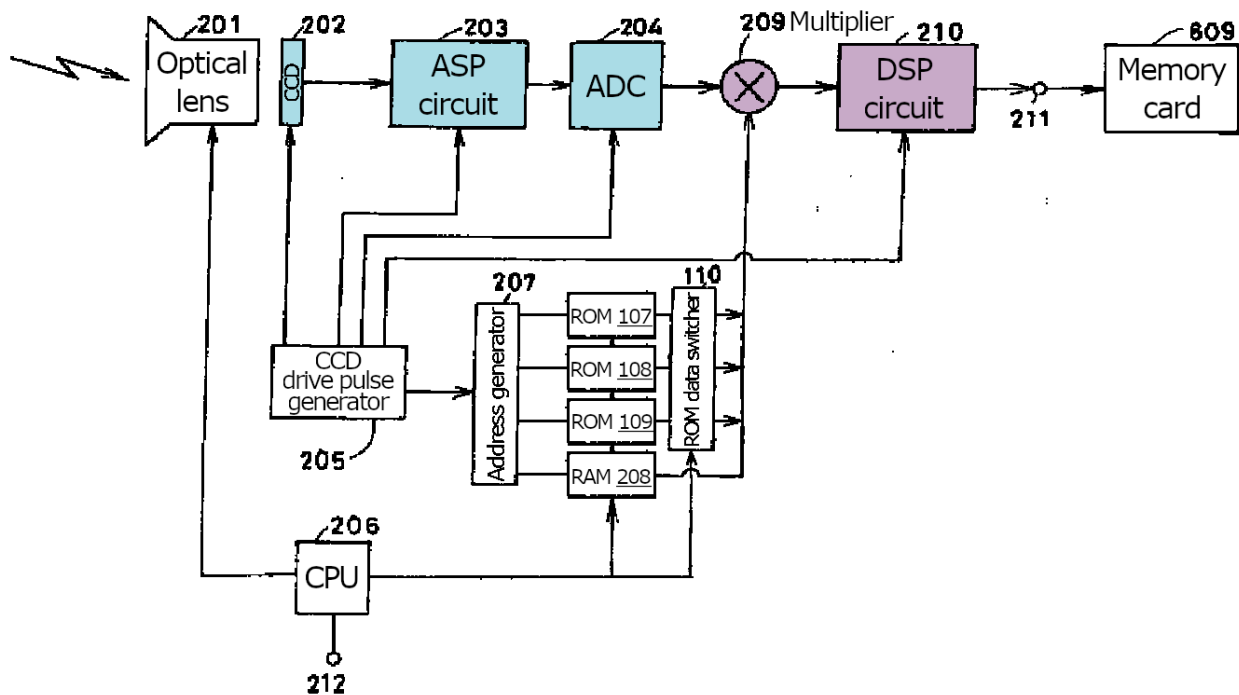
Iwasawa further teaches that correction data is selected based on a lens type. Ex-1005 ¶7. A POSA understood the lens type signal indicated that different, interchangeable, lenses may be used. Ex-1003 ¶100. Each of the different lenses would have different shading characteristics, such as different vignetting. *Id.* Thus, Iwasawa discloses multiple aberrations in the form of vignetting for aperture and zoom values for each of the interchangeable lenses.

Thus, Iwasawa renders obvious “[a] digital imaging system [IID] for correcting optical image aberrations [vignetting at different aperture and zoom pairings and for different lenses] in a digital video [imaging signal].” Ex-1003 ¶¶94-104.

4.1.3.2 Element 1[a]

Iwasawa teaches or suggests 1[a].

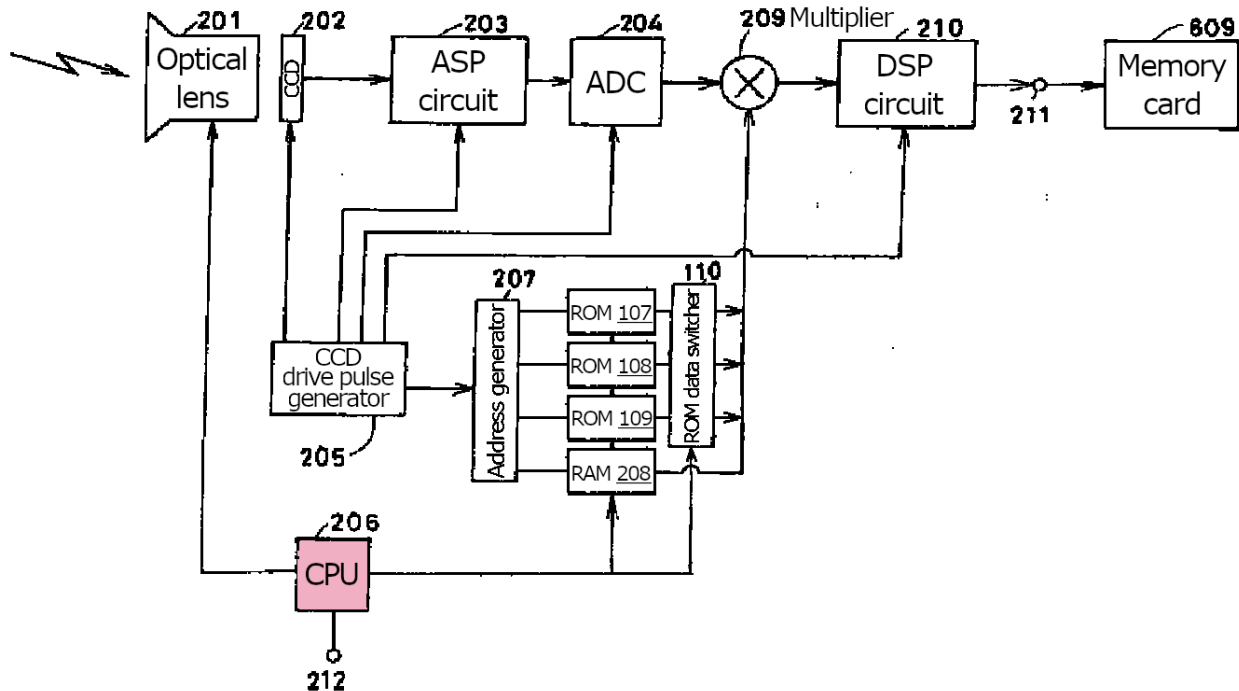
Digital Video Camera. Iwasawa “relates to an image input device having an optical system lens such as... a video camera.” Ex-1005 ¶1. After performing shading correction, the digital imaging signal is provided to DSP 210, which synchronizes different color signals in the digital imaging signal to generate video signal output 211. *Id.* Iwasawa discloses that color synchronization generates “a video signal that can be used in video or the like...” *Id.* ¶24.



Combined IID.

In-Camera Software. Iwasawa includes CPU 206 that has programs for performing certain camera functions, such as obtaining correction data or executing a program corresponding to the scene of a subject. Ex-1005 ¶¶19-21. CPU 206 is

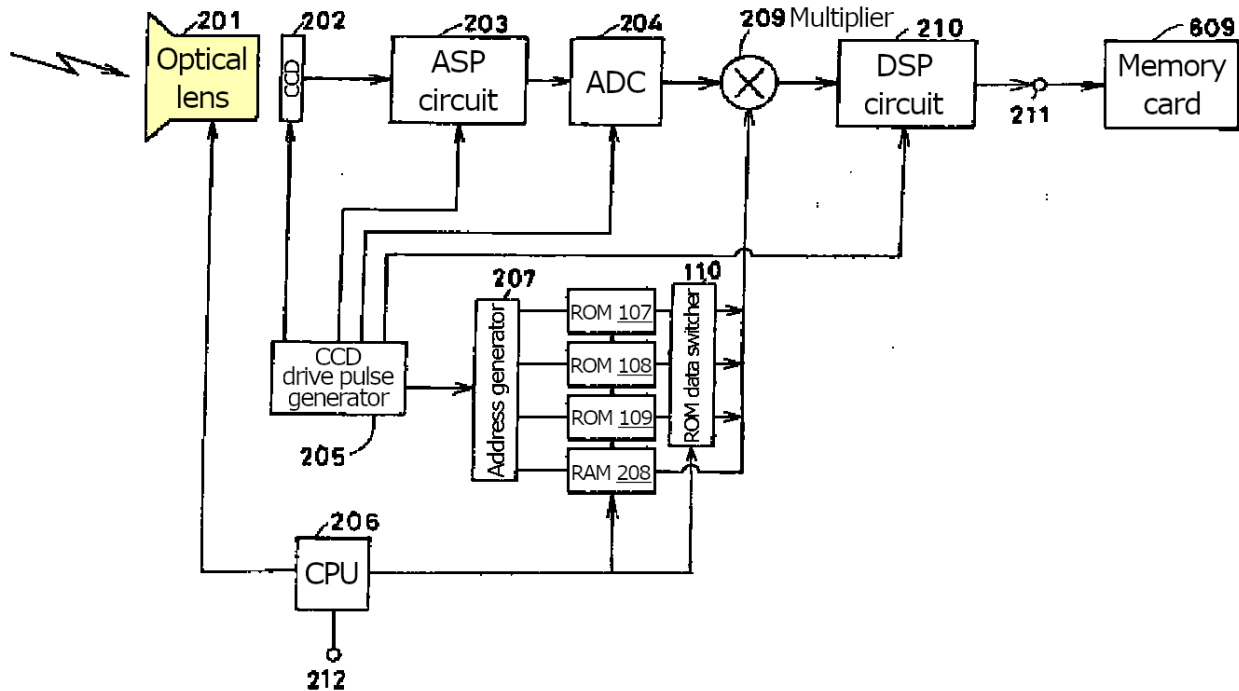
located within the camera, and a POSA would have understood that processing performed by a CPU within Iwasawa is performed in-camera. Ex-1003 ¶108.



Combined IID.

The programs (understood by a POSA as software/machine-readable instructions) implemented by CPU 206 may be input from an outside source using program input 212. Ex-1005 ¶19. Thus, a POSA would have understood the programs implemented by CPU 206 to be in-camera software. Ex-1003 ¶109.

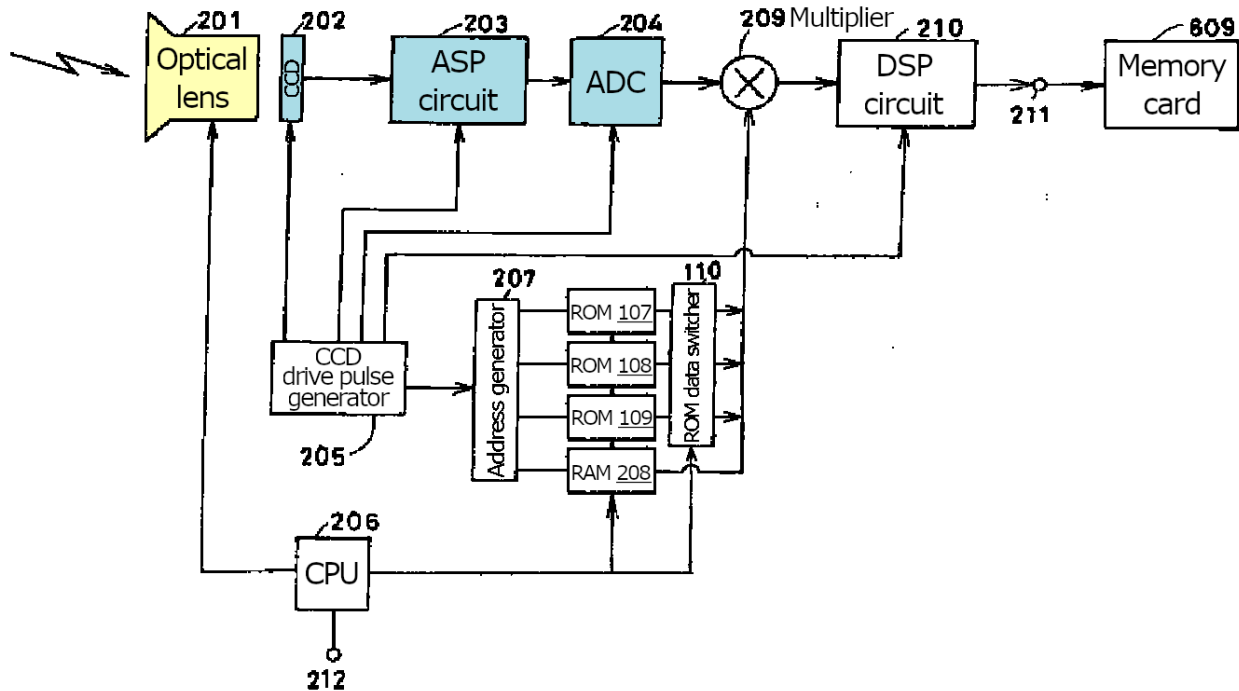
Optical Lens Mechanism. Iwasawa includes optical lens 201 “capable of outputting one or more control signals of an aperture value, a zoom position, and a lens type.” Ex-1005 ¶¶15, 21.



Combined IID.

To output a control signal, optical lens 201 must include one or more components for generating the control signal, and a POSA understood the additional elements constituted a mechanism. Ex-1003 ¶111. Notably, the '685 Patent does not use the phrase “optical lens mechanism” outside of the claims and the only example in the '685 Patent is optical lens 110, just like what Iwasawa teaches for its optical lens 201. *Id.*

A Digital Sensor. Iwasawa includes CCD 202, “a plate type imaging element wherein photoelectric conversion elements for performing photoelectric conversion are arranged in two dimensions and color filters of different colors are arranged on the photoelectric conversion elements....” Ex-1005 ¶¶15, 21.



Combined IID.

The '685 Patent identifies a CCD as a type of digital sensor, thus confirming that Iwasawa's CCD is a digital sensor. *See, e.g.*, Ex-1001, 18:12-15, 35:21-26. To the extent the digital sensor outputs a digital signal, a POSA understood CCD 202, ASP 203, and A/D convertor 204 collectively generate a digital signal to capture the digital video. Ex-1003 ¶113.

Integrated Circuit. Iwasawa includes multiplier 209 and DSP 210 that together receive correction data and process the digital imaging signal (*e.g.*, apply shading correction) to output a corrected video signal. Ex-1005 ¶17. Multiplier 209 is a calculation means for applying a correction operation. *Id.* ¶¶16, 22.

