

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of: Jin
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Title: MOVING IMAGE DATA PROCESSING APPARATUS
AND MOVING IMAGE DATA PROCESSING METHOD

DECLARATION OF DAVID B. LETT

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1. I, David B. Lett, of Atlanta, Georgia, declare that:

I. BACKGROUND

2. My name is David B. Lett, and I have been retained on behalf of TikTok Inc. to offer technical opinions relating to U.S. Patent No. 9,445,041 (“the ’041 patent”) and prior art references relating to its subject matter. My experience with digital audio and video technologies provides me with an understanding of the subject matter described and claimed in the ’041 patent.

3. I am a technical consultant and product development industry veteran with expertise in electronics, software, hardware, video, audio, and data communications, having led product development organizations in cable, satellite, consumer electronics, asset tracking, remote tank logistics, and alarm industries. My current *curriculum vitae* is attached as Appendix A and some highlights follow.

4. I earned my B.S. in Electrical Engineering (1982) with high honors from the University of Tennessee in Knoxville, Tennessee. I also attended the Georgia Institute of Technology from 1986 to 1987, completing 40% of the required degree hours for the M.S. Electrical Engineering program,

5. From 1982 to 1985, I worked at Scientific Atlanta as an Electrical Engineer designing video, audio, and data communications equipment for the cable television industry. I designed software and hardware including addressable data

transmitters, video sync suppression scramblers, transaction format converters, and data channel monitors for addressable Cable Television systems and Set Top Boxes.

6. From 1983 to 1985, while working at Scientific Atlanta, I also worked as an Assistant Professor at Devry Institute of Technology, teaching courses in electronics and microprocessor hardware/software.

7. From 1985 to 1990, I worked at Wegener Communications as a Senior Electrical engineer, designing satellite communications equipment including forward error correction (FEC) coding systems, PSK modems, and analog control systems for RF modulators and PSK demodulators. I was promoted to the Hardware Engineering Manager, where I managed product development of video, audio, and data satellite receivers, modulators, graphics display systems, DSP-based compandors, FSK and PSK satellite modems, multiplexers, forward error correction (FEC) codecs, RF upconverters and downconverters, and baseband analog and digital processing components.

8. In 1990, I returned to Scientific Atlanta, which was acquired by Cisco in 2006. I worked as Engineering Manager running the set top box engineering group where I was promoted to Director and Vice President during my tenure until 2011. I led the design of many cable set top boxes and systems through the evolution of analog video, addressability, downloadable software, electronic

program guides, digital video, software applications, high-definition TV, DVR, DOCSIS, full spectrum tuners, and multiroom DVR. These systems implemented various technologies including DOCSIS 1/2/3 and hybrid gateways, 802.11, IPTV, DVR, cable modems, ADSL, VDSL, DVB-T/C/S, bootloaders, factory diagnostics, application frameworks, Nagra, DRMs, conditional access, secure microprocessors, device management, Android, Adobe Flash, Linux, DVD play/record, MPEG-4, MPEG-2, H.264, NTSC, PAL, DAVIC, MoCA, high-performance CPUs, cablecards, network processors, HDMI, multiple video/audio display interfaces, 2D/3D graphics, multiple RF tuners, and full spectrum tuners.

9. From 2011 to 2016, I worked for EchoStar Technologies, which served as the product development organization for sister company DISH Network. I served as Vice President of Engineering and was the Head of the Atlanta research and development center. I led the development of satellite set top boxes, consumer electronic equipment, and a home automation and security system. Technologies used included video/audio, IoT, H.265, HEVC, 3D, Satellite, wireless, MoCA, transcoding, embedded C Linux applications, mobile applications (IOS and Android), SaaS, web applications (Javascript, HTML), BSS/OSS, AWS cloud storage, 2-way video/audio streaming, authentication, and VoIP.

10. In 2016, I started an independent consulting business in technology and intellectual property projects. I have consulted in various technology areas and

industries including consumer electronics, cable, satellite, television, and cryptocurrency.

11. From 2019 to 2022, I worked as Chief Technology Officer for Telular, an Ametek company. I was responsible for the development of Industrial IoT (IIoT) recurring revenue solutions, combining wireless technologies, purpose-built hardware, and SaaS in the commercial telematics, security and home automation markets and sold under the SkyBitz and Telguard Brands.

12. My record of professional service includes awards on products I designed and developed from several organizations in my field of expertise, including Best of Show, Technology Emmy, and Best of Innovations.

13. I am a named inventor on 36 issued patents and published patent applications corresponding to the areas of my professional work. The patents and published applications involving video and audio technologies include:

- U.S. Patent No. 9,615,139 titled “Determining Device That Performs Processing of Output Pictures”
- U.S. Patent No. 9,882,736 titled “Remote Sound Generation for a Home Automation System”
- U.S. Patent No. 8,549,567 titled “Media Content Sharing Over a Home Network”
- U.S. Patent No. 8,161,388 titled “Interactive discovery of display device characteristics”
- U.S. Patent No. 7,908,625 titled “Networked Multimedia System”

- U.S. Patent Nos. 7,861,272 and 7,849,486 titled “Networked subscriber television distribution”
- U.S. Patent No. 5,715,515 titled “Method and apparatus for downloading on-screen graphics and captions to a television terminal”
- U.S. Patent No. 5,592,551 titled “Method and apparatus for providing interactive electronic programming guide”
- U.S. Patent No. 5,539,822 titled “System and Method for Subscriber Interactivity in a Television System”
- U.S. Patent No. 5,357,276 titled “Method of Providing Video On Demand with VCR Like Functions”
- U.S. Patent Application Publication Nos. 2004/0068753 and 2008/0072272 titled “Video Transmission Systems and Methods for a Home Network”
- U.S. Patent Application Publication No. 2004/0133911 titled “Subscriber Network in a Satellite System”

14. My opinions, as explained below, are based on my education, experience, and expertise in the fields relating to the '041 patent. Any figures that appear within this document have been prepared with the assistance of Counsel and reflect my understanding of the '041 patent and the prior art discussed below.

15. I have no financial interest in the party or in the outcome of this proceeding. I am being compensated for my work as an expert on an hourly basis. My compensation is not dependent on the outcome of these proceedings or the content of my opinions.

16. I have reviewed the '041 patent and relevant excerpts of the prosecution history of the '041 patent. I have also reviewed the following prior art references and materials, in addition to other materials I cite in my declaration:

- U.S. Patent No. 9,445,041 (“the '041 patent” or TIKTOK-1001);
- Excerpts from the Prosecution History of the '041 patent (TIKTOK-1002);
- U.S. Patent Publication No. 2010/0226622 to Morikawa (“Morikawa” or TIKTOK-1004)
- Certified Translation of PCT Publication No. WO 2004/090703 to Takabe et al. (“Takabe” or TIKTOK-1005)
- Walpole et al., *A Player for Adaptive MPEG Video Streaming Over the Internet*, Proceedings of the 26th AIPR Workshop (October 15-17 1997) (“Walpole” or TIKTOK-1006)
- U.S. Patent Publication No. 2012/0314967 to Suzuki (“Suzuki” or TIKTOK-1007)
- U.S. Patent Publication No. 2011/0097059 to Sekiguchi (“Sekiguchi” or TIKTOK-1008)

17. Counsel has informed me that I should consider these materials through the lens of one of ordinary skill in the art related to the '041 patent at the time of the earliest possible priority date of the '041 patent, and I have done so during my review of these materials. The '041 patent claims an earliest priority date of December 28, 2012 (hereinafter the “Critical Date”). Counsel has informed me that the Critical Date represents the earliest priority date to which the

challenged claims of '041 patent are entitled, and I have therefore used that Critical Date in my analysis below. Unless otherwise stated, my testimony below refers to the knowledge of one of ordinary skill in the art as of the Critical Date, or before.

II. THE '041 PATENT

A. Brief Description

18. The '041 patent, titled “Moving image data processing apparatus and moving image data processing method,” issued on September 13, 2016 from an application filed on December 26, 2013, and claims foreign priority to Japanese patent application filed December 28, 2012.¹ TIKTOK-1001, Face.

19. The '041 patent describes techniques for “moving image data” (*e.g.*, video) “processing” that purportedly enable “*play back [of] moving image data generated at various frame rates at an arbitrary frame rate and playback speed.*” *Id.*, 19:31.² The patent describes a system that receives “moving image data” as input, and “specifies a frame rate of [the] moving image data.” *Id.*, 7:58-59. For example, “if the image capture frame rate information or information of a similar

¹ Petitioner does not concede that the '041 patent is entitled to this foreign priority date, and reserves the right to challenge the validity of this priority claim in this and other proceedings.

² All emphasis added unless indicated otherwise.

kind, is described in a predetermined data area, or is present as metadata, the input frame rate is specified based on them.” *Id.*, 8:3-6.

20. The system also “specifies” an “output frame rate ... of output moving image data when the moving image data is to be output.” *Id.*, 8:11-13.

The patent describes that this output frame rate can be specified based on a “selection by the user, ... based on the setting of an external device being an output destination” (e.g., based on a frame rate supported by an output device), or based on other considerations. *Id.*, 8:16-17.

21. The system also specifies a “playback speed of the moving image data to be output.” *Id.*, 8:59. The patent describes that a “user can select/set the playback speed” or “a predetermined playback speed (for example, only the equal speed), for example, only equal-speed playback, may be used,” in which case the system “specifies the predetermined playback speed as the playback speed of the moving image data to be output.” *Id.*, 9:4-17.

22. The patent further describes that the system “converts the frame rate of the input moving image data based on the specified output frame rate and playback speed.” *Id.*, 9:18-20. The ’041 patent states that the “***conversion of the frame rate***” can be “***performed based on a known method*** such as interpolation in addition to decimation.” *Id.*, 9:20-23.

B. The Prosecution History

23. During prosecution of the application that eventually issued as the '041 patent, the Patent Office issued a single Office Action rejecting all pending claims as anticipated by U.S. Patent Application Publication No. 2010/0310229 to Iwata. *See* TIKTOK-1002, 76. In response, the applicant argued that “Iwata does not disclose” the feature, recited in claims 1 and 6 of the '041 patent, of “an output frame rate specification unit configured *to specify the playback frame rate* of a first video data, and the playback frame rate of a second video data” because “the playback frame rate in Iwata is *fixed*.” *Id.*, 70 (emphasis in original). “Playback speed refers to how fast or slow the playback time is compared to the shooting time, and thus does not refer to *the playback frame rate*, which, in Iwata, *is apparently determined by the display device*.” *Id.*, 71. “In other words” applicant continued, “while the playback frame rate of Iwata is a factor in the playback speed relationship discussed above, *the playback frame rate is fixed*, and *only playback speed and decimation or interpolation are changed* for a given shooting frame rate.” *Id.* (emphasis in original).

24. Curiously, these arguments appear to contradict the specification of the '041 patent, which, as discussed above, states that the output frame rate can be specified based on a “*based on the setting of an external device being an output destination*.” TIKTOK-1001, 8:16-17.

25. Nevertheless, the Office responded to these arguments with a Notice of Allowance, and the '041 patent issued on September 13, 2016. *Id.*, Face.

C. Level of Ordinary Skill in the Art

26. The testimony evidence here confirms that a person of ordinary skill in the art at the time of the '041 patent (a “POSITA”) would have had at least a Bachelor’s degree in computer science, electrical engineering, computer engineering, or a related field, with 2-3 years of experience in digital video processing, or a related field, or equivalent research or professional experience.

D. Claim Construction

27. I have been informed that claim terms in IPR should be interpreted according to the *Phillips* standard. *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005); 37 C.F.R. § 42.100. I have been informed that “claim terms need only be construed to the extent necessary to resolve the controversy.” *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011). Based on the evidence presented herein and the prior art’s description of the claimed elements being similar to that of the '041 patent specification, in my opinion no formal claim constructions are necessary in this proceeding.

III. THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. GROUND 1A: Claims 1-2, 4, and 6 are obvious over Morikawa³

1. Overview of Morikawa

28. Morikawa, a U.S. Patent Publication entitled “Video player and video playback method,” describes a “video playing apparatus 101.” TIKTOK-1004, [0022], FIG. 1; *see also* [0009]. The apparatus includes an “input unit for inputting video data of the video contents.” TIKTOK-1004, [0009], [0023], and FIG. 1. These “video contents” may be, for example, “composed of a first portion recorded at a first frame rate and a second portion recorded at a second frame rate higher than the first frame rate.” *Id.*, [0009]. Morikawa “analyzes video data throughout the entire contents based on metadata and frame rate information attached to video data as header information.” *Id.*, [0023], [0025], FIG. 8.