Multiplier 209 applies correction data (*e.g.*, filtration) to correct shading characteristics (*e.g.*, optical aberrations) from a lens. Although Iwasawa labels

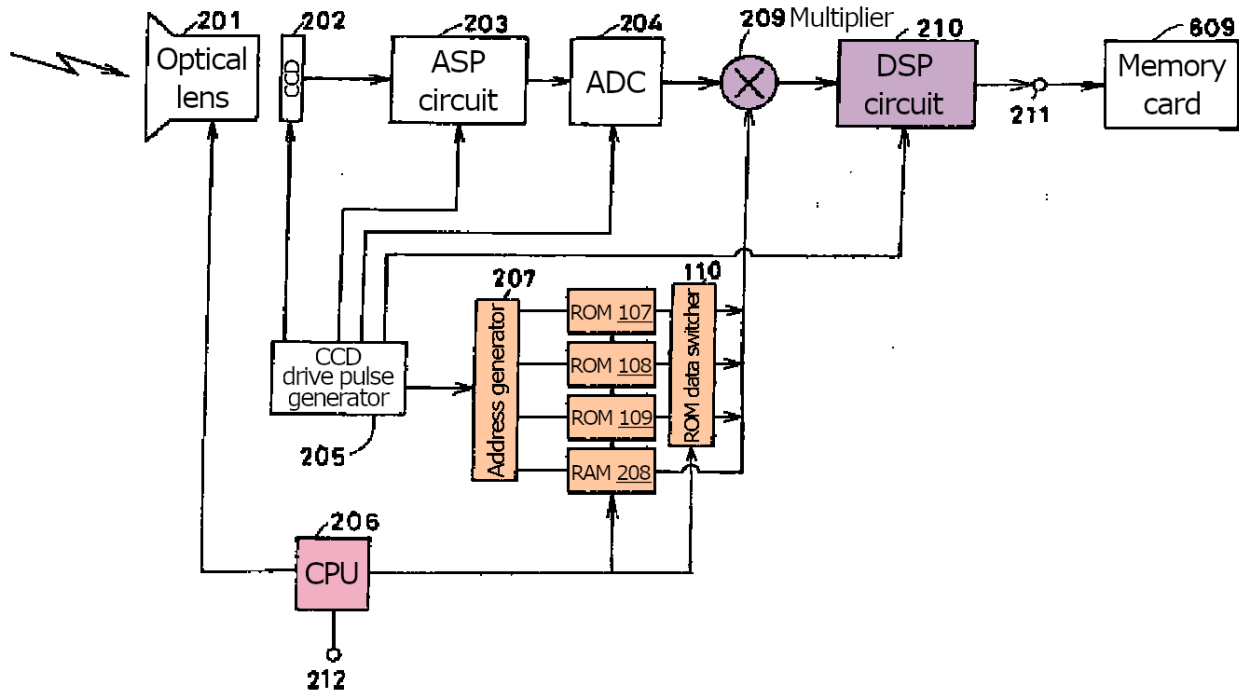
element 210 as “digital signal processing” in the figures, multiplier 209 performs shading correction, and therefore teaches or suggests, either on its own or in conjunction with DSP 210, the “digital signal processor” of claim 1. Ex-1003 ¶115. Multiplier 209 and DSP 210 collectively correct digital input data and output an encoded output video signal by synchronizing color signals in a corrected digital image signal. Ex-1005 ¶¶15, 21.

Further, it was an obvious design choice to implement Iwasawa’s multiplier 209, DSP 210, and CPU 206 on an integrated circuit, as integrating these components in this manner was routine and straightforward in this time period. Ex-1003 ¶117. Below, various references are made to “multiplier 209, alone or with DSP 210,” and this refers to three design-choice options: (i) multiplier 209 alone, (ii) multiplier 209 and DSP 210 as arranged in the Combined IID, and (iii) multiplier 209, DSP 210, and CPU 206 as an integrated circuit.

The integrated circuit of Iwasawa (*i.e.*, multiplier 209, alone or with DSP 210) receives prestored correction data, either from RAM 208 or one of ROMs 107-109. Ex-1005 ¶¶16, 19. The data storage elements (RAM 208 or ROMs 107-109) store correction data for corresponding aperture value, zoom value, and lens types that is selected based on control signals from the optical lens 201. *Id.* ROMS 107-109 and/or RAM 208 storing correction data is an organized collection of data, *e.g.*, a database. For example, a POSA understood data stored in RAM 208 would be

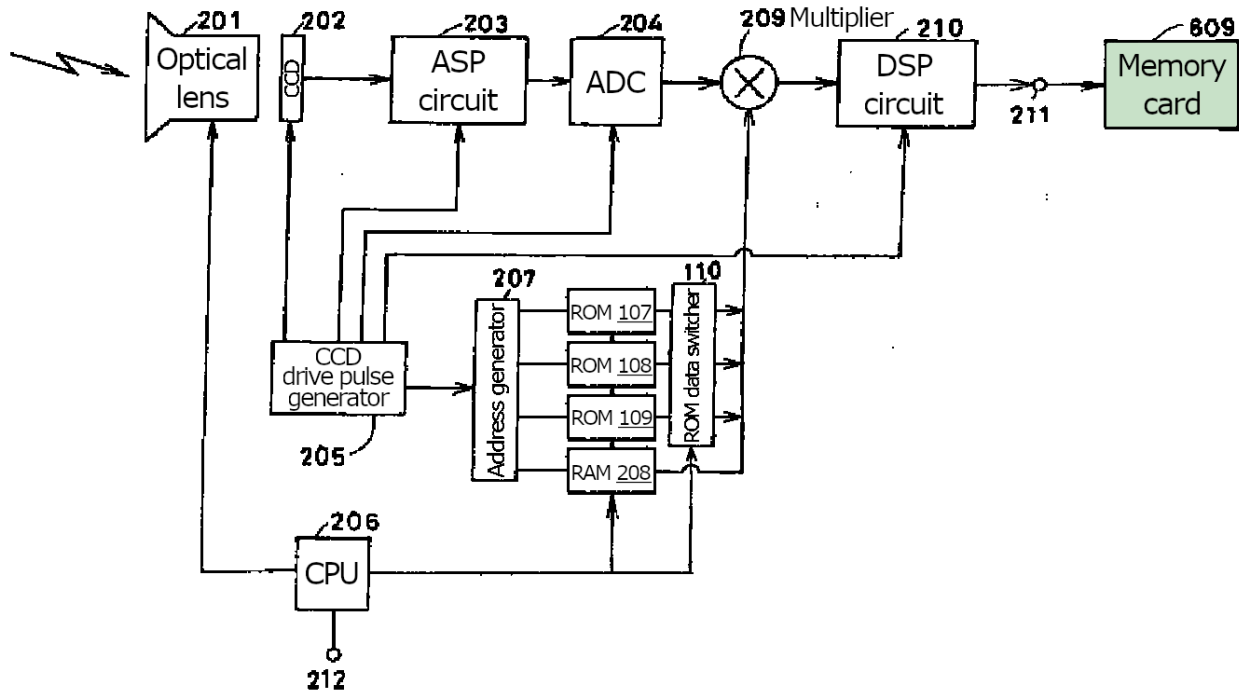
addressable based on RAM addresses, and therefore would be a database. Ex-1003 ¶120. Similarly, a POSA understood data stored in ROMs 107-109 would be organized based on addressable ROMs 107-109. *Id.* At a minimum, it would have been obvious to implement Iwasawa's data storage and retrieval using a database and database management system. *Id.* ¶120.

Iwasawa includes CPU 206, which alone or in conjunction with ROM data switcher 110, provides a controller for accessing RAM 208 and/or ROMs 107-109, *i.e.*, provides a database management system for accessing the database of RAM 208 and/or ROMs 107-109. Ex-1003 ¶121. In Iwasawa, the control signal from optical lens 201 identifies lens, aperture, and zoom values that would be used by CPU 206 to select the corresponding memory location having the appropriate correction data. *Id.*



Combined IID

Memory Storage Sub-System. As explained above, a POSA would have known that Iwasawa necessarily included a memory storage sub-system, and, further, would have been motivated to incorporate memory card 609 with a reasonable expectation of success. §4.1.2.



Combined IID.

Thus, Iwasawa renders obvious “a digital video camera [IID] including in-camera software [programs executed by CPU], an optical lens mechanism [optical lens 201], at least one digital sensor [CCD 202] for capturing the digital video [imaging signals], an integrated circuit including[] a digital signal processor [multiplier 209, alone or with DSP 210] configured to access a database management system [CPU 206 configured to select RAM/ROM containing corresponding correction data] including a plurality of optical image aberration corrections [correction data with corrections for aberrations], and a memory storage sub-system [necessary memory in Iwasawa, memory card 609, or both].” Ex-1003 ¶¶105-25.

4.1.3.3 Element 1[b]

1[b] presents alternative options, so disclosing one of a zoom lens or a fixed focal lens meets this element.

Iwasawa teaches 1[b] by selecting correction data based on control signals generated by an optical lens such that “shading correction of an optimal imaging optical system is automatically performed even when the aperture value, the zoom position, and the lens type of the optical lens are changed.” Ex-1005 ¶8. Similarly, the recording means of Iwasawa “stores shading correction data corresponding to one or more conditions of the aperture value, zoom position, and lens type of the optical lens.” *Id.* ¶12. A POSA understood that an optical lens capable of changing a zoom position is a zoom lens. Ex-1003 ¶128. Additionally, a POSA understood that Iwasawa supported interchangeable lenses (§4.1.3.1) and that interchangeable lenses would include fixed focal length lenses. Ex-1003 ¶129.

Thus, Iwasawa renders obvious “wherein the optical lens mechanism [optical lens 201] is a zoom lens [lens capable of changing zoom position] or a fixed focal lens [interchangeable, fixed focal length lens].” *Id.* ¶¶126-33.

4.1.3.4 Element 1[c]

Iwasawa teaches or suggests 1[c].

Iwasawa uses CPU 206 to identify the correction data to be applied to the received image signal. Ex-1003 ¶136. In Iwasawa, multiplier 209 receives

correction data from a database (RAM 208, ROMs 107-109) selected by CPU 206 and its programs (in-camera software) based on the control signal from optical lens 201. *Id.* For example, CPU 206 receives a control signal from optical lens 201 indicating aperture, zoom, and type and identifies the appropriate correction data based on the control signal. Ex-1005 ¶19.

In Iwasawa, a CPU configured to receive a control signal and select correction data for corresponding aperture value, zoom position, and lens type is identifying the at least one optical image aberration that is corrected by the selected correction data. *Id.* Similarly, a CPU configured to select correction data for each of three color channels is identifying the at least one optical image aberration that is present within the corresponding color channel. *Id.*

Turning to aberration correction, Iwasawa receives correction data identified by CPU 206 and uses that data to correct corresponding shading characteristics in the received image signal—thereby correcting for aberrations such as vignetting (*see* §4.1.3.1). Ex-1005 ¶21.

As discussed above, Iwasawa captures an image input and generates video output signal 211. *See* §4.1.3.2. To generate a video signal, the image signal would necessarily include at least one frame of a digital video. Ex-1003 ¶138. Shading correction is applied to the digital image signal and, therefore, would be applied to each frame in the image signal. *Id.*; Ex-1005 ¶16.

Thus, Iwasawa renders obvious “wherein the integrated circuit [CPU 206 and multiplier 209, alone or with DSP 210] uses the in-camera software [programs executed by the CPU 206] to identify at least one optical image aberration [shading characteristics including vignetting] and to correct the at least one optical image aberration in at least one frame of the digital video [image signal] using at least one of the plurality of optical image aberration corrections [correction data provided by the CPU 206 to the multiplier 209] in the database [RAM and/or ROMs storing correction data].” Ex-1003 ¶¶134-40.

4.1.3.5 Element 1[d]

Iwasawa teaches or suggests 1[d].³

Iwasawa’s CCD 202 generates an imaging signal that is provided to analog signal processing circuit 203 for sampling and amplification and is converted to a digital signal by A/D convertor 204. Ex-1005 ¶21. The output signal from A/D convertor 204 is provided to (*i.e.*, forwarded to) multiplier 209 and DSP 210. *Id.*

Patent Owner has previously asserted that “[t]he data collected by the sensor [*e.g.*, CCD] must necessarily be forwarded to the image processor in order to process the image.” Ex-1013 ¶79. Therefore, according to Patent Owner, the video

³ For this proceeding, Petitioners understand antecedent-less “the video” to refer to “digital video” of 1[a].

collected by CCD 202 of Iwasawa must necessarily be forwarded to multiplier 209 to process the image.

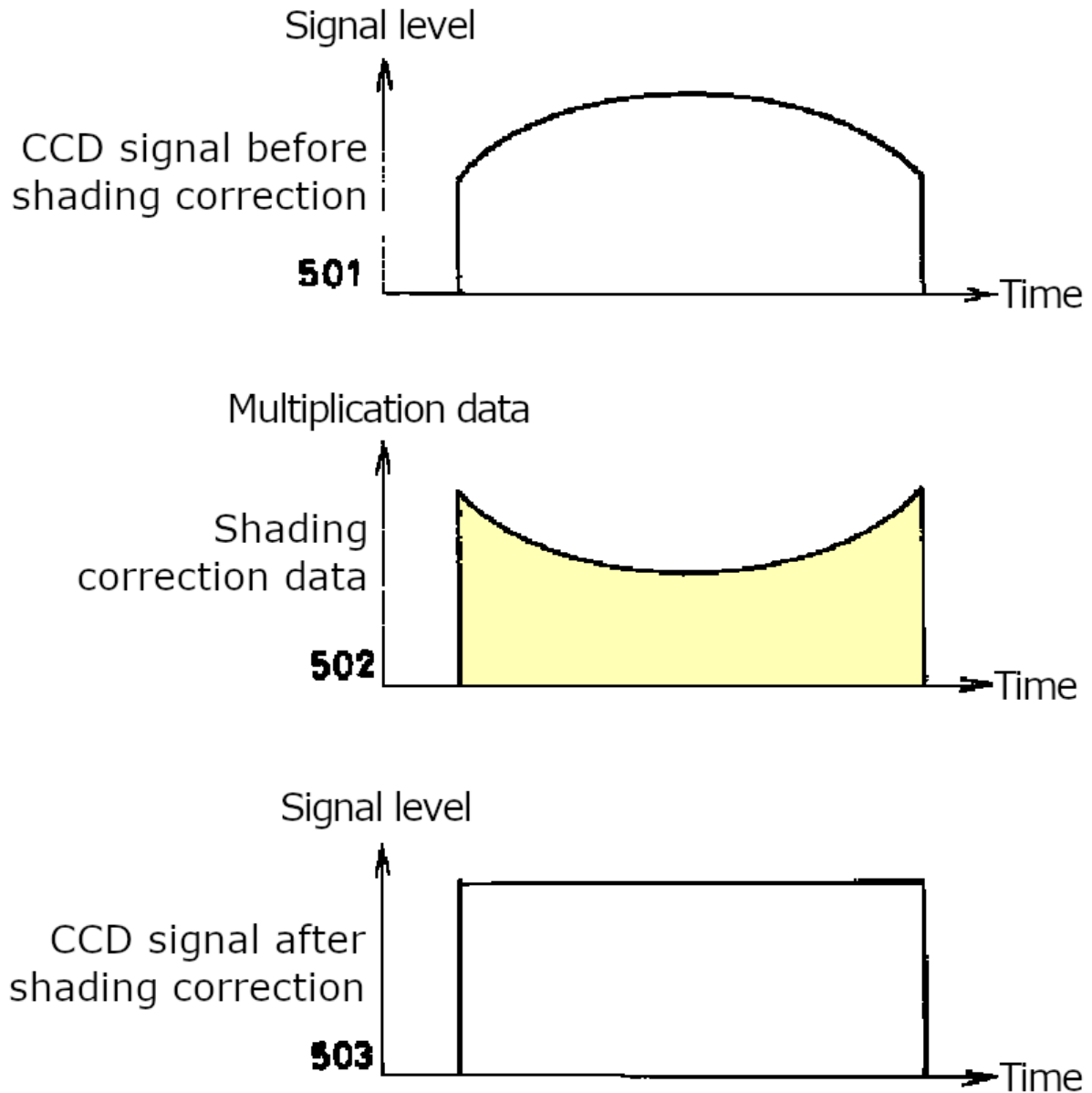
Thus, Iwasawa renders obvious “wherein the video [image signal] is captured by the at least one digital sensor [CCD 202] and is forwarded to the digital signal processor [multiplier 209, alone or with DSP 210].” Ex-1003 ¶¶141-45.

4.1.3.6 Element 1[e]

Iwasawa teaches or suggests 1[e].⁴

Iwasawa corrects the image signal generated by CCD 202 and A/D convertor 204 by applying correction data. Ex-1005 ¶20. Multiplier 209 applies shading correction to the digital image signal generated by CCD 202 and A/D convertor 204 to correct aberrations (*e.g.*, vignetting). *Id.* The ’685 Patent recognizes correction of vignetting as digital filtration. *See* Ex-1001, 9:55-10:37 (referring to vignetting correction as digital application of a “center-neutral density filter to compensate for the light fall-off on the edges.”). Similarly, Iwasawa applies correction data 502 to correct vignetting by filtering the video image file. *See* Ex-1005, fig. 5.

⁴ For this proceeding, Petitioners understand “the video image file” to refer to “digital video” of 1[a].



Iwasawa, fig. 5.

Thus, Iwasawa renders obvious “wherein the video image file [image signal] with the at least one optical image aberration [*e.g.*, vignetting] is corrected by applying digital filtration [using correction data to correct vignetting] using the

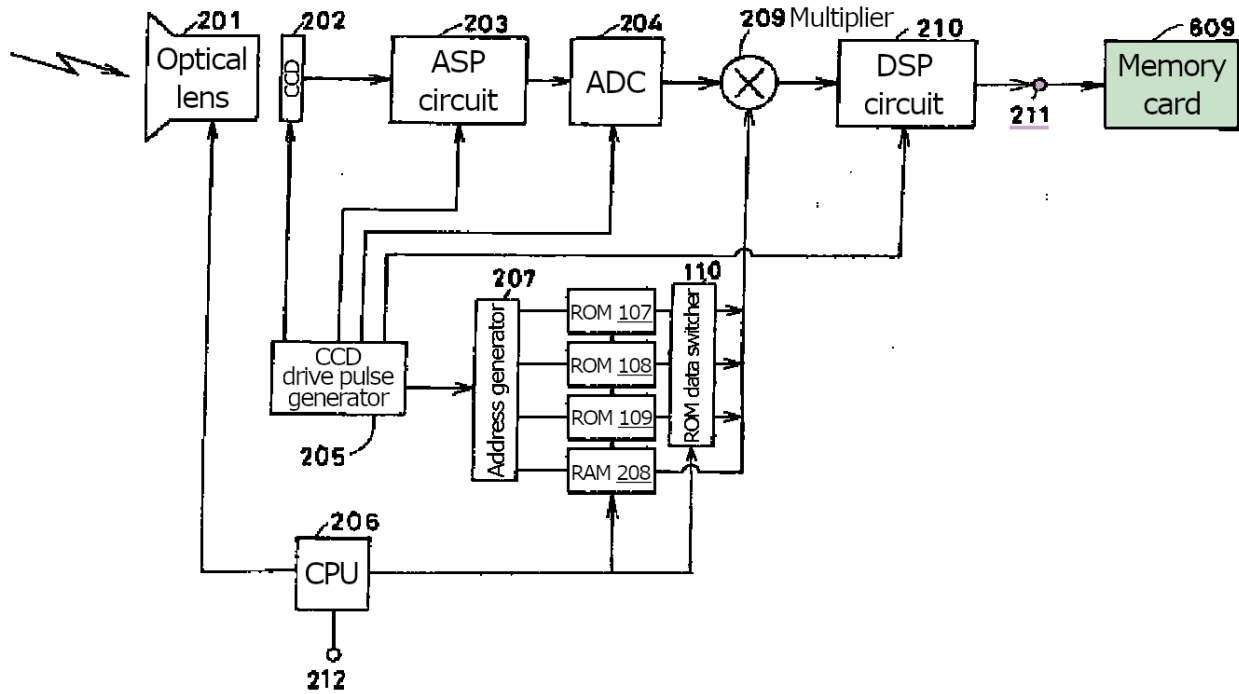
digital signal processor [multiplier 209, alone or with DSP 210].” Ex-1003 ¶¶146-49.

4.1.3.7 Element 1[f]

Iwasawa teaches or suggests 1[f].⁵

As discussed above, Iwasawa generates a corrected image signal by applying selected correction data that corrects corresponding shading characteristics (*i.e.*, optical image aberrations) in the image signal. §4.1.3.4. Iwasawa teaches that correction of shading characteristics optimizes the image signal, selecting “optimal shading correction data” based on a control signal from the optical lens. Ex-1005 ¶16. Memory card 609 provides for storage of the corrected image signal in the memory storage sub-system, *e.g.*, storage of output video signal 211. Ex-1003 ¶152. Iwasawa stores the corrected image signal, *i.e.*, the corrected video consisting of the digital data optimized from the at least one optical image aberration.

⁵ For purposes of this proceeding, Petitioners understand “**the** original video image” to be the output of the digital sensor (*e.g.*, digital video) and “**the corrected video** consisting of **the** digital data optimized from the at least one optical image aberration” to be the digital video with aberration corrections applied thereto.



Combined IID.

Thus, Iwasawa renders obvious “wherein the corrected video [video signal output 211] consisting of the digital data optimized [image signal with shading correction applied] from the at least one optical image aberration [vignetting] that are corrected from the original video image [image signal] is stored in the memory storage sub-system [inherent memory, memory card 609, or both].” Ex-1003 ¶¶150-53.

4.1.4 Claim 3

Claim 3 depends from claim 1, which Iwasawa renders obvious. §4.1.3. Iwasawa further teaches or suggests the additional elements of claim 3. Ex-1003 ¶¶154-71.

4.1.4.1 Element 3[a]

As explained above, Iwasawa discloses “wherein the optical image aberration is vignetting.” §4.1.3.1.

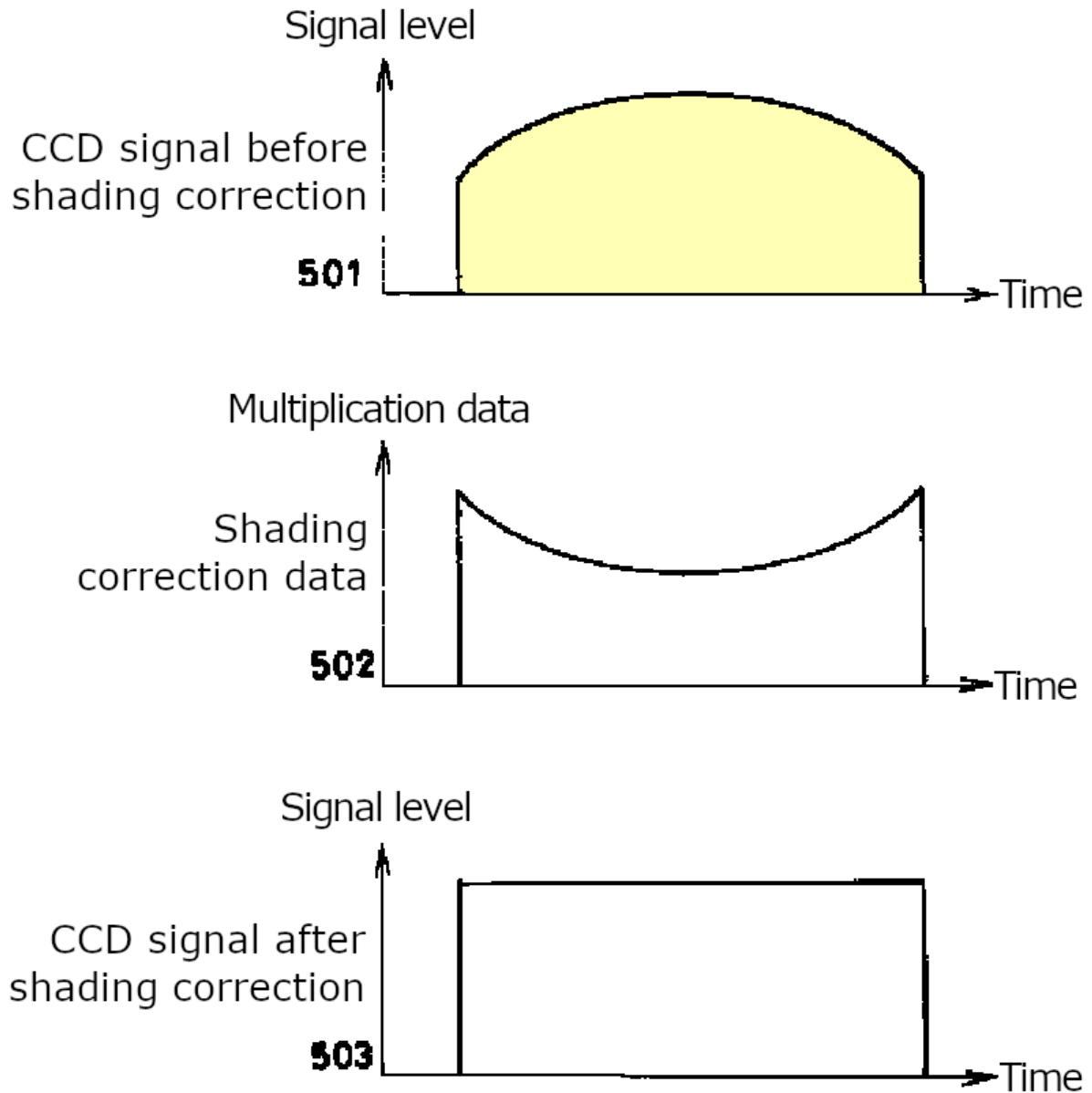
4.1.4.2 Element 3[b]

Iwasawa teaches or suggests 3[b].

This claim element is written in the alternative, requiring application of only one of various potential sub-elements.⁶

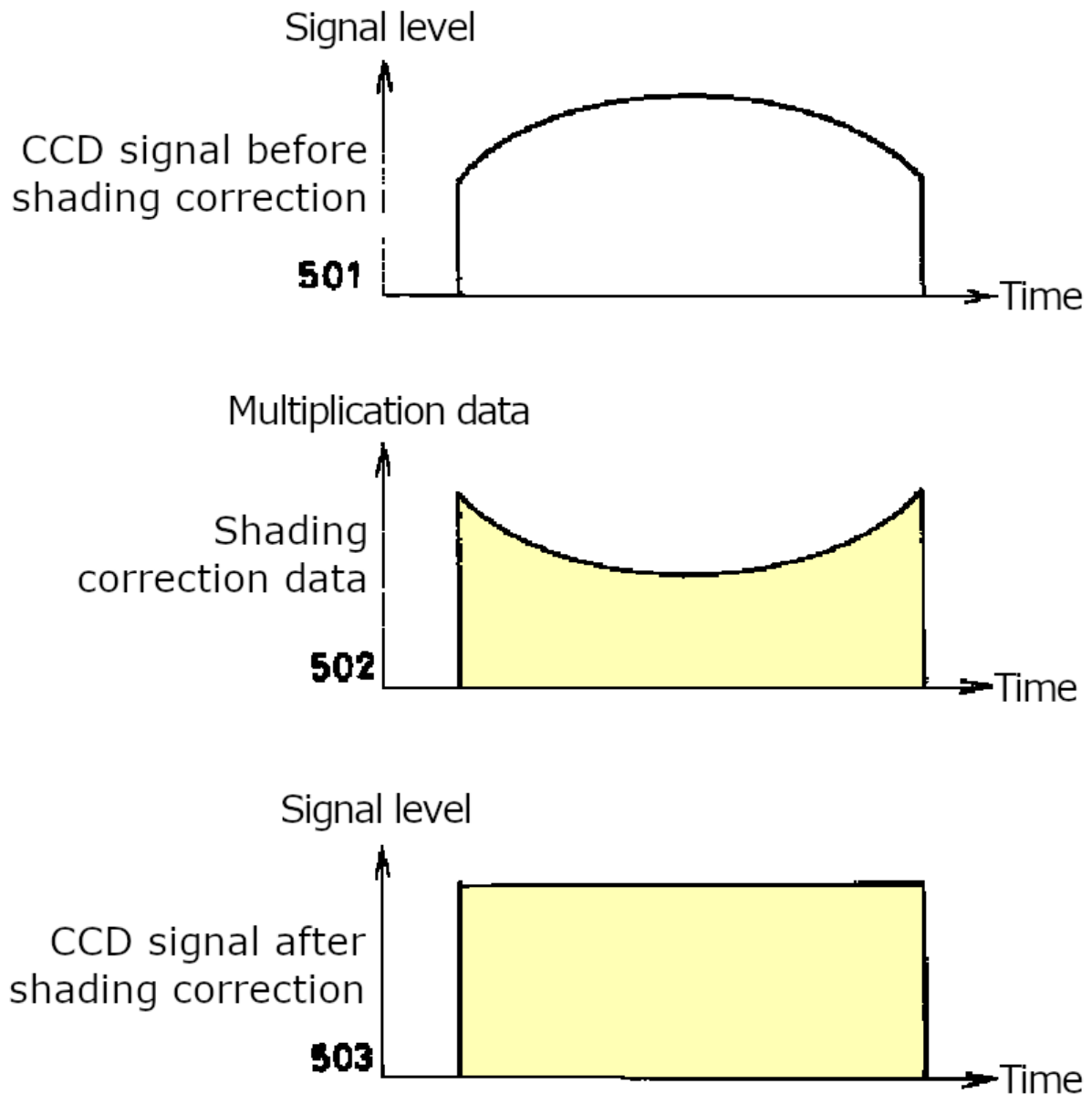
Iwasawa’s imaging signal from CCD 202 is a “point sequential signal of different color signals such as an R-G line 402 and a G-B line 403 for each line.” Ex-1005 ¶24. CCD 202 includes a grid of photoelectric conversion elements with corresponding color filters that are transferred (*e.g.*, read out) through a vertical CCD to a horizontal CCD and output by an output amplifier. *Id.* ¶23. Prior to shading correction, the output of CCD 202 will have higher values near a center and lower values at a beginning and end of the signal, for example as illustrated in figure 5 of Iwasawa:

⁶ For purposes of this proceeding, “the comers” is treated as “corners,” and “the image” is understood to refer to “at least one frame of the digital video.”