29. Morikawa provides that its rate “analysis unit ... calculat[es] a first playback time when the entire video contents are played back by applying a first frame decimating process to video in [a] second portion” of inputted video contents having a higher frame rate than video in a first portion of the contents

³ General descriptions provided for the references and combinations are incorporated into each subsection addressing/applying those references, as are the discussions of combinations.

“based on a predetermined playback frame rate.” TIKTOK-1004, [0009], Claim 1;
see also Abstract, FIG. 1.

2. Analysis

(a) Claim 1

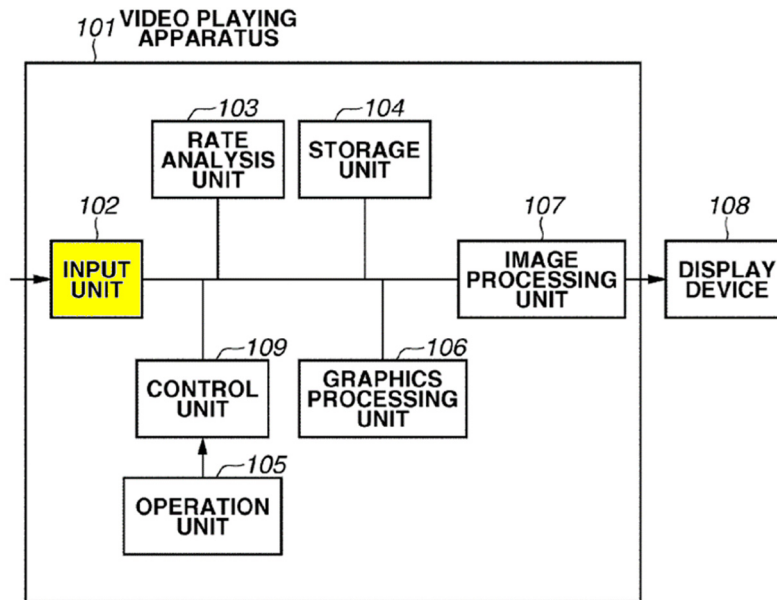
[1.0]: “A moving image data processing apparatus comprising:”

30. To the extent that the preamble is determined to be limiting, Morikawa describes a “video” (*i.e.*, “moving image data”) “playing apparatus 101” that includes, among other components, an “image processing unit 107 subjects video data to an image process such as resolution conversion [or] frame rate conversion.” TIKTOK-1004, [0022], FIG. 1; *see also* [0009].

[1.1]: “a moving image data input unit configured to be input of first moving image data generated at a first frame rate and second image data generated at a second frame rate that is different from the first frame rate;”

31. Morikawa provides that its video playing apparatus includes an “input unit for inputting video data of the video contents,” such as the “input unit 102” shown in FIG. 1. TIKTOK-1004, [0009], [0023], FIG. 1:

FIG.1



TIKTOK-1004, FIG. 1 (annotated)

32. Morikawa describes that the “input unit 102 is an input interface of video contents.” TIKTOK-1004, [0009], [0023], FIG. 1. These “video contents [are] composed of *a first portion recorded at a first frame rate* and *a second portion recorded at a second frame rate higher than the first frame rate.*” *Id.*, [0009]. In more detail, Morikawa explains that “contents within which the frame rate changes ... are termed multi-frame rate contents.” *Id.*, [0005]. These “multi-frame rate contents are composed of *a high frame-rate portion (second portion)* of a high frame rate (second frame rate) and *an ordinary frame rate portion (first portion)* of an ordinary frame rate (first frame rate).” *Id.*, [0024]. As shown in FIGS. 2 and 8 of Morikawa (reproduced below), these multi-frame rate contents

can include multiple high frame rate portions, such as a first frame rate portion of 120 fps and a second frame rate portion of 300 fps. *See id.*, FIG. 8; *see also* FIG. 2.

33. Morikawa explains that these “portions” of the content represent different image data. For example, as shown in FIG. 2, Morikawa provides that “content A” (the same content shown in FIG. 8) includes five different video “scenes” having different frame rates, such as a first scene having an ordinary frame rate, a second scene having a frame rate five times as high as the ordinary frame rate, and a fourth scene having a frame rate twice as high as the ordinary frame rate. *See id.*, [0028]-[0029], FIG. 2.

202 CONTENT INFORMATION

CONTENT A

SCENE	NORMAL PLAYBACK TIME	HIGH FRAME-RATE PORTION	SLOW PLAYBACK
1	5 MINUTES	×	
2	10 SECONDS	5 TIMES AS HIGH	50 SECONDS
3	2 MINUTES	×	
4	20 SECONDS	TWICE AS HIGH	40 SECONDS
5	3 MINUTES	×	

TOTAL PLAYBACK TIME OF ENTIRE CONTENT
NORMAL PLAYBACK TIME 10' 30"
SLOW PLAYBACK 11' 30"

High frame rate portions

TIKTOK-1004, Detail of FIG. 2 (annotated)

34. FIG. 8 of Morikawa provides example frame rate information for the different scenes of contents A. TIKTOK-1004, FIG. 8:

801 FRAME RATE INFORMATION

CONTENT A

TIME STAMP (h.m.s)	FRAME RATE (fps)
00.00.00	60
00.05.00	300
00.05.10	60
00.07.10	120
00.07.30	60
00.10.30	end

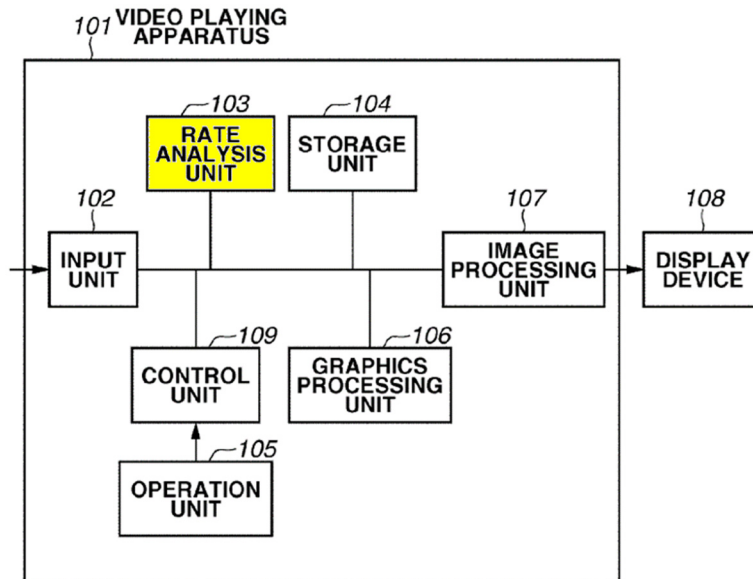
High frame rate portions

TIKTOK-1004, Detail of FIG. 8 (annotated)

[1.2]: “an input frame rate specification unit configured to specify the first frame rate of the first moving image data and the second frame rate of the second moving image data, the first and second moving image data having been input into the moving image data input unit;”

35. Morikawa provides that its video playing apparatus “includes a **rate analysis unit** for calculating playback time in the respective playback modes **by analyzing a frame rate of multi-frame rate contents.**” TIKTOK-1004, Abstract, [0023], FIG. 1. FIG. 1 from Morikawa shows the rate analysis unit 103 included in the video playing apparatus 101:

FIG.1



TIKTOK-1004, FIG. 1 (annotated)

36. Morikawa describes that the “[v]ideo data of input contents is transferred to [the] rate analysis unit 103” which “*analyzes video data* throughout the entire contents *based on metadata and frame rate information attached to video data as header information.*” *Id.*, [0023], [0025], FIG. 8; *cf.* TIKTOK-1001, 7:64-8:10 (“if the image capture frame rate information...is described in a predetermined data area, or is present as metadata, the input frame rate is specified based on them[.]”). For example, with respect to FIGS. 3 and 8, Morikawa explains that “in step S302, a frame rate of entire videos is analyzed by the rate analysis unit 103. More specifically, a frame rate and a playback time of each scene are calculated from the frame rate information 801” (e.g., as shown in FIG. 8) “attached to video contents.” *Id.*, [0035], FIGS. 2-3, 8; *see id.*, [0028]. These

video contents include a first scene (Scene 4) having an initial specified frame rate of 120 fps and a second scene (Scene 2) having an initial specified frame rate of 300 fps, both annotated in yellow below in FIG. 2 from Morikawa. *Id.*, [0029], FIGS. 2, 8:

202 CONTENT INFORMATION

CONTENT A

SCENE	NORMAL PLAYBACK TIME	HIGH FRAME-RATE PORTION	SLOW PLAYBACK
1	5 MINUTES	×	
2	10 SECONDS	5 TIMES AS HIGH	50 SECONDS
3	2 MINUTES	×	
4	20 SECONDS	TWICE AS HIGH	40 SECONDS
5	3 MINUTES	×	

TOTAL PLAYBACK TIME OF ENTIRE CONTENT
 NORMAL PLAYBACK TIME 10' 30"
 SLOW PLAYBACK 11' 30"

TIKTOK-1004, Detail of FIG. 2 (annotated)

[1.3]: “an output frame rate specification unit configured to specify output frame rate of the first moving image data and output frame rate of the second moving image data that have been input into the moving image data input unit;”

37. Morikawa provides that its rate “analysis unit...calculat[es] a first playback time when the entire video contents are played back by applying a first frame decimating process to video in [a] second portion” of inputted video

contents having a higher frame rate than video in a first portion of the contents “*based on a predetermined playback frame rate.*” TIKTOK-1004, [0009], Claim 1; *see also* Abstract, FIG. 1. Morikawa explains that this “playback frame rate is set based on a display frame rate of a display device.” *Id.*, [0025]. “More specifically, when the display frame rate is 60 HZ ..., the playback frame rate is set to 60 Hz.” *Id.*, [0026]; *c.f.*, TIKTOK-1001, 8:40-58 (“[S]pecifying the output frame rate based on the settings of an external device to be an output destination of moving image data” such as where the “output destination is limited...to 60 fps.”).

38. Accordingly, in order to calculate “[t]he playback time [of the video contents] of the normal playback mode,” the “rate analyze unit 103” identifies and, therefore, specifies the “playback frame rate” for playback of the contents. *Id.*, [0025]-[0026]; *c.f.*, TIKTOK-1001, 8:40-58.

39. The rate analysis unit of Morikawa provides the functionality of both the claimed input frame rate specification unit and the claimed output frame rate specification unit. *See* [1.2], *supra*; *see, e.g.*, TIKTOK-1004, [0009], [0025]-[0026]. To the extent the claim is interpreted to require input frame rate specification unit and the output frame rate specification unit to be separate components, it would have been obvious to a POSITA to implement the rate analysis unit of Morikawa as two separate units providing the input and output frame rate functionality, respectively. *See, e.g.*, TIKTOK-1004, [0050].

Implementing computing functionality in different units would have been well-known to a POSITA. *See id.* Moreover, implementing the input and output frame rate functionality in a single unit or two separate units would have amounted to an obvious design choice, as the apparatus would perform the same operations in either case. *See id.*

40. Accordingly, Morikawa renders this limitation obvious.

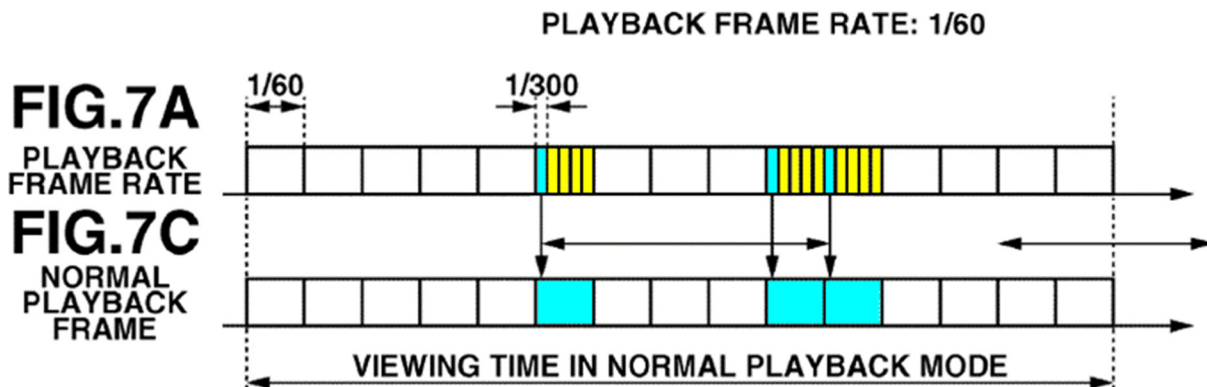
[1.4]: “a playback speed specification unit configured to specify a same playback speed for the first moving image data and the second moving image data;”

41. Morikawa provides that its video playing apparatus includes an “operation unit 105” that “is, for example, a remote controller which ... ***transmits instruction information such as a content playback [speed] to [the] control unit 109 in response to an operation of the user.***” TIKTOK-1004, [0033]-[0034], FIG.

1. For example, “the user views the multi-frame rate contents ... [and] select[s] either ***a normal playback mode or a slow playback mode.*** In the normal playback mode, a high frame rate portion is played back by adjusting a playback time by decimating out frames in the high frame-rate portion” of the video contents such that “the entire contents are ***played back at a normal speed.***” *Id.*, [0006], [0036]; *see also* [0027] (describing operation of the “slow playback mode”).

42. For example, as shown in FIGS. 7A and 7C (reproduced below), Morikawa provides that, in normal playback mode, video content portions having a high frame rate (*e.g.*, 300 fps in the annotated frames of FIG. 7A) are played back

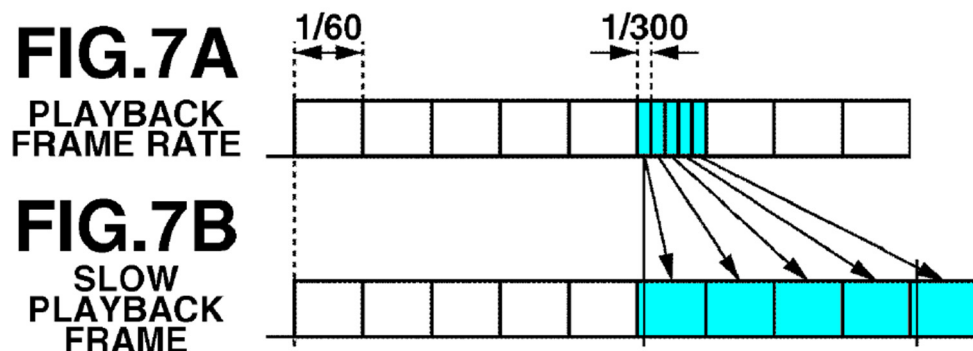
at the same speed as other video content portions having a lower frame rate (*e.g.*, 60 fps in the non-annotated frames). *Id.*, [0030], FIGS. 7A, 7C. Morikawa teaches that, in order to accomplish this, “[*f*]frames of the...high frame-rate portion[s] are *decimated out*” (*i.e.*, skipped and not displayed) “so that an overall playback time of the contents is set to a desired time when the contents are played back at a playback frame rate.” TIKTOK-1004, [0025]; *see* FIGS. 7A, 7C. The annotated FIGS 7A and 7C below show an example of this process, with the “decimated” frames annotated in yellow, and the displayed frames annotated in blue for the high frame-rate portions of the video data. *Id.*:



TIKTOK-1004, Detail of FIGS. 7A, 7C (annotated)⁴

⁴ FIG. 7B has been removed from between FIGS. 7A and 7C to more clearly show the correspondence between the video frames in FIGS. 7A and 7C.

43. In the example shown in FIGS. 7A and 7C, the playback frame rate is 60 fps (*i.e.*, each frame represents 1/60th of a second). *Id.*, FIGS. 7A, 7C. The frames shown in white in FIG. 7A are frames encoded at 60 fps, which are output without any skipping of frames. *See id.* The teal and yellow annotated frames in FIG. 7A are encoded at 300 fps. *See id.* As shown, one out of every five of the 300 fps-encoded frames is output (shown in teal), and the other 300 fps-encoded frames (shown in yellow) are skipped. *See id.* As a result of this process, all portions of the video contents are played back at the same playback speed to achieve “[a] playback time in the normal playback mode ... [that] is the same as [the] shooting time” of the contents. TIKTOK-1004, [0030]; *see* [0028]-[0029], FIG. 8. Notably, if this “decimation” process is not performed, and each of the 300 fps-encoded frames is output at the 60 fps playback frame rate, the displayed video data for these portions will appear to be in slow motion. *See, e.g.*, TIKTOK-1004, [0004]-[0005], [0027], [0029], [0040], FIGS. 7A, 7B. FIGS. 7A and 7B show an example of this process:



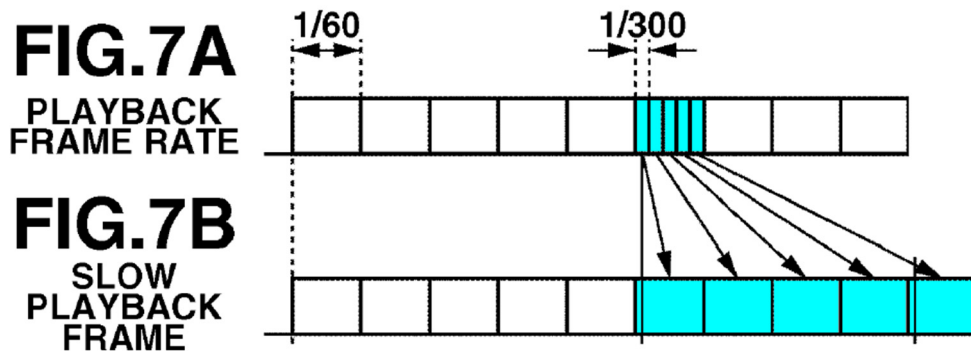
[1.5]: “a frame rate conversion unit configured to change a frame rate of the first moving image data based on the first frame rate, the output frame rate, and the playback speed, and change a frame rate of the second moving image data based on the second frame rate, the output frame rate, and the playback speed; and”

44. Morikawa provides that its video playing apparatus includes an “image processing unit 107 [that] subjects video data to an image process such as ... frame rate conversion” by “execut[ing] a frame decimating operation in response to instruction information from the operation unit 105.” TIKTOK-1004, [0032]-[0034], FIG. 1; *c.f.*, TIKTOK-1001, 13:14-22 (“[T]he decimation process described below is performed by the frame rate conversion unit 306 in a manner of reducing the total number of frames of the imaging data.”). This instruction information specifies whether the video contents should be played back in normal playback mode or slow playback mode. *See id.*, [0033]-[0034], [0039] (“After the user select the contents, he or she selects a normal playback or a slow playback.”).

45. As previously discussed (*see* [1.3], [1.4]), Morikawa describes “***applying a first frame decimating process to video in the second portion*** [of the video contents during normal playback mode]... ***based on a predetermined playback frame rate***” and avoiding the “frame decimating process or ... applying a second frame decimating process having a smaller number of frames to be decimated out than the first frame decimating process [during slow playback

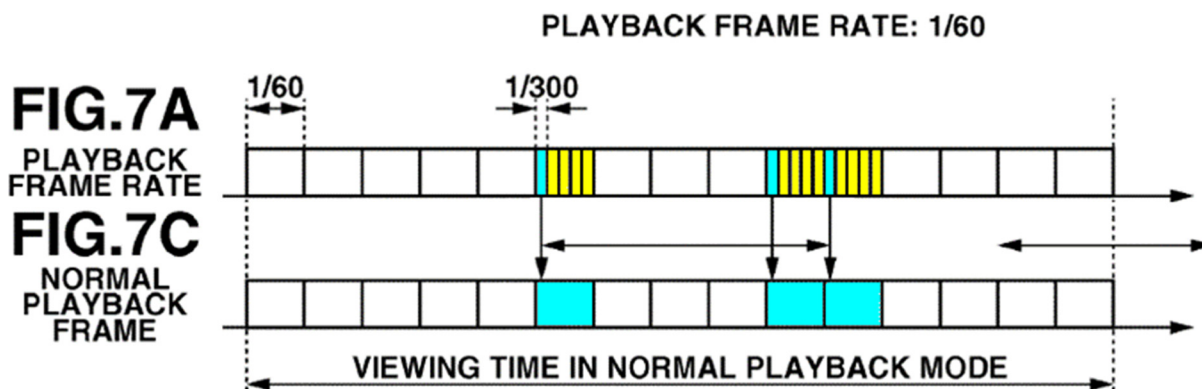
mode] ... *based on [the] predetermined playback frame rate*. *Id.*, [0009]; *see* [0025]-[0027], FIGS. 7A-7C. As previously discussed (*see* [1.2], *supra*), Morikawa further teaches that the video content can include scenes with multiple high frame-rate portions such as a first scene (Scene 4) having an initial specified frame rate of 120 fps and a second scene (Scene 2) having an initial specified frame rate of 300 fps. *Id.*, [0028]-[0029], FIGS. 2, 8.

46. The extent to which the image processing unit 107 changes the frame rate of the different scenes in the video contents is based on the initial frame rate of the respective scene, the set output frame rate of the second scene (e.g., which may be set to the same output frame rate based on the display frame rate), and the playback speed set for the video contents, e.g., the operation mode. *See id.*, [0009], [0025]-[0027], FIGS. 2, 7A, 7C, 8. For example, Morikawa provides that the 300 fps-encoded portion of the video is changed based on its initial frame rate (300 fps), the output frame rate (60 fps), and the selected playback speed. *See id.*, [0030], FIGS. 7A-7C. As shown in FIGS. 7A-7C, the selected playback speed dictates whether the 300 fps-encoded portion will be decimated or not. *Id.* In slow playback mode, as discussed above and as shown in FIGS. 7A and 7B, no frames are removed from the 300 fps-encoded. *Id.*; *see* [1.3], [1.4], *supra*:



TIKTOK-1004, Detail of FIGS. 7A, 7B (annotated)

47. In the normal playback mode, the 300 fps-encoded portion is “decimat[ed]” by a factor of 1/5 so that one out of every five frames is played back, as previously discussed and shown in FIGS 7A and 7C of Morikawa. *See* TIKTOK-1004, [0030], FIGS. 7A, 7C; [1.3], [1.4], *supra*:



TIKTOK-1004, Detail of FIGS. 7A, 7C (annotated)

48. The decimation factor of 1/5 is calculated by dividing the output frame rate (60 fps) by the encoded frame rate of the video portion (300 fps). *See* TIKTOK-1004, [0030], FIGS. 7A, 7C; [1.3], [1.4], *supra*.

49. A POSITA would have understood or at least found it obvious to apply the decimation technique described in Morikawa to video data encoded at other frame rates, such as “Scene 4” of “content A” shown in FIGS. 2 and 8, which has an input frame rate of 120 fps. *See* TIKTOK-1004, [0025]-[0029], FIGS. 2, 8. For example, in the normal playback mode and assuming a playback frame rate of 60 fps, the Scene 4 video data would be “decimat[ed]” at a factor of 1/2 so that one out of every two frames of Scene 4 is played back. *Id.* The decimation factor of 1/2 is calculated by dividing the output frame rate (60 fps) by the input frame rate of Scene 4 (120 fps). *Id.*

[1.6]: “a moving image data output unit that outputs the first and second moving image data whose frame rates have been converted by the frame rate conversion unit.”

50. As previously discussed (*see* [1.5], *supra*), Morikawa provides that its video playing apparatus includes an “image processing unit 107.” TIKTOK-1004, [0032]-[0034], FIG. 1. In addition to the functions described above, “[t]he image processing unit 107 combines the graphic data and *the video data subjected to the image process, and transmits them to a display device 108 as display data.*” *Id.*, [0033].

51. The rate analysis unit of Morikawa provides the functionality of the claimed frame rate conversion unit and the claimed moving image data output unit. *See* [1.5], *supra*; *see, e.g.*, TIKTOK-1004, [0032]-[0034], FIG. 1. To the extent the

claim is interpreted to require the frame rate conversion unit and the moving image data output unit to be separate components, it would have been obvious to a POSITA to implement such a configuration for the reasons discussed at [1.3], *supra*.