Ex-1005, fig. 5. The beginning and end of the image signal represent values for photoelectric conversion elements located at the periphery of the CCD that correspond to locations farther from the center of optical lens 201. Ex-1003 ¶161; *see also* Ex-1005 ¶¶17, 24-25.

Correction data, such as correction data 502, has higher values at the beginning and end of the correction data and a lower value at a mid-point. Ex-1005, fig. 5. When correction data is applied to the CCD signal, a substantially parallel corrected CCD signal is generated:



Id. The higher values at the beginning and end of the correction data result in a lightening of the image signal at the beginning and ending, corresponding to the edge positions of the lens. Ex-1003 ¶163.

The correction data and application thereof by multiplier 209 is an algorithm. *Id.* The correction data is a sequential set of values that are applied to the CCD signal sequentially to generate the output corrected CCD signal. Ex-1005, fig. 5. Further, a POSA understood that an integrated circuit was capable of implementing algorithms. Ex-1003 ¶165.

Thus, Iwasawa renders obvious “wherein the digital signal processor [multiplier 209, alone or with DSP 210] applies an algorithm [correction data and application thereof by multiplier 209] to lighten the corners of the image.” Ex-1003 ¶¶157-66.

4.1.4.3 Element 3[c]

Iwasawa teaches or suggests 3[c].⁷

As discussed above, Iwasawa discloses correction of vignetting. §4.1.4.1. Iwasawa further discloses that “optimal shading correction data” is selected based on a control signal from optical lens 201. Ex-1005 ¶16. Iwasawa provides “an

⁷ For this proceeding, Petitioners understand “the image exposure” to refer to “at least one frame of the digital video.”

optimal imaging optical system” that performs correction automatically based on the aperture value, zoom position, and lens type of the optical lens. *Id.* ¶8. The correction data is applied to the CCD image signal to generate a substantially parallel corrected CCD signal, *i.e.*, optimized image exposure that corrects shading characteristics (*i.e.*, vignetting). *Id.*, fig. 5.

Thus, Iwasawa renders obvious “wherein the image exposure [image signal] is optimized to correct the vignetting.” Ex-1003 ¶¶167-71.

4.1.5 Claim 6

4.1.5.1 Elements 6[pre]-6[b]

Iwasawa teaches or suggests 6[pre]-6[b] for reasons provided above as to analogous elements of claim 1. *See* §§4.1.3.1-4.1.3.3; Ex-1003 ¶¶175-80.

4.1.5.2 Element 6[c]

Iwasawa teaches or suggests 6[c].

As discussed above, Iwasawa renders obvious storing the corrected video in memory. §4.1.3.7. A POSA likewise would have found it obvious to store the video in memory prior to correcting it as the video would inherently need to be stored somewhere between capture and correction. Ex-1003 ¶183. This memory could be the memory card 609 discussed above or other, more transitory memory (*e.g.*, RAM 209). *Id.*

Thus, Iwasawa renders obvious “wherein the video is forwarded to storage in memory [memory card 609, RAM 209, or other inherent memory].” *Id.* ¶¶181-84.

4.1.5.3 Element 6[d]

Iwasawa teaches or suggests 6[d].

As discussed above, Iwasawa discloses “at least one optical aberration... of the digital video are identified using the in-camera software and the integrated circuit.” §4.1.3.4.

Iwasawa teaches identifying at least one optical aberration (*e.g.*, the same aberration) **in at least two frames** of a digital video. Iwasawa generates video signal output 211 based on a corrected digital image signal received from A/D convertor 204. Ex-1005 ¶15, 22. Digital video includes multiple frames. Ex-1003 ¶188. A video obtained at a constant aperture value, zoom position, and lens type would have at least two frames that each have the same shading characteristics, *i.e.*, the same optical aberrations. *Id.* Accordingly, after receiving the lens control signal for each frame in a video signal, Iwasawa’s IID would select prestored correction data containing corresponding correction data for each frame. *Id.*

Petitioners understand “at least one optical aberration in at least two frames of the digital video” to refer to correcting a same aberration in the at least two frames, which Iwasawa does, as discussed above. To the extent this language requires

correcting different aberrations in two frames, Iwasawa teaches that as well. Changes in aperture or zoom value during video capture would lead to different shading characteristics across different frames. *See* §4.1.3.1; *see also* Ex-1003 ¶190. Moreover, correcting aberrations in multiple frames is a mere duplication of Iwasawa’s correction for a single image frame, without any new or unexpected result. *Cisco Systems, Inc. et al v. Corrigent Corporation*, IPR2023-00169, Paper 42 at 51.

Thus, Iwasawa renders obvious “wherein at least one optical aberration [vignetting] in at least two frames of the digital video [image signal] are identified using the in-camera software and the integrated circuit [programs executed by CPU 206 and/or multiplier 209, alone or with DSP 210].” Ex-1003 ¶¶185-92.

4.1.5.4 Element 6[e]

Iwasawa teaches or suggests 6[e].

Iwasawa discloses “wherein at least one optical aberration from the optical lens mechanism... are corrected by using the digital signal processor to apply at least one digital filtration algorithm” for reasons explained above. §4.1.3.6. Doing this for at least two frames is also taught or suggested. Video signal output 211 is generated by correcting the image signal received from A/D convertor 204. Ex-1005 ¶15, 22. Where the image signal contains multiple frames, such as in a video signal (at a minimum necessarily), each frame would undergo shading correction before

being stored and therefore each frame of a video would undergo shading correction. Ex-1003 ¶195.

Thus, Iwasawa renders obvious “wherein the at least one optical aberration [vignetting] from the optical lens mechanism [optical lens 201] of at least two frames of the digital video [frames of image signal] are corrected by using the digital signal processor [multiplier 209, alone or with DSP 210] to apply at least one digital filtration algorithm [correction data and application thereof by multiplier 209].” Ex-1003 ¶¶193-96.

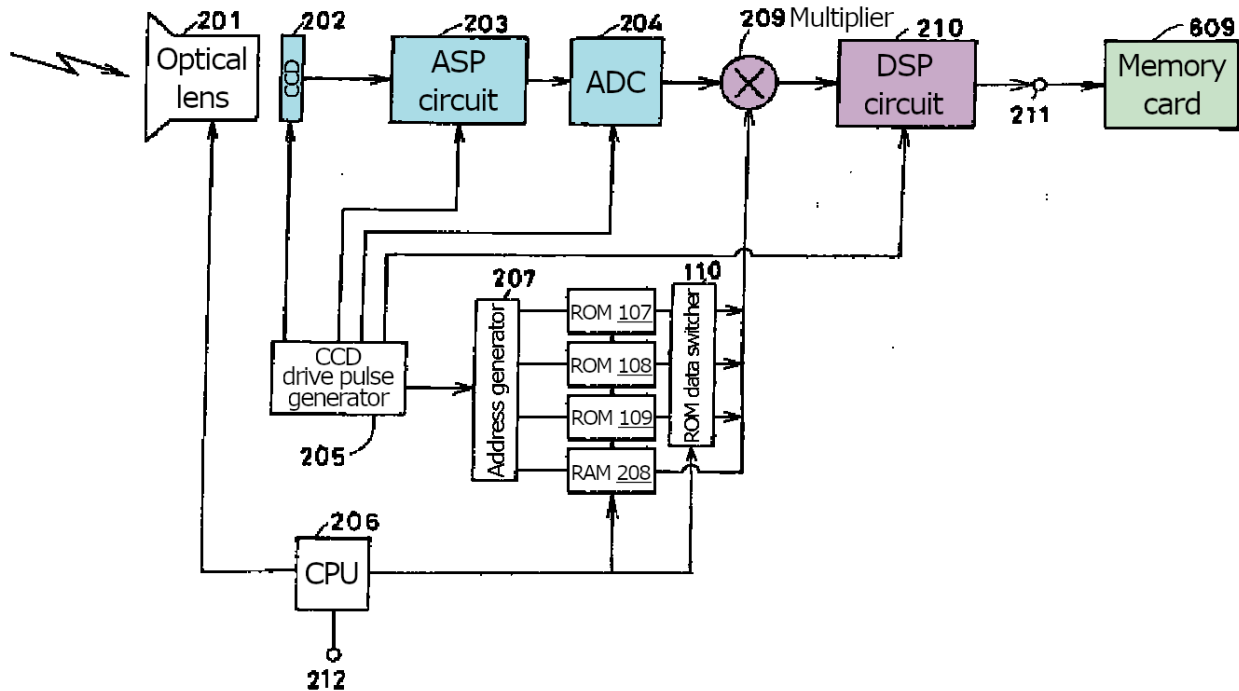
4.1.5.5 Element 6[f]

Iwasawa teaches or suggests 6[f]. *See* §4.1.3.7; Ex-1003 ¶¶197-199.

4.1.6 Claim 11

Claim 11 depends from claim 6, which Iwasawa renders obvious. §4.1.7. Iwasawa further teaches or suggests the additional elements of claim 11.

As discussed above, Iwasawa teaches filtering to correct at least one optical and/or digital aberration (*i.e.*, shading characteristics). §4.1.3.6. Multiplier 209 corrects the digital image signal prior to video signal output 211 being generated by DSP 210 (thus after capturing the image). Ex-1005 ¶21. Video signal output 211 is stored on memory card 609 after video signal output 211 is generated by DSP 210, and therefore after shading correction:



Combined IID.

Thus, Iwasawa renders obvious “wherein the digital video is filtered to correct at least one optical and/or digital aberration[] [e.g., vignetting corrected for Iwasawa’s image signal] after initial capture and before the digital video [video signal output] is initially sent to storage [memory card 609].” Ex-1003 ¶¶200-03.

4.1.7 Claim 12

Claim 12 depends from claim 6, which Iwasawa renders obvious. §4.1.7. Claim 12’s inclusion of “may” options does not limit the scope of claim 6. Regardless, as discussed above, it would have been obvious for a POSA to integrate multiplier 209, DSP 210, and CPU 206 on an integrated circuit. §4.1.3.1. A POSA would have understood such a circuit to be application-specific because it includes

circuitry specifically configured for aberration correction applications (*i.e.*, an ASIC). Ex-1003 ¶205. Moreover, a POSA would also have found it obvious to implement CPU 206 as a microprocessor in such an embodiment. *Id.* ¶206.

Thus, Iwasawa renders obvious “wherein the integrated circuit may be a microprocessor [CPU 206], an application specific integrated circuit [ASIC including multiplier 209] or a system on a chip.” Ex-1003 ¶¶204-09.

4.1.8 Claim 13

Claim 13 depends from claim 6, which Iwasawa renders obvious. §4.1.7. Beside recitations of “at least two image frames,” which Iwasawa teaches or suggests (§4.1.8.3), Claim 13 is otherwise analogous to claim 3 and is obvious for similar reasons. §4.1.5; Ex-1003 ¶210.

4.1.9 Claim 14

4.1.9.1 Elements 14[pre]-14[b]

Iwasawa teaches or suggests 14[pre]-14[b] for reasons provided above as to analogous elements of claim 1. *See* §§4.1.3.1-4.1.3.3; Ex-1003 ¶¶211-219.

4.1.9.2 Element 14[c]

Iwasawa teaches or suggests 14[c].

A zoom position of optical lens 201 of Iwasawa is changeable and outputs “control signals of an aperture value, a zoom position, and a lens type.” Ex-1005 ¶¶8, 15. The output zoom position of optical lens 201 corresponds to a selected

zoom position of a zoom lens, as without an adjustable zoom position (*e.g.*, for a fixed focal length lens), the lens type and aperture value would be sufficient to identify shading characteristics of a lens. Ex-1003 ¶222. The inclusion of a zoom position value in the control signal indicates that the zoom lens was capable of changing focal length positions during use, and therefore teaches or suggests this element. *Id.*

Thus, Iwasawa renders obvious “wherein the zoom lens [optical lens 201] changes focal length positions [zoom positions].” *Id.* ¶¶220-25.

4.1.9.3 Element 14[d]

Iwasawa teaches or suggests 14[d].

As discussed above, Iwasawa forwards digital video (image signal) to a DSP (multiplier 209, alone or with DSP 210). §4.1.3.5. Additionally, a POSA understood that image data, whether pre-correction or post-correction, would necessarily be stored in memory (*e.g.*, inherent memory or memory card 609). §4.1.3.7. To the extent “when” is not a typographical error, Iwasawa discloses obtaining correction data and correction of an image signal (the steps recited in elements 14[e]-14[f] below) occur “in response to an imaging signal read out from the CCD 202,” *e.g.*, when the image signal is read out. Ex-1005 ¶21.

Thus, Iwasawa renders obvious “wherein when the digital video is forwarded to the digital signal processor [multiplier 209, alone or with DSP 210]

and to memory [inherent memory, memory card 609, or both].” Ex-1003 ¶¶226-228.

4.1.9.4 Element 14[e]

Iwasawa teaches or suggests 14[e].

This element is substantially similar to element 1[c], with element 14[e] requiring identification occur “at any focal length of a zoom lens configuration.” Iwasawa discloses that correction data is obtained based on aperture value, zoom position, and lens type, and thus included correction data at any focal length of a corresponding lens. Ex-1005 ¶19. To the extent Iwasawa does not expressly disclose “any” zoom position, it would have been obvious to include correction data for any potential zoom position of a lens to allow correction at all functionalities of the lens. Ex-1003 ¶¶229-33.

4.1.9.5 Elements 14[f] and 14[g]

Iwasawa teaches or suggests 14[f] and 14[g].

These elements are substantially similar to elements 1[c] and 1[d]-1[f], respectively. Elements 14[f] and 14[g] differ slightly in that they recite “[a] filtration correction algorithm” (instead of an optical image aberration correction). Additionally, element 14[f] states that the algorithm is “forward[ed]... to the digital signal processor.” And element 14[g] indicates that the algorithm is “appl[ied]... to optimize the digital video.”

As discussed above, the correction of vignetting is filtering (§4.1.11), and the correction data and application thereof by multiplier 209 is an algorithm (§4.1.5.3). Thus, a POSA understood that applying the correction data of Iwasawa is a filtration correction algorithm. Ex-1003 ¶236.

Given that the Combined IID of Iwasawa has CPU 206 retrieving correction data and passing that to the DSP/multiplier, it also would have been obvious to have CPU 206 retrieve and pass associated information for applying that correction data, e.g., retrieving and passing correction data and an associated mathematical function for use in applying that data to correct the aberration.

This is confirmed because such a technique was common general knowledge. Ex-1003 ¶238 (explaining this general knowledge by pointing to Enomoto '885 as an example, which teaches retrieving “correction functions” and providing them to a portion of an image processing apparatus).

Additionally, element 14[g] requires application of the filtration algorithm to optimize the digital video, as well as correcting the optical image aberration in at least one video frame for the at least one focal length in the zoom lens configuration. Iwasawa teaches correcting an optical image aberration by applying digital filtration data (*i.e.*, Iwasawa’s correction data and application thereof by multiplier 209 is a filtration correction algorithm and is for at least one focal length in the zoom lens

configuration). *See* §§4.1.3.6, 4.1.14.5. Iwasawa teaches correcting optical image aberrations in at least one video frame. *See* §4.1.3.6.