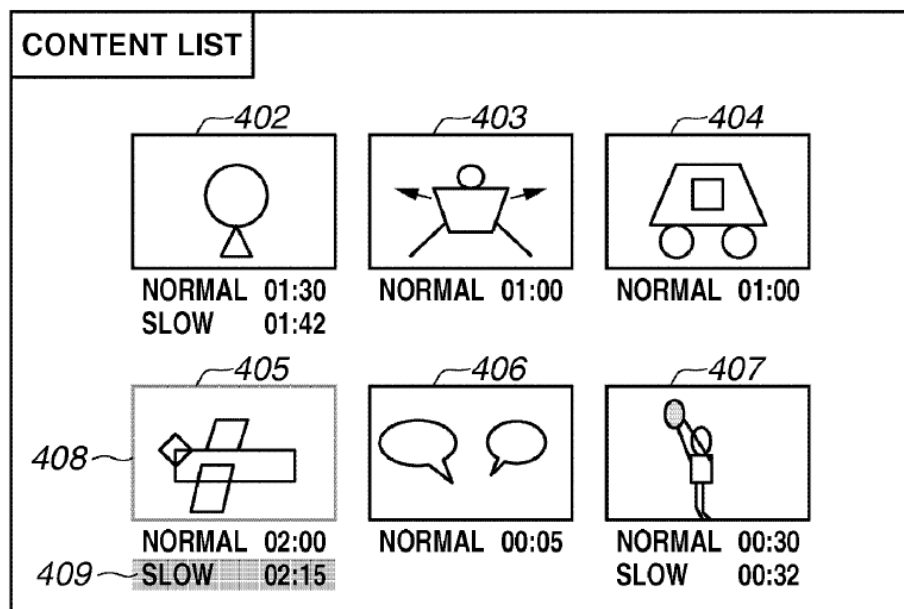
(b) Claim 2

[2.0]: “The moving image data processing apparatus according to claim 1, further comprising an operating unit configured to accept an input to specify the playback speed, wherein the playback speed specification unit specifies the playback speed based on the input that is accepted by the operating unit.”

52. As discussed above (*see* [1.5], *supra*), the control unit of Morikawa receives instruction information that includes playback speed from an “operation unit 105.” TIKTOK-1004, [0033]-[0034], FIG. 1. In more detail, Morikawa provides that its video playing apparatus includes the “operation unit 105 [which] is, for example a remote controller, which causes display of a content list or ***transmits instruction information such as a content playback to [the] control unit 109 in response to an operation of the user.***” *Id.*, [0033], FIG. 1. The user provides this operation “[w]hen the user views the multi-frame rate contents ... [and] select[s] either a normal playback mode or a slow playback mode. In the normal playback mode, a high frame rate portion is played back by adjusting a playback time by decimating out frames in the high frame-rate portion” of the video contents such that “the entire contents are ***played back at a normal speed.***” *Id.*, [0006]. [0036].

53. For example, with respect to FIG. 4 of Morikawa, “[t]he user moves a select cursor 408 among the thumbnail images by *operating the remote controller* and selects the contents which the user wants to view. After the user selects the contents, *he or she selects a normal playback or a slow playback using a playback method selection cursor.*” *Id.*, [0039], FIG. 4:

FIG.4



TIKTOK-1004, FIG. 4

(c) **Claim 4**

[4.0]: “The moving image data processing apparatus according to claim 1, wherein the output frame rate specification unit is configured to specify the output frame rate based on information of an external device receiving the moving image data output by the moving image data output unit.”

54. As previously discussed, Morikawa teaches “an output frame rate specification unit” (the rate analysis unit) “configured to specify [an] output frame rate.” See [1.3], *supra*. Morikawa further explains that the output frame rate “is set based on a display frame rate of a display device.” *Id.*, [0025]. “More specifically, when the display frame rate is 60 HZ ..., the [output] frame rate is set to 60 Hz.” *Id.*, [0026]; *cf.*, TIKTOK-1001, 8:40-58 (“[S]pecifying the output frame rate based on the settings of an external device to be an output destination of moving image data” such as where the “output destination is limited ... to 60 fps.”).

55. In order to calculate “[t]he playback time [of the video contents] of the normal playback mode,” the “rate analyze unit 103” identifies and, therefore, specifies the “playback frame rate” that the contents will be played back at. *Id.*, [0025]-[0026]; *cf.*, TIKTOK-1001, 8:40-58.

(d) **Claim 6**

[6.0]: “A moving image data processing method comprising:”

56. The preamble of claim 6 is not limiting as it fails to “recite[] limitations of the claim” and is not ““necessary to give life, meaning, and vitality’

to the claim.” *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305, 51 USPQ2d 1161, 1165-66 (Fed. Cir. 1999). However, to the extent that the preamble is determined to be limiting, Morikawa describes a “video playback method capable of playing back video contents in a plurality of playback modes using frame rate information of video contents.” TIKTOK-1004, [0002], FIGS. 3, 5.

57. Accordingly, Morikawa renders this limitation obvious.

[6.1]: “inputting first moving image data generated at a first frame rate and second image data generated at a second frame rate that is different from the first frame rate;”

58. See [1.1].

[6.2] “specifying the first frame rate of the first moving image data and the second frame rate of the second moving image data, the first and second moving image data having been input;”

59. See [1.2].

[6.3]: “specifying output frame rate of the first moving image data and output frame rate of the second moving image data that have been input”

60. See [1.3].

[6.4]: “specifying a same playback speed for the first moving image data and the second moving image data;”

61. See [1.4].

[6.5]: “changing a frame rate of the first moving image databased on the first frame rate, the output frame rate, and the playback speed, and changing the frame rate of the second moving image data based on the second frame rate, the output frame rate, and the playback speed; and”

62. See [1.5].

[6.6]: “outputting the first and second moving image data whose frame rates have been changed.”

63. See [1.6].

B. GROUND 1B: Claim 3 is obvious over Morikawa in view of Takabe

1. Overview of Takabe

64. Takabe describes that “in a device equipped with a display panel for displaying captured (taken images), such as a digital camera or video camera, the captured images are superimposed on that display panel, and the various setting state is displayed.” TIKTOK-1005, 1:10-13. “[V]alues and items for states that can be selected in multiple stages are positioned in order in designated places within a virtually set section of a circle or ellipse” (i.e., a circular ring shape) “on the display panel.” *Id.*, Summary.

2. Reasons to combine Morikawa and Takabe

65. It would have been obvious to a POSITA to use Takabe’s circular ring shape interface component to display and enable a user to specify the moving image data parameters described in the apparatus of Morikawa, such as the first frame rate (*see* [1.2], *supra*), second frame rate (*see* [1.2], *supra*), or the playback speed (*see* [1.4], *supra*). *See, e.g.*, TIKTOK-1005, 4:1-3, 5:13-17, 7:17-22, 9:14-15; [1.2], [1.4], *supra*. Takebe describes that its circular ring shape interface component “is easy to understand” and provides the benefit of making it “easy” to determine “where within the selectable range the selected value is.” TIKTOK-

1005, 4:1-3, 7:17-22; *see also* 5:13-17, 9:14-15. A POSITA would have been motivated to implement a circular ring shape interface component in Morikawa as described above in order to obtain these and other benefits described by Takabe as resulting from the use of the component. *See, e.g.*, TIKTOK-1005, 4:1-3, 5:13-17, 7:17-22, 9:14-15.

66. Further, a POSITA would have found it obvious to modify Morikawa based on Takabe's teachings because doing so entails the use of known solutions to improve similar systems and methods in the same way. I have been informed that "when a patent 'simply arranges old elements with each performing the same function it had been known to perform' and yields no more than one would expect from such an arrangement, the combination is obvious." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007). A POSITA would have recognized that applying Takabe's teachings to augment Morikawa would have led to predictable results without significantly altering or hindering the functions performed by Morikawa's system.

67. In fact, a POSITA would have been motivated to incorporate the well-known techniques of Takabe's into Morikawa to achieve the predictable benefits described in Takabe. *See, e.g.*, TIKTOK-1005, 4:1-3, 5:13-17, 7:17-22, 9:14-15. Indeed, a POSITA would have had a reasonable expectation of success incorporating Takabe's teachings into Morikawa, because Takabe describes an

imaging device operating in the proposed manner. *See* TIKTOK-1005, Summary, 1:10-13, 4:1-3, 5:13-17, 7:17-22, 9:14-15.

68. Accordingly, for at least these reasons, augmenting Morikawa's device based on the teachings of Takabe would have been routine and straightforward to a POSITA, and it would have been clear that such a combination would predictably work and provide the expected results. *Id.*

3. Analysis

(a) Claim 3

[3.0]: “The moving image data processing apparatus according to claim 1, further comprising a display unit, wherein the operating unit accepts the inputs continuously, and the moving image data output unit makes the display unit display the first frame rate, second frame rate, or the playback speed thereon arranged in a circular ring shape, makes the display unit display the circular ring shape of the first frame rate, second frame rate, or the playback speed in a rotating manner in accordance with the input of the operating unit, and specifies the first frame rate, the second frame rate, or the playback speed.”

69. In the combination, Takabe describes that “in a device equipped with a display panel for displaying captured (taken images), such as a digital camera or video camera, the captured images are superimposed on that display panel, and the various setting state is displayed.” TIKTOK-1005, 1:10-13. “[V]alues and items for states that can be selected in multiple stages are positioned in order in designated places within a virtually set section of a circle or ellipse” (*i.e.*, a circular ring shape) “on the display panel.” *Id.*, Summary.

70. Takabe further describes that a circular ring shape is used to display and set the “shutter speed value” of the imaging device, but that other “value[s] that can be adjusted in a plurality of stages” can be displayed using this technique. *Id.*, 20:14-24. As described above (*see* Section III.B.2, *supra*), it would have been obvious to a POSITA to use Takabe’s circular ring shape interface component to display and enable a user to specify the moving image data parameters described in Morikawa, such as the first frame rate (*see* [1.2], *supra*), second frame rate (*see* [1.2], *supra*), or the playback speed (*see* [1.4], *supra*). *See, e.g.*, TIKTOK-1005, 20:14-24; [1.2], [1.4], *supra*.

C. GROUND 1C: Claim 5 is obvious over Morikawa in view of Walpole

1. Overview of Walpole

71. Walpole describes “adaptive multimedia applications that attempt to preserve presentation quality in one dimension, by allowing quality to vary in other dimensions when resources become scarce.” TIKTOK-1006, 270. “For example, when *available network bandwidth* becomes scarce, an adaptive video player could reduce presentation quality in the frame rate dimension (*i.e.*, temporal resolution) in order to preserve real-time play out at a given spatial resolution.” *Id.*

2. Reasons to combine Morikawa and Walpole

72. It would have been obvious to a POSITA to modify Morikawa to specify the output frame rate based on currently available network bandwidth, as

taught by Walpole. Morikawa describes its video processing system as network-enabled. TIKTOK-1004, [0023]. Walpole describes that “when available network bandwidth becomes scarce, an adaptive video player could reduce presentation quality in the frame rate dimension ... in order to preserve real-time play out at a given spatial resolution.” TIKTOK-1006, 270. Such an adaptive scheme would lead to a better user experience by maintaining allowing full motion video (*i.e.*, “real-time play out”) to be preserved at a lower frame rate, as opposed to lagging or choppy video at a higher frame rate. *Id.*, 276. Walpole further describes that this approach also provides a benefit to the network by reducing the number of packets (*i.e.*, those carrying video data) sent over the network during times of network congestion or other issues. TIKTOK-1006, 276-279. A POSITA would have been motivated modify Morikawa to specify the output frame rate based on currently available network bandwidth as described above in order to obtain these and other benefits described by Walpole as resulting from the use of its techniques. *See, e.g.*, TIKTOK-1006, 276-279.

73. Further, a POSITA would have found it obvious to modify Morikawa based on Walpole teachings because doing so entails the use of known solutions to improve similar systems and methods in the same way. I have been informed that “when a patent ‘simply arranges old elements with each performing the same function it had been known to perform’ and yields no more than one would expect

from such an arrangement, the combination is obvious.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007). A POSITA would have recognized that applying Walpole’s teachings to augment Morikawa would have led to predictable results without significantly altering or hindering the functions performed by Morikawa’s system.

74. In fact, a POSITA would have been motivated to incorporate the well-known techniques of Walpole’s into Morikawa to achieve the predictable benefits described in Walpole. *See, e.g.*, TIKTOK-1006, 270, 276-279. Indeed, a POSITA would have had a reasonable expectation of success incorporating Walpole’s teachings into Morikawa, because Walpole describes a device operating in the proposed manner. *See* TIKTOK-1006, 270, 276-279.

75. Accordingly, for at least these reasons, augmenting Morikawa’s device based on the teachings of Walpole would have been routine and straightforward to a POSITA, and it would have been clear that such a combination would predictably work and provide the expected results. *Id.*

3. Analysis

(a) Claim 5

[5.0]: “The moving image data processing apparatus according to claim 1, wherein the output frame rate specification unit is configured to specify the output frame rate based on network band information of an external device receiving the moving image data output by the moving image data output unit.”

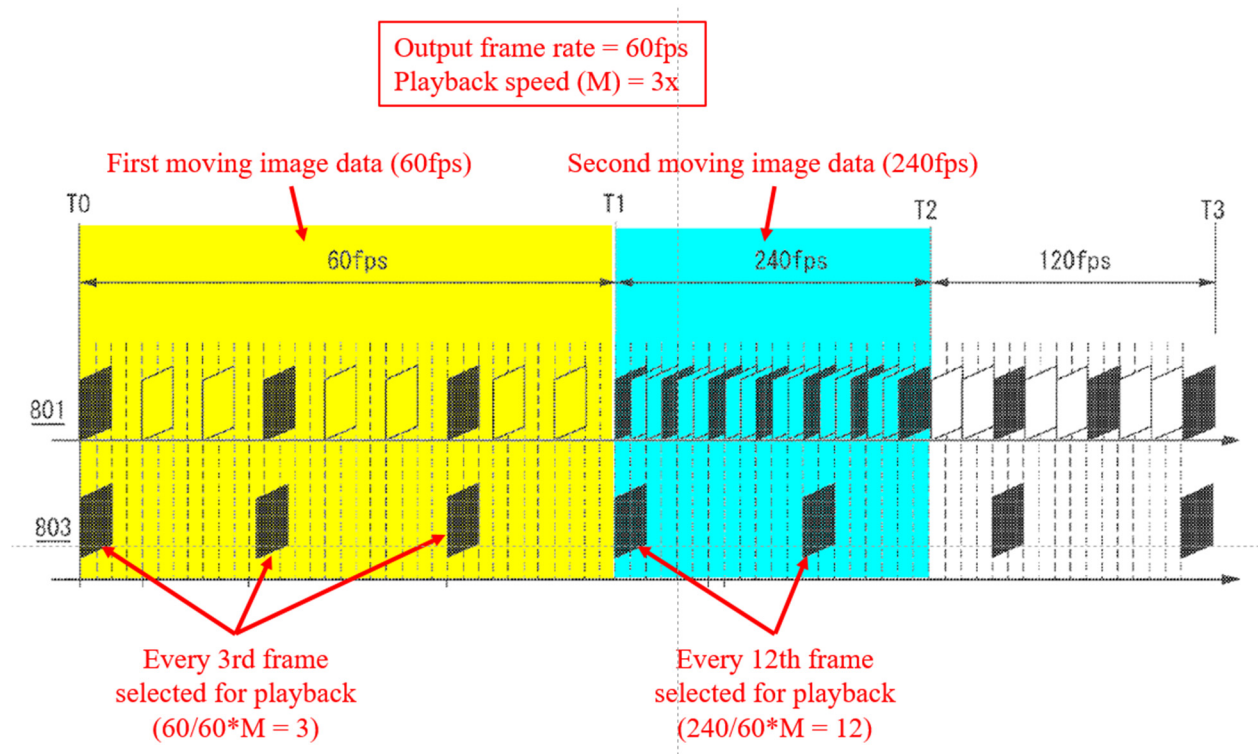
76. In the combination, Walpole describes “adaptive multimedia applications that attempt to preserve presentation quality in one dimension, by allowing quality to vary in other dimensions when resources become scarce.” TIKTOK-1006, 270. “For example, when *available network bandwidth* becomes scarce, an adaptive video player could reduce presentation quality in the frame rate dimension (*i.e.*, temporal resolution) in order to preserve real-time play out at a given spatial resolution.” *Id.* A POSITA would have understood the available network bandwidth taught by Walpole to be “network band information” as recited in the claim.

D. GROUND 2A: Claims 1 and 6 are obvious over Suzuki

1. Overview of Suzuki

77. Suzuki, a U.S. Patent Publication entitled “Reproduction apparatus,” describes an “imaging apparatus 100” that “can change the frame rate (the number of frames per unit time) of ... moving image data.” TIKTOK-1007, [0024]-[0025]. Based on the specified input frame rates of multiple moving image data sets, and a specified output frame rate and reproduction speed, the frame rates of the multiple

moving image data sets are changed, and the transformed moving image data is output via a display device. The following annotated detail of FIG. 8, discussed in greater detail below, shows a first moving image data (in yellow) and a second moving image data (in teal), both shown in row 801, that have their frame rates altered prior to reproduction, as shown in row 803:



TIKTOK-1007, Detail of FIG. 8 (annotated)⁵

⁵ Note that row 802 has been removed from the original FIG. 8 to enable easier comparison between rows 801 and 803.

2. Analysis

(a) Claim 1

[1.0]: “A moving image data processing apparatus comprising:”

78. Suzuki describes an “**imaging apparatus 100**” that “can change the frame rate (the number of frames per unit time) of ... moving image data.”

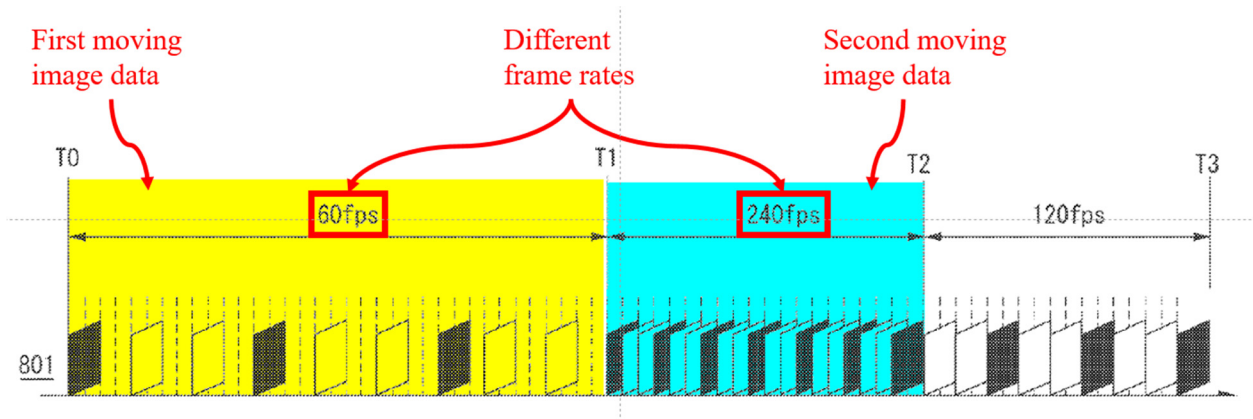
TIKTOK-1007, [0024]-[0025]. Suzuki further describes that components of the imaging apparatus 100 perform multiple types of “**processing**” on the moving image data. *See id.*, [0027] (“coding processing”), [0034] (“recording processing”), [0045] (“reproduction processing”), FIG. 3.

79. Accordingly, Suzuki teaches a “moving image data processing apparatus.”

[1.1]: “a moving image data input unit configured to be input of first moving image data generated at a first frame rate and second image data generated at a second frame rate that is different from the first frame rate;”

80. Suzuki describes an “**image capturing unit 101** captures an image of an object, and **generates and outputs moving image data corresponding** to the object.” TIKTOK-1007, [0025]. “The image capturing unit 101 includes an optical system such as a zoom lens and a focus lens, a complementary metal oxide silicon (CMOS) sensor or the like, an iris, an AD converter for converting captured moving image data into digital data, and a processing circuit for applying necessary processing to captured moving image data.” *Id.* “**A memory 103 stores moving image data** output from the image capturing unit 101[.]” *Id.*, [0026].

81. Suzuki further teaches that the image capturing unit can capture moving image data at different frame rates in frames per second (fps), including “60fps, 120fps, and 240 fps.” TIKTOK-1007, [0005], [0024]. FIG. 8 from Suzuki “illustrates moving image data that is captured and recorded” by the image capturing unit. *Id.*, [0044]. As shown in the following annotated detail of FIG. 8, “[m]oving image data 801 includes a 60-fps moving image in the period from T0 to T1” (first moving image data, shown in yellow), “a 240-fps moving image in the period from T1 to T2” (second moving image data, shown in teal), “and a 120-fps moving image in the period from T2 to T3.” *Id.*:



TIKTOK-1007, Detail of FIG. 8 (annotated)

82. As shown in the annotated FIG. 8, the frame rate of the first moving image data (60fps) is different than the frame rate of the second moving image data (240fps). TIKTOK-1007, [0044], FIG. 8.

83. Accordingly, Suzuki teaches “a moving image data input unit configured to be input of first moving image data generated at a first frame rate and

second image data generated at a second frame rate that is different from the first frame rate.”

[1.2]: “an input frame rate specification unit configured to specify the first frame rate of the first moving image data and the second frame rate of the second moving image data, the first and second moving image data having been input into the moving image data input unit;”

84. As previously discussed (*see* [1.1], *supra*), Suzuki teaches capturing first and second moving image data having different frame rates. Suzuki further describes that, after capturing the moving image data, the “control unit 107 instructs the *recording and reproduction unit 109 to generate additional information including information on the frame rate of the moving image data* and record the generated additional information on the recording medium 110 as additional information of a moving image file.” TIKTOK-1007, [0042], FIG. 8; *see also* [0024] (the apparatus “displays recorded moving images at 60 fps”), [0035].

85. Accordingly, Suzuki teaches this limitation.

[1.3]: “an output frame rate specification unit configured to specify output frame rate of the first moving image data and output frame rate of the second moving image data that have been input into the moving image data input unit;”

86. Suzuki describes setting an output frame rate for display of the first and second moving image data. For example, Suzuki describes examples where its apparatus “has the configuration of *reproducing captured moving images at 60fps*,” but that “*moving images may be reproduced at other frame rates*” as well.

See TIKTOK-1007, [0051], [0052] (moving image data is “displayed at 60fps”), [0096]. Suzuki further provides a detailed explanation of how its apparatus operates when the output frame rate is specified to be a value other than 60fs. TIKTOK-1007, [0096]-[0098].

[1.4]: “a playback speed specification unit configured to specify a same playback speed for the first moving image data and the second moving image data;”

87. Suzuki describes setting a “reproduction speed” when playing back video image data. TIKTOK-1007, [0089]. It refers to this value as “M” and notes that the speed of playback is “M times that of normal reproduction.” *Id.* For example, Suzuki describes that an “M” value of 3 would result in a “three-fold speed” increase over normal reproduction speed. *See id.*. As explained in greater detail below (*see* [1.5], *infra*), Suzuki teaches that this same playback speed is applied to both the first and second moving image data. *See, e.g.*, TIKTOK-1007, [0087] (“the control unit 107 sets the interval of frames to be displayed to FR/60xM according to the reproduction speed in high-speed reproduction and the frame rate of the moving image”) [0089], [0094], FIG. 8 (showing reproduction speed applied to the 60fps, 120fps, and 240 fps moving image data in row 801). .