Thus, Iwasawa renders obvious “wherein the integrated circuit [ASIC including multiplier 209] accesses the database [ROMs/RAM] to obtain at least one filtration correction algorithm [correction data and application thereof by multiplier 209] to the optical image aberration [vignetting] of at least one frame in the video file and forwards the at least one filtration algorithms to the digital signal processor; [and] wherein the digital video is forwarded to the digital signal processor which applies at least one filtration algorithm [correction data and application thereof by multiplier 209] to optimize the digital video and corrects the at least one optical image aberration in at least one video frame for the at least one focal length in the zoom lens configuration.” Ex-1003 ¶¶234-38.

4.1.9.6 Element 14[h]

Iwasawa teaches or suggests 14[h]. *See* §4.1.3.7; Ex-1003 ¶¶239-41.

4.1.10 Claim 17

Claim 17 depends from claim 14, which Iwasawa renders obvious.

§4.1.12. Iwasawa further teaches or suggests the additional elements of claim 17.

Shading characteristics for different focal lengths are different sets of optical aberrations. §4.1.6.3. Further, Iwasawa teaches that shading characteristics are corrected for a zoom position (*i.e.*, focal length) when the image data is captured.

Ex-1005 ¶15. A video image frame would include a single zoom position and the aberrations corrected for the frame would correspond to the single zoom position in that frame. Ex-1003 ¶244. Iwasawa teaches that different zoom positions have different vignetting values, which is a different optical aberration. *See* §4.1.6.3. Thus, a change in zoom position of optical lens 201 would result in a subsequent image, *i.e.*, at least one video image frame, being analyzed for different shading characteristics, *i.e.*, a different optical aberration.

Thus, Iwasawa renders obvious “wherein each focal length [zoom position] of a zoom lens [optical lens 201] in at least one video image frame [image signal] is analyzed for a different set of optical aberrations [vignetting].” Ex-1003 ¶¶242-47.

4.1.11 Claim 19

Claim 19 depends from claim 14, which Iwasawa renders obvious. §4.1.12. Claim 19 is otherwise analogous to claim 3 and is obvious for similar reasons. §4.1.5; Ex-1003 ¶248.

4.2 Ground 2: Iwasawa and Enomoto Render Obvious Claims 1-3, 5-7, 10-15, 17-19, 23, 24, 27, 28, and 30

4.2.1 Overview of Enomoto

Enomoto issued on July 17, 2007 and therefore qualifies as prior art under §§102(a) and 102(e). Enomoto discloses “a digital image shooting device” (*e.g.*, a video camera) designed to compensate for low-quality lens 32 by correcting for

aberrations caused thereby. Ex-1006, 1:7-13; *see also id.*, 10:29-40 (indicating the “digital image shooting device” can be a “digital video camera”). To that end, the device includes data processing unit 16 with a lens characteristic correction unit that corrects for various types of aberrations. *Id.*, 3:44-49; *see also* Ex-1003 ¶¶65.

4.2.2 Motivation to Combine

Enomoto is analogous art. It is in the same field of endeavor as the ’685 Patent and Iwasawa—namely, digital signal processing techniques, such as aberration correction, for imaging systems like digital and video cameras. It is reasonably pertinent to the alleged problem of providing a camera capable of performing onboard aberration correction, and uses a similar correction data storage scheme. *Compare* Ex-1001, 1:18-21 *with* Ex-1005 Abstract ¶¶1, 16 *and* Ex-1006 1:7-13, 4:16-20; *see also* Ex-1003 ¶¶251.

Plurality of Optical Image Aberrations. A POSA would have been motivated to incorporate Enomoto’s corrections into Iwasawa. Ex-1003 ¶¶252-58. As discussed above, Iwasawa provides an IID that selects correction data according to aperture value, zoom position, and lens type, and performs shading correction according to the imaging scene via embodiments of an IID that include a multiplier to apply shading correction to a digital image signal. *See* §4.1.3. Iwasawa further teaches that programs for additional corrections can be uploaded to CPU 206 and applied to the imaging signal. Ex-1005 ¶19.

From Iwasawa's disclosure, a POSA would have sought additional aberration corrections that could be applied to an image signal by a digital camera to create high-quality finished images and videos, which was desirable to camera users. Ex-1003 ¶252. Similarly, the '685 Patent recognizes multiple types of optical aberrations and corresponding corrections were well known in both digital and film-based photography before the priority date of the '685 Patent. Ex-1001, 1:39-6:62. Thus, even the '685 patent admits that the desire to improve multiple aberration types was a known motivation. Ex-1003 ¶252.

In following this motivation, a POSA would have encountered Enomoto and its teachings of an image processing unit that provides "white balance control of the image, gray balance control thereof,..., color balance control thereof and a sharpness... process" and lens characteristic correction unit that "corrects a chromatic aberration of magnification and distortion aberration originating in the lens characteristic...." Ex-1003 ¶252-254; Ex-1006, 3:32-49. Correction of multiple aberrations provides for high quality image output from comparatively low-price lenses. *Id.*, Abstract, 1:60-65.

A POSA would have been motivated to incorporate the aberration corrections taught in Enomoto into Iwasawa to provide for correction of additional aberrations. Ex-1003 ¶255. Because Iwasawa recognized the importance of producing high-quality finished images and videos, including by correcting for

vignetting, a POSA would have looked to other references, such as Enomoto, for additional aberrations that could be corrected by in-camera processing to thereby produce even higher-quality finished images and videos, *e.g.*, to appeal to more consumers and produce a successful digital video camera. *Id.*

A POSA also would have found additional motivation and reasonable expectation of success in the combination because Enomoto's correction method is similar to that of Iwasawa. Ex-1003 ¶256. Both references disclose receiving lens identification (*e.g.*, lens characteristics in Enomoto and control signals in Iwasawa), retrieving correction data for corrections from a memory (lens characteristics of image forming lens incorporated into Enomoto's digital video camera and Iwasawa's RAM 208/ROMs 107-109), and utilizing a correction component (characteristic correction unit 36 in Enomoto and multiplier 209 in Iwasawa) to apply the correction data to correct an image signal for aberrations. *Compare* Ex-1005 ¶¶7, 15, 16, 19 *with* Ex-1006 4:16-20, 10:31-40. Additionally, Enomoto teaches that correction of multiple aberrations, such as chromatic aberration of magnification and distortion aberrations, is desirable as it provides for a "high-quality image with a stability that there is neither the distortion nor the color deviation, and a cost for the digital camera can be remarkably reduced." *Id.*, 4:12-15.

At minimum, this modification combines known prior art elements (Iwasawa's IID and Enomoto's correction data) according to known methods (storage in memory and retrieval based on lens data) and applying a known technique (*e.g.*, the chromatic and distortion aberration corrections of Enomoto) to a known device ready for improvement (*e.g.*, Iwasawa's IID). Ex-1003 ¶¶257.

4.2.3 Claims 1, 3, 6, 11-14, 17, and 19

Iwasawa renders claim 1 obvious. §4.1.3. To the extent 1[pre] requires correction of different types of optical aberrations, Iwasawa and Enomoto together teach or suggest this.

Enomoto discloses barrel distortion and chromatic aberration correction. Ex-1006 4:34-40, 6:53-56. A POSA would have been motivated to include the barrel distortion and chromatic aberration correction of Enomoto into Iwasawa to provide for a “high-quality image with a stability that there is neither the distortion nor the color deviation....” *Id.*, 4:12-15; *see also* Ex-1003 ¶259. For these reasons and the reasons discussed in the Motivation to Combine section, a POSA would have been motivated to add barrel distortion and/or chromatic aberration correction data to the prestored correction data in RAM 208 and/or ROMS 107-109 (*e.g.*, the database) of Iwasawa and would have been reasonably certain of their success. Ex-1003 ¶¶258-62.

Thus, Iwasawa-Enomoto renders obvious “[a] digital imaging system [IID] for correcting optical image aberrations [vignetting, chromatic aberrations, and/or barrel distortion] in a digital video [imaging signal].” *Id.* ¶258-262. Iwasawa-Enomoto renders obvious claims 3, 6, 11-14, 17, and 19 for similar reasons discussed above. §4.1.4-4.1.11.

4.2.4 Claim 2

Claim 2 depends from claim 1, which Iwasawa renders obvious. §4.1.3. Iwasawa and Enomoto together teach or suggest the alternatively-recited additional elements of claim 2. As discussed above, a POSA would have been motivated to incorporate the barrel distortion and/or chromatic aberration correction data of Enomoto into Iwasawa. §4.2.3.

Thus, Iwasawa in view of Enomoto renders obvious “wherein the optical image aberrations include at least one of spherical, comatic, lens distortion, astigmatism, curvature of field, pin cushion, *barrel distortion*, *chromatic aberrations*, scattered light, and/or flare types of optical image aberrations.” Ex-1003 ¶¶263-67.

4.2.5 Claim 5

Claim 5 depends from claim 1, which Iwasawa renders obvious. §4.1.3. Iwasawa-Enomoto teaches or suggests the additional elements of claim 5. Ex-1003 ¶268.

4.2.5.1 Element 5[a]⁸

Iwasawa discloses correction data is obtained based on the control signal received from optical lens 201 identifying the aperture value, zoom position, and the *lens type*. See Ex-1005 ¶¶7, 15, 18-19. To allow this retrieval to function, each lens type would be registered in ROMs and/ or RAM (Iwasawa’s database) in some fashion (*e.g.*, as having an association in the memory structure/ database with the retrieved correction data). See Ex-1003 ¶271.

Thus, Iwasawa-Enomoto renders obvious “wherein each lens type is registered [stored/associated with correction data] in the camera database.” *Id.* ¶¶269-72.

4.2.5.2 Element 5[b]

Iwasawa, alone or with Enomoto, teaches or suggests 5[b].

Iwasawa’s ROMs and/or RAM list multiple optical aberrations of each lens at least because correction data is obtained based on the control signal received from optical lens 201 which identifies *aperture value*, *zoom position*, and lens type. Ex-1005 ¶16, 21. Each set of correction data for different aperture values and/or

⁸ For this proceeding, Petitioners understand “[T]he camera database” to refer to “the database” of 1[c].

zoom positions of a lens type correspond to “multiple optical aberrations of each lens,” which are prestored in Iwasawa’s database. Ex-1003 ¶275.

To the extent 5[b] requires data for different aberration types, Iwasawa modified to include the barrel distortion and/or chromatic aberration correction of Enomoto would list multiple optical aberrations of each lens in the database. As discussed above, a POSA would have been motivated to incorporate the corrections of Enomoto into Iwasawa. §4.2.3. Both Enomoto and Iwasawa teach correction data being stored (*i.e.*, listed) according to lens data and the additional correction data incorporated into Iwasawa from Enomoto would be similarly listed by aperture value, zoom position, and lens type. Ex-1003 ¶¶276-77.

Thus, Iwasawa, alone or in combination with Enomoto, renders obvious “wherein the multiple optical aberrations [*e.g.*, vignetting for each aperture value and/or zoom position or vignetting, chromatic aberrations, and/or barrel distortion] of each lens is listed in the database [Iwasawa’s ROMs and/or RAM].” *Id.* ¶¶273-78.

4.2.5.3 Element 5[c]

Iwasawa teaches or suggests 5[c].⁹

The correction data of Iwasawa include filtration solutions. As discussed above, shading characteristics include vignetting (§4.1.3.2) and corresponding corrections are stored in a database (§4.1.6.2). Further, as discussed in the prior section, modification of Iwasawa to include the aberration corrections of Enomoto would include correction data for multiple aberrations being listed in the database. Shading correction applied by Iwasawa suppresses undesirable unevenness between the increased signal value corresponding to the location of a center of an optical lens and decreased signal value corresponding to locations farther away from the center of the optical lens. Ex-1005 ¶17. Similarly, Enomoto discloses that functions for correcting chromatic aberrations or distortion aberrations correct aberrations based on pixel locations from the center of an image. Ex-1006 4:34-40. Therefore, a POSA understood that shading characteristic corrections and/or chromatic aberration corrections are filtration solutions to lens optical aberrations. Ex-1003 ¶284.

⁹ For this proceeding, Petitioners understand “filtration solutions” to refer to “plurality of optical image aberration corrections” of 1[a] and “lens optical aberrations” to refer to “multiple optical aberrations” of 5[b].

Thus, Iwasawa renders obvious “wherein the filtration solutions [correction data] to the lens optical aberrations [vignetting, chromatic aberrations] are listed in the database [the correction data is stored in Iwasawa’s ROMs and/or RAM].” Ex-1003 ¶¶279-85.

4.2.5.4 Element 5[d]

Shading characteristic correction of Iwasawa and chromatic aberration correction of Enomoto are filtration of lens optical aberrations. §4.2.4.3. Similarly, as discussed above, correction data (*e.g.*, shading or chromatic correction) is applied by a DSP in Iwasawa. §4.1.3.2.

Thus, Iwasawa-Enomoto renders obvious “wherein the filtration [correction] of each lens optical aberration [vignetting, chromatic aberration, barrel distortion] is applied by the digital signal processor [multiplier 209, alone or with DSP 210].” Ex-1003 ¶¶286-89.

4.2.5.5 Element 5[e]

Iwasawa, alone or with Enomoto, teaches or suggests 5[e].¹⁰

As discussed above, vignetting correction of Iwasawa and chromatic aberration and/or barrel distortion incorporated into Iwasawa from Enomoto are

¹⁰ Antecedent-less “corrected digital file” is understood for this proceeding to refer to “the corrected video.” *See* §4.1.3.7.

filtration of lens optical aberrations. §4.2.4.4. The correction data of Iwasawa is applied by a DSP. §4.1.3.5. Further, as discussed above, Iwasawa stores the video signal output after the correction data is applied. §4.1.3.6. Storage of the video signal output is in the form of a file stored in memory, such as a file stored on memory card 609. *Id.*

Thus, Iwasawa-Enomoto renders obvious “wherein after the digital signal processor [multiplier 209, alone or with DSP 210] applies the filtration [using correction data] to correct the optical image aberrations [vignetting at different aperture and zoom pairings, chromatic aberrations, and/or barrel distortion] the corrected digital file [video signal output 211] is forwarded to storage in memory [memory card 609].” Ex-1003 ¶¶290-93.

4.2.6 Claims 7 and 15

Claims 7 and 15 depend from claims 6 and 14, respectively, which Iwasawa renders obvious. §4.1.5 and 4.1.9. The additional features are taught by Enomoto for reasons provided above as to analogous claim 2 (§4.2.3). These claims are thus rendered obvious by Iwasawa-Enomoto. Ex-1003 ¶¶294-95, 300-01.

4.2.7 Claims 10 and 18

Claims 10 and 18 depend from claims 6 and 14, respectively, which Iwasawa renders obvious. §4.1.5 and §4.1.9. Iwasawa and Enomoto together teach or suggest the additional elements of claims 10 and 18.