[1.5]: “a frame rate conversion unit configured to change a frame rate of the first moving image data based on the first frame rate, the output frame rate, and the playback speed, and change a frame rate of the second moving image data based on the second frame rate, the output frame rate, and the playback speed; and”

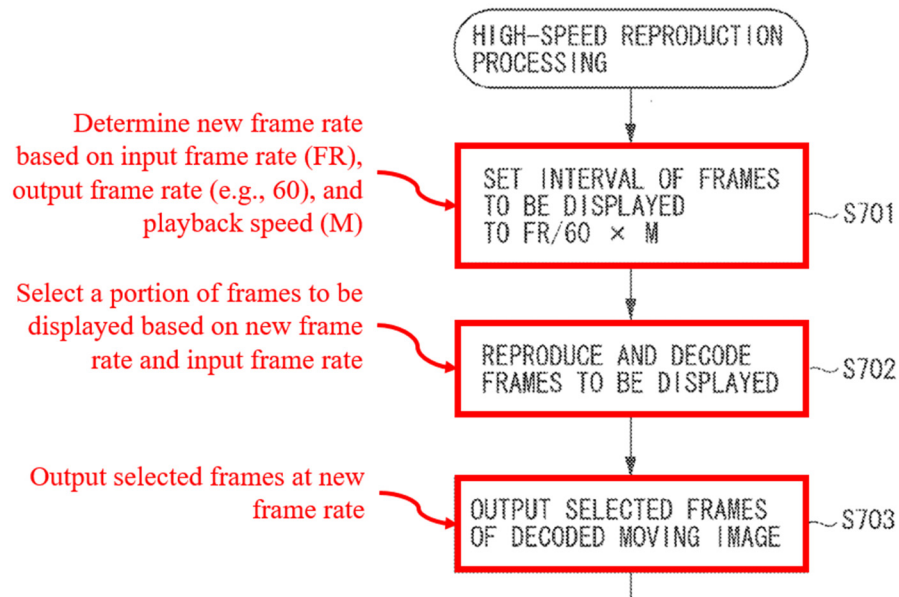
88. As previously discussed, Suzuki describes specifying an output frame rate of the first moving image data and the second moving image data (*e.g.*, 60fps or another value, *see* [1.3], *supra*), and specifying a same playback speed for the first moving image data and the second moving image data (reproduction speed “M,” *see* [1.4], *supra*). Suzuki further describes that “during high-speed reproduction in the second reproduction mode..., the control unit 107 ***sets the interval of frames to be displayed to FR/60xM*** according to the reproduction speed in high-speed reproduction and the frame rate of the moving image.”

TIKTOK-1007, [0087]. In the equation “***FR/60xM***” from the above quote, “FR” is the frame rate of the moving image data, “60” is the output frame rate, and “M” is the reproduction speed. *See* TIKTOK-1007, [0051]-[0052] (output frame rate of “60fps”), [0065] (“frame rate FR”), [0089] (reproduction speed “M”), [0096]-[0098] (output frame rates besides 60fps).

89. Suzuki further teaches that “the control unit 107 instructs the display control unit 105 to ***select frames to be displayed of the decoded moving image.***”

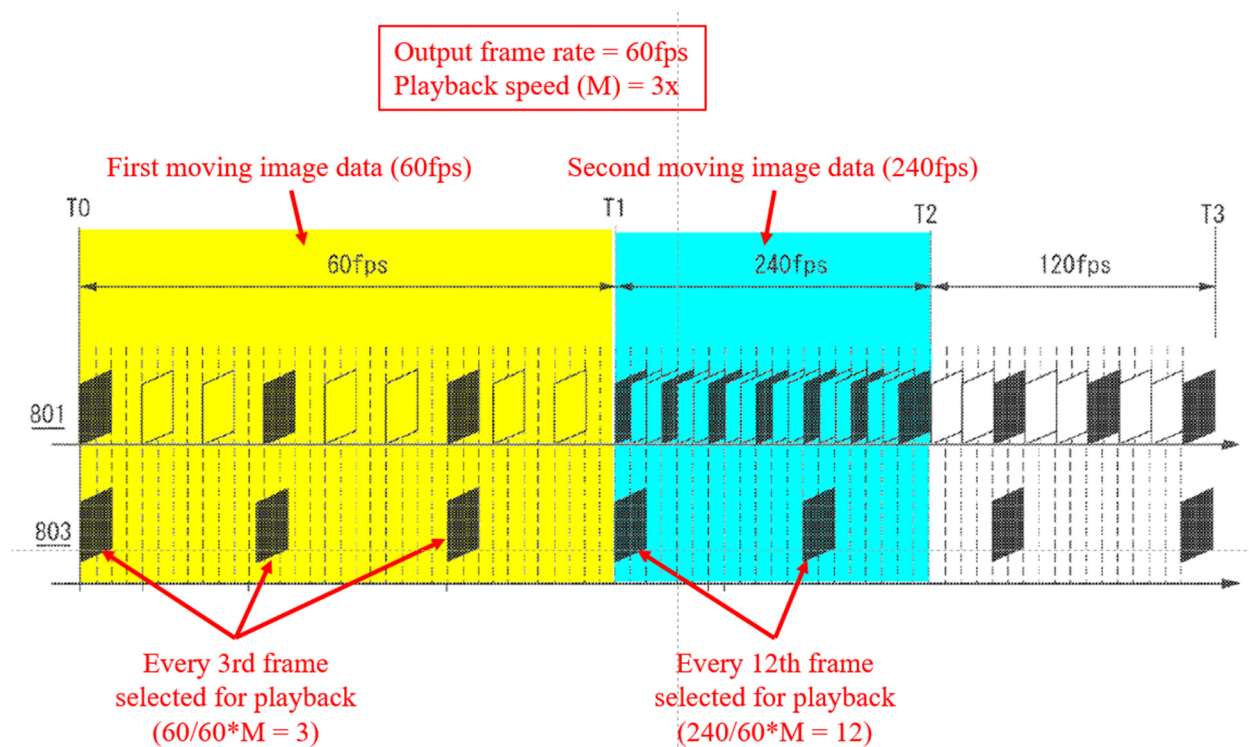
TIKTOK-1007, [0088]. Suzuki describes that “***the interval of frames*** to be displayed is determined according to the frame rate of the moving image under

reproduction so that the reproduction speed with respect to the real time is *M times that of normal reproduction.*” *Id.*, [0089]. The following detail from FIG. 7 of Suzuki shows this process:



TIKTOK-1007, Detail of FIG. 7 (annotated)

90. FIG. 8 from Suzuki shows an example of this frame rate conversion being performed on the first moving image data (shown in yellow) and the second moving image data (shown in teal):

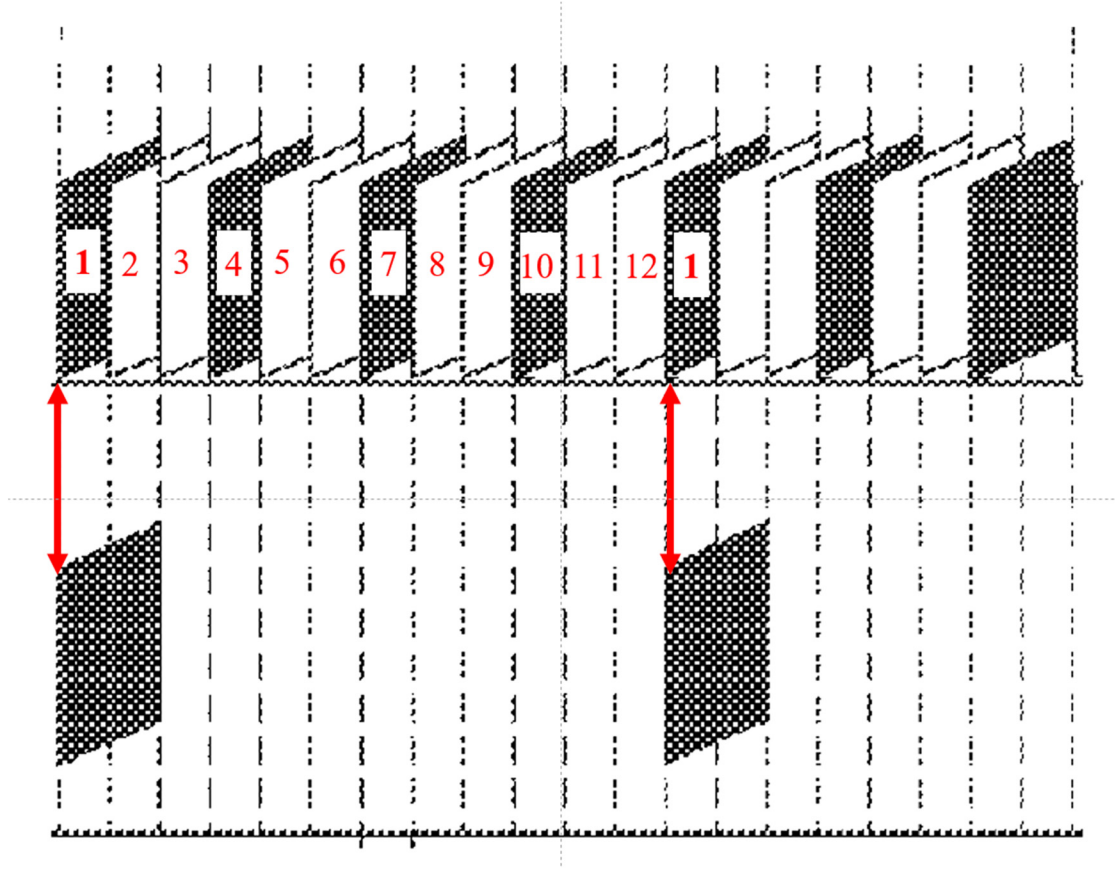


TIKTOK-1007, Detail of FIG. 8 (annotated)⁶

91. As shown in the annotated figure, given the stated output frame rate of 60fps and a playback speed (M) of 3x, the “FR/60*M” calculation described in FIG. 7 of Suzuki yields a result of 3 ($60/60 \cdot 3 = 3$) for the first moving image data (60fps, shown in yellow). TIKTOK-1007, [0087], FIG. 7, FIG. 8. This result is the “interval,” which determines how many frames from the original moving image data are selected for display (*i.e.*, 1 frame out of every 3 frames in this case). *See id.*

⁶ Note that row 802 has been removed from the original FIG. 8 to enable easier comparison between rows 801 and 803.

92. Given the same stated output frame rate of 60fps and playback speed (M) of 3x, the “FR/60*M” calculation described in FIG. 7 of Suzuki yields a result of 12 ($240/60*3 = 12$) for the second moving image data (240fps, shown in teal). TIKTOK-1007, [0087], FIG. 7, FIG. 8. The “interval” of 12 indicates that 1 out of every 12 frames of the second moving image data should be selected for display. *See id.* And in fact, a closer examination of FIG. 8 from Suzuki reveals that this is exactly how the frame selection is depicted:



TIKTOK-1007, Detail of FIG. 8 (annotated)

93. Accordingly, Suzuki renders this limitation obvious.

[1.6]: “a moving image data output unit that outputs the first and second moving image data whose frame rates have been converted by the frame rate conversion unit.”

94. With respect to FIG. 7, Suzuki describes that, “[i]n step S703, the control unit 107 instructs the display control unit 105 to select frames to be displayed of the decoded moving image and **output the selected frames to the display unit 106 for display.**” TIKTOK-1007, [0088]. As described above (see [1.5], *supra*), the display control unit 105 selecting frames to be displayed from the first and second moving image data is a frame rate conversion, and thus the moving image data output to the display unit 106 have had a frame rate conversion performed. *See, e.g.*, TIKTOK-1007, [0087]-[0089], FIGS. 7-8.

95. Accordingly, Suzuki renders this limitation obvious.

(b) Claim 6

[6.0]: “A moving image data processing method comprising:”

96. As previously discussed (see Ground 1A, [6.0], *supra*), the preamble of claim 6 is not limiting. However, to the extent that the preamble is determined to be limiting, Suzuki renders it obvious. For example, Suzuki describes a “reproduction **method**” that involves “chang[ing] the frame rate (the number of frames per unit time) of ... moving image data.” TIKTOK-1007, claim 9, [0024]-[0025]. Suzuki further describes that its techniques include different types of “**processing**” on the moving image data. *See id.*, [0027] (“coding processing”), [0034] (“recording processing”), [0045] (“reproduction processing”), FIG. 3.

97. Accordingly, Suzuki renders this limitation obvious.

[6.1]: “inputting first moving image data generated at a first frame rate and second image data generated at a second frame rate that is different from the first frame rate;”

98. See [1.1].

[6.2] “specifying the first frame rate of the first moving image data and the second frame rate of the second moving image data, the first and second moving image data having been input;”

99. See [1.2].

[6.3]: “specifying output frame rate of the first moving image data and output frame rate of the second moving image data that have been input”

100. See [1.3].

[6.4]: “specifying a same playback speed for the first moving image data and the second moving image data;”

101. See [1.4].

[6.5]: “changing a frame rate of the first moving image data based on the first frame rate, the output frame rate, and the playback speed, and changing the frame rate of the second moving image data based on the second frame rate, the output frame rate, and the playback speed; and”

102. See [1.5].

[6.6]: “outputting the first and second moving image data whose frame rates have been changed.”

103. See [1.6].

E. GROUND 2B: Claim 3 is obvious over Suzuki in view of Takabe

1. Reasons to combine Suzuki and Takabe

104. It would have been obvious to a POSITA to use Takabe’s circular ring shape interface component to display and enable a user to specify the moving image data parameters described in the apparatus of Suzuki, such as the first frame rate (*see* [1.2], *supra*), second frame rate (*see* [1.2], *supra*), or the playback speed (*see* [1.4], *supra*). *See, e.g.*, TIKTOK-1005, 4:1-3, 5:13-17, 7:17-22, 9:14-15; [1.2], [1.4], *supra*. Takebe describes that its circular ring shape interface component “is easy to understand” and provides the benefit of making it “easy” to determine “where within the selectable range the selected value is.” TIKTOK-1005, 4:1-3, 7:17-22; *see also* 5:13-17, 9:14-15. A POSITA would have been motivated to implement a circular ring shape interface component in Suzuki as described above in order to obtain these and other benefits described by Takabe as resulting from the use of the component. *See, e.g.*, TIKTOK-1005, 4:1-3, 5:13-17, 7:17-22, 9:14-15.

105. Further, a POSITA would have found it obvious to modify Suzuki based on Takabe’s teachings because doing so entails the use of known solutions to improve similar systems and methods in the same way. I have been informed that “when a patent ‘simply arranges old elements with each performing the same function it had been known to perform’ and yields no more than one would expect

from such an arrangement, the combination is obvious.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007). A POSITA would have recognized that applying Takabe’s teachings to augment Suzuki would have led to predictable results without significantly altering or hindering the functions performed by Suzuki’s system.

106. In fact, a POSITA would have been motivated to incorporate the well-known techniques of Takabe’s into Suzuki to achieve the predictable benefits described in Takabe. *See, e.g.*, TIKTOK-1005, 4:1-3, 5:13-17, 7:17-22, 9:14-15. Indeed, a POSITA would have had a reasonable expectation of success incorporating Takabe’s teachings into Suzuki, because Takaba describes a device operating in the proposed manner. *See* TIKTOK-1005, Summary, 1:10-13, 4:1-3, 5:13-17, 7:17-22, 9:14-15.

107. Accordingly, for at least these reasons, augmenting Suzuki’s device based on the teachings of Takabe would have been routine and straightforward to a POSITA, and it would have been clear that such a combination would predictably work and provide the expected results. *Id.*

2. Analysis

(a) Claim 3

[3.0]: “The moving image data processing apparatus according to claim 1, further comprising a display unit, wherein the operating unit accepts the inputs continuously, and the moving image data output unit makes the display unit display the first frame rate, second frame rate, or the playback speed thereon arranged in a circular ring shape, makes the display unit display the circular ring shape of the first frame rate, second frame rate, or the playback speed in a rotating manner in accordance with the input of the operating unit, and specifies the first frame rate, the second frame rate, or the playback speed.”

108. In the combination, Takabe describes that “in a device equipped with a display panel for displaying captured (taken images), such as a digital camera or video camera, the captured images are superimposed on that display panel, and the various setting state is displayed.” TIKTOK-1005, 1:10-13. “[V]alues and items for states that can be selected in multiple stages are positioned in order in designated places within a virtually set section of a circle or ellipse” (i.e., a circular ring shape) “on the display panel.” *Id.*, Summary.

109. Takabe further describes that the circular ring shape is used to display and set the “shutter speed value” of the imaging device, but that other “value[s] that can be adjusted in a plurality of stages” can be displayed using this technique. *Id.*, 20:14-24. As described above (*see* Section III.E.1, *supra*), it would have been obvious to a POSITA to use Takabe’s circular ring shape interface component to display and enable a user to specify the moving image data parameters described in Suzuki, such as the first frame rate (*see* [1.2], *supra*), second frame rate (*see* [1.2],

supra), or the playback speed (*see* [1.4], *supra*). *See, e.g.*, TIKTOK-1005, 20:14-24; [1.2], [1.4], *supra*.

F. GROUND 2C: Claim 4 is obvious over Suzuki in view of Sekiguchi

1. Overview of Sekiguchi

110. Sekuguchi, a U.S. Patent Publication entitled “Video playback apparatus and method for controlling the video playback apparatus,” describes “control[ling] the frame rate of the video data in units of frames to 60fps so that the framerate is synchronized with the refresh rate of a display panel.” TIKTOK-1008, [0031].

2. Reasons to combine Suzuki and Sekiguchi

111. It would have been obvious to a POSITA to modify Suzuki to specify the output frame rate of moving image data based on the supported frame rate of a display device, as taught by Sekiguchi. As described by Sekiguchi, various playback anomalies can result if the output frame rate of a video is not supported by the selected playback device. TIKTOK-1008, [0008]-[0013]. These anomalies are avoided if the output frame rate of moving image data is set based on the supported frame rate of the display on which the moving image data is to be displayed. *See, e.g.*, TIKTOK-1008, [0008]-[0013], [0031]. A POSITA would have been motivated to modify Suzuki to specify the output frame rate of moving

image data based on the supported frame rate of a display device, as taught by Sekiguchi, in order to avoid these described anomalies. *See id.*

112. Further, a POSITA would have found it obvious to modify Suzuki based on Sekiguchi teachings because doing so entails the use of known solutions to improve similar systems and methods in the same way. I have been informed that “when a patent ‘simply arranges old elements with each performing the same function it had been known to perform’ and yields no more than one would expect from such an arrangement, the combination is obvious.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007). A POSITA would have recognized that applying Sekiguchi’s teachings to augment Suzuki would have led to predictable results without significantly altering or hindering the functions performed by Suzuki’s system.

113. In fact, a POSITA would have been motivated to incorporate the well-known techniques of Sekiguchi’s into Suzuki to achieve the predictable benefits described in Sekiguchi. *See, e.g.*, TIKTOK-1008, [0008]-[0013], [0031]. Indeed, a POSITA would have had a reasonable expectation of success incorporating Sekiguchi’s teachings into Suzuki, because Sekiguchi describes a device operating in the proposed manner. *See* TIKTOK-1008, [0008]-[0013], [0031].

114. Accordingly, for at least these reasons, augmenting Suzuki’s device based on the teachings of Sekiguchi would have been routine and straightforward

to a POSITA, and it would have been clear that such a combination would predictably work and provide the expected results. *Id.*

3. Analysis

(a) Claim 4

[4.0]: “The moving image data processing apparatus according to claim 1, wherein the output frame rate specification unit is configured to specify the output frame rate based on information of an external device receiving the moving image data output by the moving image data output unit.”

115. In the combination, Sekiguchi describes “control[ling] the frame rate of the video data in units of frames to 60fps so that ***the framerate is synchronized with the refresh rate of a display panel.***” TIKTOK-1008, [0031]; *see also* [0008] (“Conventionally, in general display devices, a refresh rate in displaying video is 60 Hz in many cases.”). As described above (*see* Section III.F.2, *supra*), it would have been obvious to a POSITA to modify Suzuki to specify the output frame rate based on the refresh rate of a display panel (*i.e.*, “information of an external device receiving the moving image data output by the moving image data output unit”).

G. GROUND 2D: Claim 5 is obvious over Suzuki in view of Walpole

1. Reasons to combine Suzuki and Walpole

116. It would have been obvious to a POSITA to modify Suzuki to specify the output frame rate based on currently available network bandwidth, as taught by Walpole. Walpole describes that “when available network bandwidth becomes

scarce, an adaptive video player could reduce presentation quality in the frame rate dimension ... in order to preserve real-time play out at a given spatial resolution.” TIKTOK-1006, 270. Such an adaptive scheme would lead to a better user experience by maintaining allowing full motion video (*i.e.*, “real-time play out”) to be preserved at a lower frame rate, as opposed to lagging or choppy video at a higher frame rate. *Id.*, 276. Walpole further describes that this approach also provides a benefit to the network by reducing the number of packets (*i.e.*, those carrying video data) sent over the network during times of network congestion or other issues. TIKTOK-1006, 276-279. A POSITA would have been motivated modify Suzuki to specify the output frame rate based on currently available network bandwidth as described above in order to obtain these and other benefits described by Walpole as resulting from the use of its techniques. *See, e.g.*, TIKTOK-1006, 276-279.

117. Further, a POSITA would have found it obvious to modify Suzuki based on Walpole teachings because doing so entails the use of known solutions to improve similar systems and methods in the same way. I have been informed that “when a patent ‘simply arranges old elements with each performing the same function it had been known to perform’ and yields no more than one would expect from such an arrangement, the combination is obvious.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007). A POSITA would have recognized that applying

Walpole's teachings to augment Suzuki would have led to predictable results without significantly altering or hindering the functions performed by Suzuki's system.

118. In fact, a POSITA would have been motivated to incorporate the well-known techniques of Walpole's into Suzuki to achieve the predictable benefits described in Walpole. *See, e.g.,* TIKTOK-1006, 270, 276-279. Indeed, a POSITA would have had a reasonable expectation of success incorporating Walpole's teachings into Suzuki, because Walpole describes a device operating in the proposed manner. *See* TIKTOK-1006, 270, 276-279.

119. Accordingly, for at least these reasons, augmenting Suzuki's device based on the teachings of Walpole would have been routine and straightforward to a POSITA, and it would have been clear that such a combination would predictably work and provide the expected results. *Id.*

3. Analysis

(a) Claim 5

[5.0]: "The moving image data processing apparatus according to claim 1, wherein the output frame rate specification unit is configured to specify the output frame rate based on network band information of an external device receiving the moving image data output by the moving image data output unit."

120. In the combination, Walpole describes "adaptive multimedia applications that attempt to preserve presentation quality in one dimension, by allowing quality to vary in other dimensions when resources become scarce."

TIKTOK-1006, 270. “For example, when *available network bandwidth* becomes scarce, an adaptive video player could reduce presentation quality in the frame rate dimension (*i.e.*, temporal resolution) in order to preserve real-time play out at a given spatial resolution.” *Id.* A POSITA would have understood the available network bandwidth taught by Walpole to be “network band information” as recited in the claim.

IV. LEGAL STANDARDS

A. Anticipation

121. I have been informed by Counsel and understand that documents and materials that qualify as prior art can render a patent claim unpatentable as anticipated. I am informed by Counsel and understand that all prior art references are to be looked at from the viewpoint of a person of ordinary skill in the art.

122. I am informed by Counsel and understand that a challenged claim is unpatentable as “anticipated” under 35 U.S.C. § 102 if it is determined that all the limitations of the claim are described in a single prior art reference. I am informed by Counsel and understand that, to anticipate a claim, a prior art reference must disclose, either expressly or inherently, each and every limitation of that claim and enable one of ordinary skill in the art to make and use the invention.

123. I have been informed by Counsel and understand that in an *inter partes* review, “the petitioner shall have the burden of proving a proposition of

unpatentability,” including a proposition of anticipation, “by a preponderance of the evidence.” 35 U.S.C. §316(e).

B. Obviousness

124. I have been informed by Counsel and understand that documents and materials that qualify as prior art can render a patent claim unpatentable as obvious. I am informed by Counsel and understand that all prior art references are to be looked at from the viewpoint of a person of ordinary skill in the art at the time of the invention, and that this viewpoint prevents one from using his or her own insight or hindsight in deciding whether a claim is obvious.

125. I have been informed by Counsel and understand that a claim is unpatentable for obviousness under 35 U.S.C. § 103 (in the pre-AIA form of that statute that applies to the '041 patent) “if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” I am informed by Counsel and understand that obviousness may be based upon a combination of references. I am informed by Counsel and understand that the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. However, I am informed by Counsel and understand that a patent claim composed of several

elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.

126. I am informed by Counsel and understand that when a patented invention is a combination of known elements, a court must determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue by considering the teachings of prior art references, the effects of demands known to people working in the field or present in the marketplace, and the background knowledge possessed by a person having ordinary skill in the art.

127. I am informed by Counsel and understand that a patent claim composed of several limitations is not proved obvious merely by demonstrating that each of its limitations was independently known in the prior art. I am informed by counsel for the Patent Owner and understand that identifying a reason those elements would be combined can be important because inventions in many instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known. I am informed by Counsel and understand that it is improper to use hindsight in an obviousness analysis, and that a patent's claims should not be used as a "roadmap."