The additional features are taught by Enomoto for reasons provided above as to claim 2 (§4.2.3) and claim 5 (§4.2.4). These claims are thus rendered obvious by Iwasawa-Enomoto. Ex-1003 ¶¶296-99, 302-03.

4.2.8 Claim 23

As discussed above, a POSA would have been motivated to modify Iwasawa to include the chromatic aberration corrections of Enomoto. §4.2.2-4.2.3. Further, and as discussed above, the CPU implements programs to perform corrections, §4.2.8, which are in the form of machine-readable instructions for a system. Ex-1003 ¶305.

Thus, Iwasawa-Enomoto renders “wherein the system includes machine readable instructions for the system to correct for chromatic aberrations” obvious. Ex-1003 ¶¶304-06.

4.2.9 Claim 24

As discussed above, a POSA would have been motivated to modify Iwasawa to include the white, gray, and color balances and sharpness processes of Enomoto. §4.2.2. A POSA understood that color balancing and sharpness processes corrected contrast in an image, and therefore corrects for scattered light. Ex-1003 ¶¶308-09. This is confirmed because correcting for scattered light was common general knowledge. Ex-1003 ¶310 (explaining this general knowledge by pointing

to Turner (Ex-1028 ¶¶0027), Nakamura (Ex-1029 1:11-18), and Gindele (Ex-1030 ¶2 as examples).

Further, and as discussed above, CPU 206 implements programs to perform corrections (§4.2.8), which are in the form of machine-readable instructions for a system. Ex-1003 ¶¶309.

Thus, Iwasawa-Enomoto renders “wherein the system includes machine readable instructions for the system to correct for scattered light aberrations” obvious. *Id.* ¶¶307-310.

4.2.10 Claims 27 and 30

Claims 27 and 30 depend from claim 1, which Iwasawa renders obvious. §4.1.3. Iwasawa and Enomoto together teach or suggest the additional elements of claims 27 and 30.

As discussed above, a POSA would have been motivated to modify Iwasawa to include the aberration corrections of Enomoto (§§4.2.2-4.2.3), such as lens distortion and barrel distortion corrections. Ex-1006, 3:44-49, 6:53-59. Further, and as discussed above, CPU 206 implements programs to perform corrections (§4.1.3), which are in the form of machine-readable instructions for a system. Ex-1003 ¶¶314, 320.

Thus, Iwasawa-Enomoto renders obvious “wherein the system includes machine readable instructions for the system to correct for lens distortion

aberrations” (Ex-1003 ¶¶311-15) and “wherein the system includes machine readable instructions for the system to correct for barrel distortion aberrations” (Ex-1003 ¶¶319-21).

4.2.11 Claim 28

Claim 28 depends from claim 1, which Iwasawa renders obvious. §4.1.3. Iwasawa and Enomoto together teach or suggest the additional elements of claim 28.

As discussed above, a POSA would have been motivated to modify Iwasawa to include the aberration corrections of Enomoto (§§4.2.2-4.2.3), including correcting for the “bobbin winder” aberration described in Enomoto, which a POSA understood was a pin cushion aberration. Ex-1006, 6:53-56; Ex-1003 ¶317. Further, and as discussed above, CPU 206 implements programs to perform corrections, §4.1.3, which are in the form of machine-readable instructions for a system. Ex-1003 ¶317.

Thus, Iwasawa-Enomoto renders obvious “wherein the system includes machine readable instructions for the system to correct for pin cushion aberrations.” Ex-1003 ¶¶316-18.

4.3 Grounds 3 and 4: Iwasawa-Ito or Iwasawa-Enomoto-Ito Render Obvious Claims 4, 8, 9, and 16

4.3.1 Overview of Ito

Ito (Ex-1007) published on April 22, 1994, and therefore qualifies as prior art under §102(b). Ito discloses a digital video camera including an imaging means

for imaging an incident image from an optical lens system and correction means for correcting chromatic aberration of RGB signals from the imaging means. Ex-1007 ¶7. Ito includes the use of a fast Fourier transform (“FFT”) as the chromatic aberration correction that is applied by digital signal processing. *Id.* ¶17; *see also* Ex-1003 ¶66.

4.3.2 Motivation to Combine

Ito (like Iwasawa/Enomoto) qualifies as analogous art at least because it is in the same field of endeavor as the ’685 Patent—namely, digital signal processing techniques, such as aberration correction, for imaging systems like digital and video cameras. *Compare* Ex-1001, 1:18-21 *with* Ex-1005, Abstract ¶1 *and* Ex-1007 ¶6. Like the ’685 Patent, Iwasawa and Ito also correct aberrations in-camera for specific image problems. *Id.*; *see also* Ex-1003 ¶¶322-29.

FFT. A POSA would have been motivated to incorporate Ito’s chromatic aberration correction via FFT into Iwasawa. Ex-1003 ¶¶324-29. Iwasawa seeks to correct optical aberrations such as vignetting, *see* §4.1.3.4, and teaches that programs for additional corrections can be uploaded to CPU 206 and applied to the imaging signal. Ex-1005 ¶19. This would have prompted a POSA to consider additional changes to Iwasawa to use its updateable programs to address additional aberrations.

A POSA would have understood that programs embodying additional aberration corrections could be uploaded to CPU 206 and applied thereby. Even the

'685 Patent admits that multiple types of optical aberrations were well known in both digital and film-based photography, confirming that a POSA would have been motivated to seek out other known aberration corrections for implementation by Iwasawa. *See* Ex-1001, 1:39-6:62.

Following these motivations, a POSA would have encountered Ito, which discloses correction of an optical aberration in the form of chromatic aberration in a digital video. Ex-1007 ¶12. The correction that is applied by the DSP in Ito can be an FFT. *Id.* ¶¶17-18; *see also* Ex-1001, 32:56-57 (providing FFT as an example of digital filtration).

A POSA would have been motivated to incorporate the FFT-based chromatic aberration correction taught in Ito into Iwasawa to provide for correction of chromatic aberrations. Ex-1003 ¶326. During prosecution of the Parent Application, it was admitted that incorporation of FFTs would be obvious, as “[t]here is no reason not to include” FFTs in this time period. Ex-1012, 157.

As discussed above, because Iwasawa recognized the importance of aberration correction, a POSA would have additionally or alternatively been motivated to consult other references for additional aberration corrections, including chromatic aberration correction, that could be applied by in-camera processing to address issues with colors in images. §4.2.2. A POSA understood that the chromatic

aberration correction of Ito could be embodied in a program uploaded to CPU 206 and implemented within Iwasawa.

A POSA would have been motivated to make this modification in order to correct for loss of sharpness in an image and image coloring caused by chromatic aberrations. Ex-1007 ¶3. A POSA understood that digital aberrations could be corrected in a similar manner, and thus would have understood that an FFT-based correction, as taught by Ito, could be applied to correct digital artifacts, such as Iwasawa's false color, caused by shading correction. Ex-1003 ¶342. At a minimum, this modification is a combination of known prior art elements according to known methods and applying a known technique (*e.g.*, the FFT chromatic aberration of Ito) to a known device ready for improvement (*e.g.*, IID). *Id.*

A reasonable expectation of success existed too as Ito discloses that the FFT chromatic correction is applied by digital signal processing, which Iwasawa similarly uses for the disclosed shading correction processes, so the updates to use FFT in Iwasawa would have been straightforward and within the skill of a POSA.

4.3.3 Claim 4

Claim 4 depends from claim 1, which Iwasawa/Iwasawa-Enomoto renders obvious. §§4.1.3, 4.2.3. Iwasawa/Iwasawa-Enomoto together with Ito teach or suggest the additional elements of claim 4.

As noted by Ito, chromatic aberration occurs due to refractive index of glass in an optical lens that causes loss of sharpness in an image and image coloring. *Id.* ¶¶2-3. Ito discloses chromatic aberration correction performed by a DSP. *Id.* ¶¶13-15. As discussed above, a POSA would have been motivated to include correction of chromatic aberrations in order to correct for loss of sharpness in an image and image coloring. §4.3.2. After such modification, “the at least one optical image aberration” would be a chromatic aberration as well as the aberrations explained above from Iwasawa.

The aberration correction disclosed in Ito can use an FFT. *Id.* ¶¶17-18. A POSA understood that the focal-length correction values for chromatic aberration of Ito, which are like the focal-length correction values for shading correction of Iwasawa, could be similarly selected based on a control signal from optical lens 201 and applied by the multiplier 209, alone or with the DSP 210. Ex-1003 ¶333.

When modifying Iwasawa to include correction of chromatic aberrations, a POSA would have adopted the chromatic aberration corrections provided by Ito, including the focal-length FFT correction values, as focal-length FFT correction values could be easily accessed in the same manner as correction data taught in Iwasawa, *i.e.*, based on a control signal that includes a zoom position (*e.g.*, focal length). For these reasons, as well as the detailed discussion set forth in the Motivation to Combine section, a POSA would have been motivated to add Ito’s

FFT-based chromatic aberration corrections to Iwasawa's IID and would have reasonably expected success. Ex-1003 ¶334.

Thus, Iwasawa/Iwasawa-Enomoto in view of Ito renders obvious “wherein the digital signal processor [multiplier 209, alone or with DSP 210] applies at least one fast Fourier transform (FFT) algorithm [focal-length FFT correction values and application thereof] to correct the at least one optical image aberration [chromatic aberration].” Ex-1003 ¶¶330-35.

4.3.4 Claim 8

Claim 8 depends from claim 6, which Iwasawa/Iwasawa-Enomoto renders obvious. §§4.1.7, 4.2.3. Claim 8 is otherwise analogous to claim 4 and is therefore obvious for similar reasons. *See* §4.3.3; Ex-1003 ¶¶336-37.

4.3.5 Claim 9

Claim 9 depends from claim 6, which Iwasawa/Iwasawa-Enomoto renders obvious. §§4.1.7, 4.2.3. Ito teaches or suggests the additional elements of claim 9.

As discussed above, Iwasawa/Iwasawa-Enomoto render obvious applying corrections to at least two frames in a digital video (§4.1.5.4) and, as modified by Ito, discloses applying an FFT algorithm to correct aberrations (§4.3.3).

Iwasawa recognizes application of correction data can result in a loss of “correlation with an imaging signal corresponding to a nearby and adjacent different filter,” resulting in false color. Ex-1005 ¶5. The loss of correlation is caused by

multiplication of a digital image signal (*id.*), which is a digital aberration. Ex-1003 ¶341.

As discussed above, Iwasawa/Iwasawa-Enomoto in view of Ito renders obvious a DSP applying an FFT to correct digital aberrations. §4.3.3. In particular, Ito teaches correction of digital aberrations. §4.3.2; Ex-1003 ¶342.

Thus, Iwasawa/Iwasawa-Enomoto in view of Ito renders obvious “wherein the digital signal processor [multiplier 209, alone or with DSP 210] applies a[n] [FFT] algorithm [FFT-based correction values and application thereof] to correct digital aberrations [false color] of at least two frames in the digital video.” Ex-1003 ¶¶338-43.

4.3.6 Claim 16

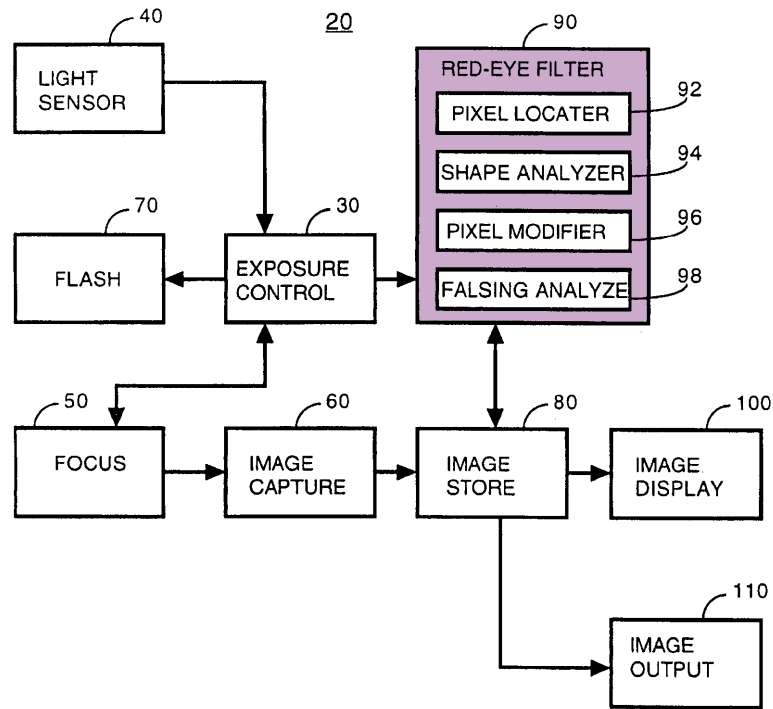
Claim 16 depends from claim 14, which Iwasawa/Iwasawa-Enomoto renders obvious. §§4.1.12, 4.2.3. Claim 16 recites features found in claims 8 and 9 and is therefore obvious for similar reasons. §§4.3.4-4.3.5; Ex-1003 ¶¶344-45.

4.4 Grounds 5 and 6: Iwasawa-Prilutsky or Iwasawa-Enomoto-Prilutsky Render Claim 20 Obvious

4.4.1 Overview of Prilutsky

Prilutsky (Ex-1008) published on June 30, 2005, and is §102(b) art. Prilutsky discloses “[a] method of filtering a red eye phenomenon from a digitized image....” Ex-1008 ¶15. This method involves analyzing regions of a digitized image to determine whether red eye is present. *Id.* If it is, the relevant regions are

modified by applying sub-filters to remove the red eye. *Id.* ¶21. Figure 1 of Prilutsky is a block diagram for a camera 20 configured to perform this method. *Id.* ¶33; *see also* Ex-1003 ¶67.



Ex-1008, fig. 1.

4.4.2 Motivation to Combine

Prilutsky (like Iwasawa/Enomoto) qualifies as analogous art at least because it is in the same field of endeavor as the '685 Patent—namely, digital signal processing techniques, such as aberration correction, for imaging systems like digital and video cameras. *Compare* Ex-1001, 1:18-21 *with* Ex-1005, Abstract ¶1 *and* Ex-1008 ¶2. Like the '685 Patent, the references each present a capability to correct

various aberrations in-camera for specific image problems. *Id.*; *see also* Ex-1003 ¶347.

Red-Eye Correction. A POSA would have been motivated to incorporate Prilutsky’s red-eye correction into Iwasawa. Ex-1003 ¶¶348-51. As discussed above, Iwasawa seeks to correct aberrations such as vignetting and scene-specific aberrations. *See* §4.1.3.4. In seeking to construct Iwasawa’s system, a POSA would have sought to “readily expand[]” (Ex-1005 ¶¶8, 27) its teachings to correct additional known aberration types to further Iwasawa’s goals of “high-speed and accurate” (*id.*) aberration corrections. Iwasawa also indicates “it is possible to freely switch the program for calculating” corrections (*id.* ¶19), thus further prompting a POSA to include other known aberration types when switching Iwasawa’s program.