128. I am informed by Counsel and understand that an obviousness inquiry requires consideration of the following factors: (1) the scope and content of the

prior art; (2) the differences between the claims and the prior art; (3) the level of ordinary skill in the pertinent art; and (4) any objective indicia of non-obviousness, such as commercial success, long-felt but unresolved need, failure of others, industry recognition, copying, and unexpected results. I understand that the foregoing factors are sometimes referred to as the “Graham factors.”

129. I have been informed by Counsel and understand that an obviousness evaluation can be based on a combination of multiple prior art references. I understand that the prior art references themselves may provide a suggestion, motivation, or reason to combine, but that the nexus linking two or more prior art references is sometimes simple common sense. I have been informed by Counsel and understand that obviousness analysis recognizes that market demand, rather than scientific literature, often drives innovation, and that a motivation to combine references may be supplied by the direction of the marketplace.

130. I have been informed by Counsel and understand that if a technique has been used to improve one device, and a person of ordinary skill at the time of invention would have recognized that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.

131. I have been informed by Counsel and understand that practical and common sense considerations should guide a proper obviousness analysis, because

familiar items may have obvious uses beyond their primary purposes. I have been informed by Counsel and understand that a person of ordinary skill looking to overcome a problem will often be able to fit together the teachings of multiple prior art references. I have been informed by Counsel and understand that obviousness analysis therefore takes into account the inferences and creative steps that a person of ordinary skill would have employed at the time of invention.

132. I have been informed by Counsel and understand that a proper obviousness analysis focuses on what was known or obvious to a person of ordinary skill at the time of invention, not just the patentee. Accordingly, I understand that any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.

133. I have been informed by Counsel and understand that a claim can be obvious in light of a single reference, without the need to combine references, if the elements of the claim that are not found explicitly or inherently in the reference can be supplied by the common sense of one of skill in the art.

134. I have been informed by Counsel and understand that secondary indicia of non-obviousness may include (1) a long felt but unmet need in the prior art that was satisfied by the invention of the patent; (2) commercial success of processes covered by the patent; (3) unexpected results achieved by the invention;

(4) praise of the invention by others skilled in the art; (5) taking of licenses under the patent by others; (6) deliberate copying of the invention; (7) failure of others to find a solution to the long felt need; and (8) skepticism by experts. I understand that evidence of secondary indicia of non-obviousness, if available, should be considered as part of the obviousness analysis.

135. I have been informed by Counsel and understand that there must be a relationship between any such secondary considerations and the invention, and that contemporaneous and independent invention by others is a secondary consideration supporting an obviousness determination.

136. In sum, my understanding is that prior art teachings are properly combined where a POSITA having the understanding and knowledge reflected in the prior art and motivated by the general problem facing the inventor, would have been led to make the combination of elements recited in the claims. Under this analysis, the prior art references themselves, or any need or problem known in the field of endeavor at the time of the invention, can provide a reason for combining the elements of multiple prior art references in the claimed manner.

137. I have been informed by Counsel and understand that in an *inter partes* review, “the petitioner shall have the burden of proving a proposition of unpatentability,” including a proposition of obviousness, “by a preponderance of the evidence.” 35 U.S.C. §316(e).

CONCLUSION

I currently hold the opinions set expressed in this declaration. But my analysis may continue, and I may acquire additional information and/or attain supplemental insights that may result in added observations.

I hereby declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I further declare that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of the Title 18 of the United States Code.

Dated: 9/15/2022

By: David B. Lett

David B. Lett

APPENDIX A

Expert Witness, CTO

Technology industry veteran with electronics/software/hardware/video/audio/data expertise.

IoT | Consumer Electronics | Telecommunications | Cable | Satellite | Broadband | Wireless

- Patent litigation expert witness testimony, technical consulting, and expert reports for renowned patent law firms such as Fish & Richardson, King & Spalding, Banner & Witcoff, Kent & Risley, and Quinn Emanuel Urquhart & Sullivan.
- 28 U.S. Patents and more pending. Served on corporate patent boards.
- Uniquely broad hardware/software/systems technical understanding.
- Award winning design and development including Best of Show, Technology Emmy, and Best of Innovations of over 100 million shipped products, responsible for \$1.3B annual revenue.
- Industries: Consumer Electronics, Cable, Satellite, Internet of Things (IoT), Telematics, Smart Truck Logistics, Transportation, Alarm Systems, Smart Tank monitoring & fulfillment, Television, Telecommunications, Video, Audio, Wireless, Broadband, OTT Video, IPTV, Payments
- Technical: hardware design, software design, systems design, mechanical design, embedded systems, cloud computing, AWS, Azure, OCS, SaaS, fog computing, edge computing, high speed digital, C, Linux, mobile applications (IOS and Android), web applications (Java, JavaScript, HTML), firmware, user interfaces, UI/UX, video, audio, data, RF, DSP, communications, cybersecurity, encryption, error correction coding, real-time systems, cable, CATV, DOCSIS, broadband, satellite, satcom, IPTV, OTT video, video streaming, wireless, cellular, 3G, 4G, LTE, LTE-M, 5G, NB-IoT, Cat-M1, WiFi, ZigBee, Z-Wave, Bluetooth, BLE, LoRa, Internet of Things (IoT), IIoT, Machine-to-Machine (M2M), Telematics, AI, ML, networks, consumer electronics, payments, and telecommunications.

EXPERIENCE

Nov. 2016-present, **Expert Witness/CTO**, Independent Consultant

Technology, product development, organizational, & intellectual property consulting

- Intellectual property, patent assistance, and expert witness testimony
- Technical Consulting

Jul. 2019 – June 2022, **Chief Technology Officer (CTO)**, **Telular**, an Ametek Company, Greater Atlanta Area

- Responsible for global engineering, corporate technical strategy, and technical representation.
- Telular is a technology leader in Industrial IoT (IIoT) recurring revenue solutions, combining wireless technologies, purpose-built hardware, and SaaS in the commercial telematics, security and home automation markets and sold under the SkyBitz and Telguard Brands.
- SaaS, Cellular, 3G, 4G, LTE, LTE-M, 5G, NB-IoT, Cat-M1, BLE, Satellite, cloud, distributed systems, Azure, Oracle Cloud, IoT, AI, ML, M2M, hardware, firmware, software, systems, architecture, video, mobile apps, web apps.

Aug. 2011 – Oct. 2016, **Vice President of Engineering, Head of the Atlanta R & D Center**, **EchoStar Technologies**, Greater Atlanta Area (\$3B revenue, Engineering for Dish Network with a common controlling stockholder)

- Developed products for Dish Network and international customers including highest volume set-top boxes, H.265, HEVC, 3D, Satellite, MoCA, transcoding, Embedded C Linux applications, mobile applications (IOS and Android), SaaS, and web applications (Javascript, HTML). Provided product lifecycle support of contract manufacturers, test methodologies, customer service, QA, marketing, and sales.
- Led the architecture and global development of a huge end-to-end secure IoT cloud/fog/edge Platform for the consumer security & smart home market and other adjacent markets. Established the unique TV and mobile UI and MyLocal911 patented self-monitored security paradigm. System architecture consisted of 32 cloud systems and 24 CPE products. Systems included BSS/OSS, AWS cloud storage, 2-way video/audio streaming,

authentication, provisioning, software download, command and control, customer service, online storefront, 911 emergency VoIP, logistics, CPE, and mobile applications. Represented the platform at trade shows.

- Functioned as a general manager in roles and responsibilities including vision, operations, business results, product management, program management, complex projects and services, hardware/software/systems product development of video, Internet of Things (IoT), and mobile application products.
- **Winner of the prestigious Best of Show award at the 2013 CES for the Hopper** because of the Hopper Transfers functionality and mobile applications.
- **Won 2015 CSI award “Best smart home product, technology or service”.**
- Established and evangelized the vision to be a center of excellence through business results, time to market, quality, innovation, team results, and continuous improvement.

Aug. 1990 – July 2011, **Vice President of Engineering, Cisco / Scientific Atlanta**, Greater Atlanta Area (\$35B / \$1.9B revenue companies respectively. Cisco acquired Scientific Atlanta Feb. 2006)

- Intellectual property – served on the corporate patent board, provided patent assistance, and testified in patent litigation cases including as a 30(b)(6) witness representing the corporation.
- Responsible for the hardware/firmware/software/mechanical/systems/architecture/ASIC requirements design and development of several generations of high volume set top boxes and other products with extensive data communications and multimedia capabilities and advanced features including DOCSIS 1/2/3 and hybrid gateways, 802.11, IPTV, DVR, cable modems, ADSL, VDSL, DVB-T/C/S, bootloaders, factory diagnostics, application frameworks, Nagra, DRMs, conditional access, secure microprocessors, device management, Android, Adobe Flash, Linux, DVD play/record, MPEG-4, MPEG-2, H.264, NTSC, PAL, DAVIC, MoCA, high-performance CPUs, cablecards, network processors, HDMI, multiple video/audio display interfaces, 2D/3D graphics, multiple RF tuners, and full spectrum tuners.
- Products developed supported worldwide video, audio, power supply, and regulatory standards.
- Developed products manufactured in company factories, contract manufacturers (CMs), Original Design Manufacturers (ODMs), and Joint Design Manufacturers (JDMs).
- Developed processes and practices to ensure success in high quality, high volume, low cost, and fast time-to-market product development.
- Architected Video-On-Demand (VOD) systems.
- Architected robust software download system to ensure network disaster recovery to avoid truck rolls. Received some of the **industries’ first downloadable software patents and an electronic program guide patent**. Developed the downloadable software system, enabling the applications software development business which evolved into a major corporate strategic business objective.
- Responsible for the total value proposition strategy internally in the organization through process design and externally facing customers to propose innovative solutions that add value and differentiate our offering.
- Established and managed department capex and opex budgets and manpower planning.
- Achieved unprecedented 3%/qtr product cost reductions for all products during the product lifecycle.
- Highly reliable products never had a field recall, which would have been disastrous to the business due to truck roll costs.
- Established software development department and software development practices including software processes, code reviews, networked version control and defect tracking, unit test teams, coding standards, and release processes.
- Reduced product development time to market for set top boxes from 14 months to 6 months through continuous process improvement
- Scaled organization from supporting \$10M to \$1.3B in sales
- Accounted for more than **70% of the revenues for Cisco’s Service Provider Video Technology Group and for Scientific Atlanta Corporation**.
- Award winning design and development of over 100 million shipped products
- **Winner of Technology Emmy in 2012 for Pioneering Development of Multi-Room DVR.**
- **Winner of 2006 CES "Best of Innovations" award for DVR/DVD Recorder/Player.**
- **Winner of Motorola/EE Times Excellence in Innovation Award in 1994.**

Nov. 1985 - July 1990, **Hardware Engineering Manager / Senior Engineer, Wegener Communications, Inc.**, Greater Atlanta Area

- Managed product development of video, audio, and data satellite receivers, modulators, graphics display systems, DSP-based companders, FSK and PSK satellite modems, multiplexers, forward error correction (FEC) codecs, RF upconverters and downconverters, and baseband analog and digital processing components. Disciplines managed included hardware, ASICs, FPGAs, RF, digital, microprocessors, analog, mechanical, and embedded software.
- Architected and designed forward error correction (FEC) coding systems, PSK modems, and analog control systems for RF modulators and PSK demodulators.

Mar. 1983 - June 1985 (while working at Scientific Atlanta), Assistant Professor, **DeVry Institute of Technology**, Greater Atlanta Area

- Taught evening school courses in microprocessor hardware/software and Electronics

June 1982 – Oct. 1985, **Scientific-Atlanta, Engineer II/Engineer I**, Greater Atlanta Area

- Designed software and hardware including addressable data transmitters, video sync suppression scramblers, transaction format converters, and data channel monitors for addressable Cable Television systems and Set Top Boxes.

EDUCATION

- MSEE course work in Electrical Engineering, Georgia Institute of Technology, Atlanta, Georgia
- BSEE, University of Tennessee, Knoxville, Tennessee, with High Honors. Specialization in Computer Engineering. GPA: 3.53/4.00.
- Georgia Institute of Technology Scrum Leadership Certificate, Certified Scrum Master (CSM), Certified Scrum Product Owner (CSPO), Certified Large Scale Scrum (LeSS) Practitioner
- Many short courses in business and engineering.