Additionally, or alternatively, creating a commercially desirable digital video camera that produced higher-quality corrected videos would have also fueled the motivation as a POSA understood that better video was a desirable feature for consumers and would have sought to meet that need. A POSA understood red-eye correction was desirable, as red-eye is an objectionable phenomenon in photography. Ex-1008 ¶3. Even the ’685 Patent admits multiple types of aberrations were well known, so this admits familiarity with the need to correct more aberrations to produce higher-quality videos. Ex-1001, 1:39-6:62.

These motivations would have led a POSA directly to Prilutsky, which discloses red-eye filter 90 that analyzes images for red-eye characteristics and removes the red-eye . Ex-1008 ¶33. The red-eye filter 90 includes pixel locator 92 for locating pixels having color indicative of red-eye; shape analyzer 94 for determining if a grouping of pixels located by the pixel locator comprise a shape indicative of red-eye; a pixel modifier 96 for modifying the color of pixels within the grouping; and a falsing analyzer 98 for processing the image around the grouping. *Id.* Prilutsky expressly notes “many of the processes implemented in the digital camera may be implemented in or controlled by software operating in a microcomputer or [DSP] and/or an [ASIC].” *Id.*

Adding Prilutsky’s red-eye correction to Iwasawa would have been straightforward for a POSA—requiring updates to the prestored data in ROMs and/or updates to Iwasawa’s programs to address Prilutsky’s red-eye issues, thus success was reasonably certain.

At a minimum, this modification includes a combination of known prior art elements according to known methods (*e.g.*, merely updating software or introducing additional data to Iwasawa’s ROMs and/or RAM, or incorporating Prilutsky’s red-eye correction components described above) and applying a known technique (*e.g.*, Prilutsky’s red-eye correction) to a known device ready for improvement (Iwasawa’s IID). *Id.* Further, as Prilutsky recognizes, the processes

for performing red-eye correction could be implemented in software operating in a microcomputer or a digital signal processor (*id.* ¶33.), both of which appear in Iwasawa’s IID.

4.4.3 Claim 20

Claim 20 depends from claim 1, which Iwasawa/Iwasawa-Enomoto renders obvious. §§4.1.3, 4.2.3. Prilutsky teaches or suggests the additional elements of claim 20.

As explained above, the Iwasawa-Prilutsky system would be “configured to correct red-eye” either through the use of Prilutsky’s red-eye correction components in Iwasawa and/or by updating Iwasawa’s ROMs and/or RAM to have the data necessary to perform the red-eye correction described in Prilutsky.

Thus, Iwasawa/Iwasawa-Enomoto in view of Prilutsky renders obvious “wherein the system [IID] is configured to correct red-eye [using red-eye filter 90].” Ex-1003 ¶¶352-55.

4.5 Grounds 7 and 8: Iwasawa-Miyazawa or Iwasawa-Enomoto-Miyazawa Render Obvious Claim 21

4.5.1 Overview of Miyazawa

Miyazawa (Ex-1009) issued on September 14, 2004, and therefore qualifies as prior art under 35 U.S.C. §102(b). Miyazawa teaches a method for

judging whether dust is adhering on an image sensor device unit.¹¹ Ex-1009, 2:58-67. When dust is detected on an image element, normal surrounding image data is utilized to correct the image defect caused by the dust. *Id.*, 6:31-37; *see also* Ex-1003 ¶68.

4.5.2 Motivation to Combine

Miyazawa (like Iwasawa/Enomoto) qualifies as analogous art at least because it is in the same field of endeavor as the '685 Patent—namely, digital signal processing techniques, such as aberration correction, for imaging systems like digital and video cameras. *Compare* Ex-1001, 1:18-21 *with* Ex-1005, Abstract ¶1 *and* Ex-1009, 1:16-18. Similar to the '685 Patent, Iwasawa and Miyazawa each also corrects various aberrations in-camera for specific image problems. *Id.*; *see also* Ex-1003 ¶356.

Dust Defect Correction. A POSA would have been motivated to incorporate Miyazawa's dust detection and correction process into Iwasawa. Ex-1003 ¶¶357-62. As discussed above, Iwasawa seeks to correct aberrations, such as vignetting and scene-specific aberrations. *See* §4.1.3.4. In seeking to construct Iwasawa's system, a POSA would have sought to “readily expand[]” (Ex-1005 ¶¶8,

¹¹ Miyazawa collectively refers to dirt and dust as “dirt.” Ex-1009, 1:26-27.

27) its teachings to correct additional known aberration types to further Iwasawa's goals of "high-speed and accurate" (*id.*) aberration corrections.

Iwasawa also indicates "it is possible to freely switch the program for calculating" corrections (*id.* ¶19), thus further prompting a POSA to consult other known aberration types to be included when freely switching Iwasawa's program. Additionally, or alternatively, creating a commercially desirable digital video camera that produced higher-quality corrected videos would have fueled the motivation too as a POSA understood that better videos were a desirable feature for consumers and would have sought to meet that need.

A POSA understood dust correction was desirable, as dust on an image sensor can cause image failure. Ex-1009, 1:38-45. Even the '685 Patent admits multiple types of aberrations were well known and thus a POSA would have been familiar with the need to correct more aberrations to produce higher quality videos. Ex-1001, 1:39-6:62.

These motivations would have led a POSA directly to Miyazawa, which teaches a camera case 100 that has a detachable mount for a lens 200. Ex-1009, 3:63-65. The camera case 100 houses CCD 103' that forms image data through the lens 200. *Id.*, 3:65-4:2. CCD 103' is coupled to CPU 110 which is also in communication with an A/D convertor 113, image processor 115 comprising a DSP, and dust position storing memory 117 for storing a position of a picture element in

CCD 103' having an image failure due to dust. *Id.*, 4:8-17. The camera case 100 and changeable lens 200 of Miyazawa are similar to the IID and optical lens 210 in the combined IID of Iwasawa, which similarly allows for interchangeable lenses (§4.1.3.1). Ex-1003 ¶360.

Miyazawa further teaches “a method for detecting a position of a picture element having failure caused by dust....” Ex-1009, 5:12-15. The method identifies pixels of CCD 103' that have a failure due to dust being present. *Id.*, 5:16-53. At the time of photographing, “if the address of read-out image data corresponds to the address of a picture element having dust, the image data are corrected using surrounding normal image data....” *Id.* 6:31-34.

Adding Miyazawa's dust correction to Iwasawa would have been straightforward for a POSA—requiring updates to the prestored data in ROMs and/or updates to Iwasawa's programs to address Miyazawa's dust issues, thus success was reasonably certain. At a minimum, this modification includes a combination of known prior art elements according to known methods (*e.g.*, merely updating software or introducing additional data to Iwasawa's ROMs and/or RAM, or incorporating Miyazawa's dust correction components described above) and applying a known technique (*e.g.*, the dust detection and correction of Miyazawa) to a known device ready for improvement (Iwasawa's IID). *Id.* Further, as Miyazawa recognizes, the processes for performing dust detection and correction would be

implemented by operating a CPU and DSP, each of which is similarly disclosed by Iwasawa.

4.5.3 Claim 21

Claim 21 depends from claim 1, which Iwasawa/Iwasawa-Enomoto renders obvious. §§4.1.3, 4.2.3. Miyazawa further teaches “wherein the system is configured to correct for dust.”

Miyazawa discloses a dust detection and correction method. Ex-1009, 5:12-6:34. At the time of photographing, “if the address of read-out image data corresponds to the address of a picture element having dust, the image data are corrected using surrounding normal image data....” *Id.* 6:31-34. A POSA understood dust correction was desirable, as dust on a CCD results in image defects. *Id.*, 1:31-34. For these reasons, as well as the detailed discussion set forth in the Motivation to Combine section, a POSA would have been motivated to add the dust detection and correction process of Miyazawa into Iwasawa and would have been reasonably certain of their success. Ex-1003 ¶365.

Thus, Iwasawa/Iwasawa-Enomoto in view of Miyazawa renders obvious “wherein the system [Iwasawa’s IID] is configured to correct for dust.” Ex-1003 ¶¶363-66.

4.6 **Grounds 9 and 10: Iwasawa-Matsutani or Iwasawa-Enomoto-Matsutani Render Obvious Claims 22, 25, 26 and 29**

4.6.1 **Overview of Matsutani**

Matsutani (Ex-1010) published on September 24, 2004, and therefore qualifies as prior art under 35 U.S.C. §102(b). Matsutani discloses an image processing system that corrects image aberrations in a digital camera. Ex-1010 ¶23. Aberrations are corrected by a real-time processing unit (RPU) that loads correction processes from a ROM. *Id.* ¶26-27. Corrected aberrations include spherical aberration, coma, astigmatism, and field curvature. *Id.* ¶3; *see also* Ex-1003 ¶69.

4.6.2 **Motivation to Combine**

Matsutani (like Iwasawa/Enomoto) qualifies as analogous art at least because it is in the same field of endeavor as the '685 Patent—namely, digital signal processing techniques, such as aberration correction, for imaging systems like digital and video cameras. *Compare* Ex-1001, 1:18-21 *with* Ex-1005, Abstract ¶1 *and* Ex-1010, ¶21. Similar to the '685 Patent, Iwasawa and Matsutani each also correct various aberrations in-camera for specific image problems. *Id.*; *see also* Ex-1003 ¶368.

Aberration Corrections. A POSA would have been motivated to incorporate one or more of Matsutani's aberration corrections into Iwasawa. Ex-1003 ¶¶369-73. As discussed above, Iwasawa seeks to correct optical aberrations

including shading characteristics. *See* §4.1.3.4. In seeking to construct Iwasawa’s system, a POSA would have sought to “readily expand[]”its teachings to correct additional known aberration types to further Iwasawa’s goals of “high-speed and accurate” aberration corrections. Ex-1005 ¶¶8, 27.

Iwasawa also indicates that “it is possible to freely switch the program for calculating” corrections (*id.* ¶19), thus further prompting a POSA to consult other known aberration types to be included when freely switching Iwasawa’s program. Additionally, or alternatively, creating a commercially desirable digital video camera that produced higher-quality corrected videos would have fueled the motivation too as a POSA understood that better videos were a desirable feature for consumers and would have sought to meet that need.

A POSA understood the desirability of correcting for aberrations based on photographing conditions. Ex-1010 ¶3. These motivations would have led a POSA directly to Matsutani, which teaches a digital camera that includes optical mechanism 10, image sensor 11, image-processing LSI 13, RAM 14, and ROM 15. Ex-1010 ¶23. Image sensor 11 generates an image signal and can be, for example, a CCD area sensor. *Id.* ¶24. LSI 13, which includes RPU 21, transfers correction data from ROM 15 based on a control process executed by control unit 22. *Id.* ¶27. Aberrations are corrected by RPU 21 based on transferred correction data. *Id.* ¶29.

Matsutani discloses aberrations including, but not limited to, spherical aberration, coma, astigmatism, and field curvature. *Id.* ¶3.

Adding Matsutani's aberration corrections to Iwasawa would have been straightforward for a POSA—requiring updates to the prestored data in the ROMs and/or updates to Iwasawa's programs to address Matsutani's aberrations, thus success was reasonably certain. At a minimum, this modification includes a combination of known prior art elements according to known methods (*e.g.*, merely updating software or introducing additional data to Iwasawa's ROMs and/or RAM or incorporating Matsutani's LSI described above) and applying a known technique (*e.g.*, the aberration corrections of Matsutani) to a known device ready for improvement (Iwasawa's IID). *Id.* Further, as Matsutani teaches, the aberration corrections are performed by processing blocks and therefore could be included in Iwasawa.

4.6.3 Claim 22

Claim 22 depends from claim 1, which Iwasawa/Iwasawa-Enomoto renders obvious. §§4.1.3, 4.2.3. Iwasawa/Iwasawa-Enomoto together with Matsutani teaches the additional elements of claim 22, as the combined system includes correction of spherical aberration (Matsutani ¶3) in the form of machine-readable instructions (§4.2.8). Ex-1003 ¶¶375-76.

Thus, Iwasawa/Iwasawa-Enomoto in view of Matsutani renders obvious “wherein the system includes machine readable instructions for the system to correct for spherical aberrations.” Ex-1003 ¶¶373-77.

4.6.4 Claim 25

Claim 25 depends from claim 1, which Iwasawa/Iwasawa-Enomoto renders obvious. §§4.1.3, 4.2.3. Iwasawa/Iwasawa-Enomoto together with Matsutani teaches the additional elements of claim 25, as the combined system includes correction of coma (Matsutani ¶3) in the form of machine-readable instructions (§4.2.8) Ex-1003 ¶¶378-82.

4.6.5 Claim 26

Claim 26 depends from claim 1, which Iwasawa/Iwasawa-Enomoto renders obvious. §§4.1.3, 4.2.3. Iwasawa/Iwasawa-Enomoto together with Matsutani teaches the additional elements of claim 26, as the combined system includes correction of astigmatism (Matsutani ¶3) in the form of machine-readable instructions (§4.2.8) Ex-1003 ¶¶383-86.

4.6.6 Claim 29

Claim 29 depends from claim 1, which Iwasawa/Iwasawa-Enomoto renders obvious. §4.1.3. Iwasawa/Iwasawa-Enomoto together with Matsutani teaches the additional elements of claim 29, as the combined system includes

correction of curvature of field (Matsutani ¶3) in the form of machine-readable instructions (§4.2.8) Ex-1003 ¶¶388-92.

5. No Secondary Considerations

Any purported secondary considerations would be addressed after institution. *See, e.g., Zurn Industries v. Sioux Chief*, IPR2018-00975, Paper 9 at 39.

6. Discretionary Denial Would Be Inappropriate

6.1 *General Plastic* Favors Institution

These grounds rely on references different from those raised in the Sony IPR and that were not substantively considered during prosecution. Each *General Plastic* factor favors institution or is neutral.

Factors One and Two favor institution because Petitioners have no involvement with the Sony IPR, and Petitioners and Sony lack any legally significant relationship. *Ericsson Inc., v. General Access Solns., Ltd.*, IPR2024-00392, Paper 13 at 25; *see also LG Elecs., Inc. v. Bell N. Research, LLC*, IPR2020-00319, Paper 15 at 15 (“[A]n unrelated Petitioner presenting some new references... weighs against denying institution under §314(a) quite heavily.”). Thus, “factor one necessarily outweighs the other *General Plastic* factors.” *Videndum Production v. Rotolight*, IPR2023-01218, Paper 12 at 6 (PTAB Apr. 19, 2024) (Director Review).

Even if considered, Factor Three favors institution, as well. Patent Owner filed a preliminary response to the corresponding Sony IPR just hours before this

filing but the current petition relies upon a different set of references and was not drafted to address any specific arguments that may have been made in PO's preliminary response. Accordingly, road-mapping concerns like those at issue in *General Plastic* are inapplicable.

Even if considered, Factors Four and Five favor institution. Petitioners have no involvement with the Sony IPR, so—unlike in *General Plastic*—it does not make sense to hold Petitioners responsible for the time elapsed since filing of an unrelated petition. Regardless, Petitioners pursued their unpatentability grounds, which are different in content and scope from those in the Sony IPR, with reasonable diligence.

Factor Six favors institution because this Petition raises references not cited to in the Sony IPR. Accordingly, IPR of the grounds raised here make good use of the Board's limited resources for “improving patent quality by reviewing the merits of the [raised] challenges.” *Code200, UAB v. Bright Data, Ltd.*, IPR2022-00861, Paper 18 at 6.

Factor Seven favors institution because nothing in this Petition will impede the Board from issuing a final written determination within one year of IPR institution.

6.2 *Sotera* Stipulations Moot *Fintiv*

Each Petitioner has provided a *Sotera* stipulation (Ex-1025), so “the PTAB will not discretionarily deny institution in view of parallel district court litigation where petitioner presents [such] a stipulation....” *See* Memorandum on “Interim Procedure for Discretionary Denials.”

7. Payment of Fees

The U.S. Patent and Trademark Office is hereby authorized to charge any fees due during the IPR proceeding to Deposit Account No. 50-0310 (Order No. 121417-00-0015).

8. Mandatory Notices

8.1 Real Parties-in-Interest

Petitioners certify that they are the only real parties-in-interest.

8.2 Related Matters

Patent Owner is currently asserting the '685 Patent in the following cases:

- *Optimum Imaging Techs. LLC v. Olympus Corp., et al.*, Civ. No. 4-23-cv-00924 (E.D. Tex., filed Oct. 18, 2023);
- *Optimum Imaging Techs. LLC v. Nikon Corp.*, Case No. 4-23-cv-00923 (E.D. Tex. Oct. 18, 2023);
- *Optimum Imaging Techs. LLC v. Panasonic Corp., et al.*, Case No. 4-23-cv-00926 (E.D. Tex., filed Oct. 18, 2023);

- *Optimum Imaging Techs. LLC v. Sony Corp.*, Case No. 4-23-cv-00928 (E.D. Tex., filed Oct. 18, 2023);
- *Optimum Imaging Technologies LLC v. FUJIFILM Corporation*, Case No. 4-23-cv-00922 (E.D. Tex. Oct. 18, 2023);

The '685 Patent is also at issue in: (i) *FUJIFILM North America Corp. v. Optimum Imaging Techs. LLC*, Case No. 4-24-cv-03297 (N.D. Cal. May 31, 2024); and (ii) *Panasonic Entertainment & Comm. Co., Ltd. v. Optimum Imaging Techs. LLC*, Case No. 3-24-cv-02466 (N.D. Cal. Apr. 25, 2024).

Additionally, the '685 Patent is currently at issue in *Sony Corp. v. Optimum Imaging Techs. LLC*, IPR2024-00923 (PTAB May 20, 2024) ("Sony IPR").

Further, four years ago, Patent Owner threatened to assert the '685 Patent against Canon, which led to Canon seeking an unenforceability judgment in *Canon Inc. v. Optimum Imaging Techs. LLC*, Civ. No. 1-20-cv-01238 (W.D. Tex., filed Dec. 22, 2020), which settled in April 2021.

Out of an abundance of caution, Petitioners also note the '685 Patent is in the same family as three other patents: (i) U.S. Patent No. 7,612,805; (ii) U.S. Patent No. 8,451,339 ("339 Patent"); and (iii) U.S. Patent No. 10,877,266. Petitioners intend to challenge these three patents in other IPRs. Sony has also challenged these three patents, respectively, in: (i) IPR2024-00924; (ii) IPR2024-00925; and (iii) IPR2024-01046. Moreover, these three patents were at issue in *Optimum*

Imaging Techs. LLC v. Samsung Elecs. Co., Ltd., Case No. 4-23-cv-00927 (E.D. Tex. Oct. 18, 2023).

8.3 Lead and Back-up Counsel

Petitioners Olympus Corporation and OM Digital Solutions Corporation designate Alexander B. Stein (Reg. No. 71,397) as lead counsel for this Petition, with Manita Rawat (Reg. No. 61,944), Daniel J. Tarr (Reg. No. 66,595), and Peter M. Loderup (Reg. No. 79,839) as back-up counsel.

Petitioner Nikon Corporation designates Matthew W. Johnson (Reg. No. 59,108), Keith B. Davis (pro hac vice to be filed), Marc S. Blackman (Reg. No. 43,501), and John R. O'Donnell (Reg. No. 76,940) as counsel.

Petitioners FUJIFILM Corporation and FUJIFILM North America Corporation designate T. Vann Pearce, Jr. (Reg. No. 58,945) and Anri Nakamoto (pro hac vice to be filed) as counsel.

Petitioner Panasonic designates Joseph M. Casino (Reg. No. 57,224) and Thomas M. Landman (Reg. No. 71,073) as counsel.

Pursuant to 37 C.F.R. §42.10(b), each of the Petitioners is filing a respective Power of Attorney concurrently herewith.

8.4 Service Information

Petitioners request service via electronic mail at OIT-685Patent-IPR@morganlewis.com, mwjohnson@jonesday.com, kbdavis@jonesday.com,

msblackman@jonesday.com, jodonnell@jonesday.com, anakamoto@orrick.com, TVPPTABDocket@orrick.com, jcasino@wiggin.com, and tlandman@wiggin.com.

Alternatively, service can be made via postal mail to Morgan, Lewis & Bockius LLP, 1301 Second Ave., Suite 3000, Seattle, WA (Tel. 206-274-6400; Fax 206-274-6401).

9. Conclusion

As demonstrated above, the Challenged Claims are old, obvious, and, therefore, need to be canceled.

Dated: August 29, 2024

Respectfully Submitted,

/ Alexander B. Stein /

Alexander B. Stein, Reg. No. 71,397
for Olympus and OMDS

/ Marc S. Blackman /

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U.S. PATENT NO. 10,873,685 – LISTING OF CHALLENGED CLAIMS

Claim No.	Claim Element(s)
1[pre]	A digital imaging system for correcting optical image aberrations in a digital video, comprising:
1[a]	a digital video camera including in-camera software, an optical lens mechanism, at least one digital sensor for capturing the digital video, an integrated circuit including; a digital signal processor configured to access a database management system including a plurality of optical image aberration corrections, and a memory storage sub-system;
1[b]	wherein the optical lens mechanism is a zoom lens or a fixed focal length lens;
1[c]	wherein the integrated circuit uses the in-camera software to identify at least one optical image aberration and to correct the at least one optical image aberration in at least one frame of the digital video using at least one of the plurality of optical image aberration corrections in the database;
1[d]	wherein the video is captured by the at least one digital sensor and is forwarded to the digital signal processor;
1[e]	wherein the video image file with the at least one optical image aberration is corrected by applying digital filtration using the digital signal processor; and
1[f]	wherein the corrected video consisting of the digital data optimized from the at least one optical image aberration that are corrected from the original video image is stored in the memory storage sub-system.
2[pre]	The system of claim 1:
2[a]	wherein the optical image aberrations include at least one of spherical, comatic, lens distortion, astigmatism, curvature of field,

	pin cushion, barrel distortion, chromatic aberrations, scattered light, and/or flare types of optical image aberrations.
3[pre]	The system of claim 1:
3[a]	wherein the optical image aberration is vignetting;
3[b]	wherein the digital signal processor applies neutral density filtration from one third of a stop to three stops in the center of the image and/or wherein the digital signal processor applies an algorithm to lighten the comers of the image or the digital signal processor applies both neutral density filtration in the image center and/or an algorithm to lighten the comers of the image; and
3[c]	wherein the image exposure is optimized to correct the vignetting.
4[pre]	The system of claim 1:
4[a]	wherein the digital signal processor applies at least one fast Fourier transform (FFT) algorithm to correct the at least one optical image aberration.
5[pre]	The system of claim 1:
5[a]	wherein each lens type is registered in the camera database;
5[b]	wherein the multiple optical aberrations of each lens is listed in the database;
5[c]	wherein the filtration solutions to the lens optical aberrations are listed in the database;
5[d]	wherein the filtration of each lens optical aberration is applied by the digital signal processor; and
5[e]	wherein after the digital signal processor applies the filtration to correct the optical image aberrations the corrected digital file is forwarded to storage in memory.

6[pre]	A digital imaging system for correcting image aberrations comprising:
6[a]	a digital video camera including in-camera software, an optical lens mechanism, at least one digital sensor for capturing digital video, an integrated circuit including a digital signal processor configured to access a database management system including a plurality of optical image aberration corrections, and a memory storage sub-system;
6[b]	wherein the optical lens mechanism is a zoom lens or a fixed focal length lens;
6[c]	wherein the video is forwarded to storage in memory;
6[d]	wherein at least one optical aberration in at least two frames of the digital video are identified using the in-camera software and the integrated circuit;
6[e]	wherein the at least one optical aberration from the optical lens mechanism of at least two frames of the digital video are corrected by using the digital signal processor to apply at least one digital filtration algorithm; and
6[f]	wherein the corrected digital video file is stored in memory.
7[pre]	The system of claim 6:
7[a]	wherein the optical image aberrations include spherical, comatic, lens distortion, astigmatism, chromatic aberrations, curvature of field, pin cushion, barrel distortion, scattered light, and/or flare types of optical aberrations.
8[pre]	The system of claim 6:
8[a]	wherein the digital signal processor applies at least one fast Fourier transform (FFT) algorithm to correct the at least one optical image aberration.

9[pre]	The system of claim 6:
9[a]	wherein the digital signal processor applies a fast Fourier transform (FFT) algorithm to correct digital aberrations of at least two frames in the digital video.
10[pre]	The system of claim 6:
10[a]	wherein the digital signal processor applies color filtration to at least two frames of the digital video image.
11[pre]	The system of claim 6:
11[a]	wherein the digital video is filtered to correct at least one optical and/or digital aberrations after initial capture and before the digital video is initially sent to storage.
12[pre]	The system of claim 6:
12[a]	wherein the integrated circuit may be a microprocessor, an application specific integrated circuit or a system on a chip.
13[pre]	The system of claim 6:
13[a]	wherein the optical image aberration is vignetting;
13[b]	wherein the digital signal processor applies neutral density filtration from one third of a stop to three stops in the center of the image and/or wherein the digital signal processor applies an algorithm to lighten the comers of the at least two image frames or the digital signal processor applies both neutral density filtration in the image center and/or an algorithm to lighten the comers of the image of at least two image frames; and
13[c]	wherein the image exposure for at least two frames in the digital video file is optimized to correct the vignetting.

14[pre]	A digital imaging system for correcting image aberrations comprising:
14[a]	a digital video camera including in-camera software, an optical lens mechanism, at least one digital sensor for capturing digital video, an integrated circuit including a digital signal processor configured to access a database management system including a plurality of optical image aberration corrections, and a memory storage sub-system;
14[b]	wherein the optical lens mechanism is a zoom lens;
14[c]	wherein the zoom lens changes focal length positions;
14[d]	wherein when the digital video is forwarded to the digital signal processor and to memory;
14[e]	wherein the integrated circuit uses system software to access the database to identify at least one optical aberration in at least one frame of the video at any focal length of a zoom lens configuration;
14[f]	wherein the integrated circuit accesses the database to obtain at least one filtration correction algorithm to the optical image aberration of at least one frame in the video file and forwards the at least one filtration algorithms to the digital signal processor;
14[g]	wherein the digital video is forwarded to the digital signal processor which applies at least one filtration algorithm to optimize the digital video and corrects the at least one optical image aberration in at least one video frame for the at least one focal length in the zoom lens configuration; and
14[h]	wherein the corrected digital video is stored in memory.
15[pre]	The system of claim 14:
15[a]	wherein the optical aberrations include vignetting, spherical, comatic, lens distortion, chromatic aberrations, curvature of field,

	pin cushion, barrel distortion, scattered light, and/or flare types of optical aberrations.
16[pre]	The system of claim 14:
16[a]	wherein the digital signal processor applies a fast Fourier transform (FFT) algorithm to correct optical and/or digital aberrations in the digital video.
17[pre]	The system of claim 14:
17[a]	wherein each focal length of a zoom lens in at least one video image frame is analyzed for a different set of optical aberrations.
18[pre]	The system of claim 14:
18[a]	wherein the digital signal processor applies color filtration to at least one frame of the digital video image.
19[pre]	The system of claim 14:
19[a]	wherein the optical image aberration is vignetting;
19[b]	wherein the digital signal processor applies neutral density filtration from one third of a stop to three stops in the center of the image and/or wherein the digital signal processor applies an algorithm to lighten the corners of at least one image frame or the digital signal processor applies both neutral density filtration in the image center and/or an algorithm to lighten the corners of the image of at least one image frame; and
19[c]	wherein the image exposure for at least one frame in the digital video file is optimized to correct the vignetting.
20[pre]	The system of claim 1,
20[a]	wherein the system is configured to correct red-eye.

21[pre]	The system of claim 1,
21[a]	wherein the system is configured to correct for dust.
22[pre]	The system of claim 1,
22[a]	wherein the system includes machine readable instructions for the system to correct for spherical aberrations.
23[pre]	The system of claim 1,
23[a]	wherein the system includes machine readable instructions for the system to correct for chromatic aberrations.
24[pre]	The system of claim 1,
24[a]	wherein the system includes machine readable instructions for the system to correct for scattered light aberrations.
25[pre]	The system of claim 1,
25[a]	wherein the system includes machine readable instructions for the system to correct for comatic aberrations.
26[pre]	The system of claim 1,
26[a]	wherein the system includes machine readable instructions for the system to correct for astigmatism aberrations.
27[pre]	The system of claim 1,
27[a]	wherein the system includes machine readable instructions for the system to correct for lens distortion aberrations.
28[pre]	The system of claim 1,
28[a]	wherein the system includes machine readable instructions for the system to correct for pin cushion aberrations.

29[pre]	The system of claim 1,
29[a]	wherein the system includes machine readable instructions for the system to correct for curvature of field aberrations.
30[pre]	The system of claim 1,
30[a]	wherein the system includes machine readable instructions for the system to correct for barrel distortion aberrations.

CERTIFICATION OF COMPLIANCE WITH TYPE-VOLUME LIMITS

As counted by Microsoft Word, this Petition includes 14,000 words and is therefore in compliance with the 14,000-word limit established by 37 C.F.R. §42.24(a)(1)(i). Accordingly, pursuant to 37 C.F.R. §42.24(d), Petitioners' lead counsel hereby certifies that this Petition complies with the type-volume limits established for an IPR petition.

Dated: August 29, 2024

Respectfully Submitted,

/ Alexander B. Stein /

Alexander B. Stein, Reg. No. 71,397

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §42.6(e)(4) and 42.105, lead counsel for Petitioners hereby certifies that on August 29, 2024, copies of this Petition and all supporting exhibits were sent via Priority Mail Express to the correspondence address of record for the ‘685 Patent:

Optimum Imaging Technologies LLC
8701 Shoal Creek Blvd. #401
Austin, Texas 78757

Courtesy copies have also been delivered electronically to opposing counsel of record for the District Court Case:

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Dated: August 29, 2024

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