

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ARASHI VISION (U.S.) LLC (D/B/A INSTA360)
Petitioner,

v.

GOPRO, INC.
Patent Owner.

Patent No. 10,574,894

Inter Partes Review No. IPR2024-01186

**PETITION FOR *INTER PARTES* REVIEW
UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. § 42.100 *et seq.***

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Petitioner Arashi Vision (U.S.) LLC (d/b/a Insta360) (“Petitioner” or “Insta360”) respectfully petitions for *inter partes* review of claims 1-20 of U.S. Patent No. 10,574,894 (“the ’894 patent” (EX1001)) in accordance with 35 U.S.C. §§ 311-319 and 37 C.F.R. § 42.100 *et seq.*

I. INTRODUCTION

The ’894 patent relates to “stabilizing videos using positions of an image capture device during a capture duration.” (EX1001, 1:6-7.) The video stabilization involves determining a capture trajectory of the image capture device by using a look ahead, or later portion, of the trajectory of the device, and by “includ[ing] a path that minimizes a combination of rotational velocity and rotational acceleration.” (*Id.*, 9:45-50, claim 1.) Stabilized video is generated by including a smaller, or cropped, portion of the captured video content (a “punch-out”) and by determining orientations of the punch-outs based on the capture trajectory. (*Id.*, Abstract, 8:10-16.)

Determining a capture trajectory by including a path that minimizes a combination of rotation velocity and rotational acceleration was not new at the time of the ’894 patent filing in 2018. The prior art commonly stabilized videos by minimizing a combination of rotational velocity and rotational acceleration. For example, Kwatra discloses that “[a] smooth camera path can be estimated using minimization of derivatives of the original camera path.” (EX1005, 5:64-65.) The

original camera path includes rotational motion, and the derivatives being minimized include rotational velocity and acceleration. (*Id.*, 1:17-19, 13:23-48, 16:13-32, 18:54-56.)

Determining a capture trajectory using a look ahead of the trajectory and generating stabilized video using a “punch-out” of a captured video were also well-known in 2018. For example, Zhou discloses using future motion data, which “permits stabilization adjustments (the movement of individual frames within their overscan) of a current frame in a way that prepares for . . . motion in future frames.” (EX1004, 4:1-4.) Zhou discloses calculating the amount of movement for “visible frame 300 within captured frame 305,” with visible frame 300 being smaller than the captured frame 305 by the “overscan.” (*Id.*, 7:24-26, Fig. 3.) Only the content within visible frame 300 is displayed to the user. (*Id.*, 3:1-3.)

Petitioner submits that the challenged claims are unpatentable for the reasons set forth in this Petition, as supported by Dr. Katsaggelos. (EX1002.)

II. THE '894 PATENT

A. Summary

The independent claims of the '894 patent are directed to a system that stabilizes videos and a method for stabilizing videos. (EX1001, claims 1, 11.)

As shown in Figure 5C, a captured video is stabilized by determining a capture trajectory corresponding to an observed trajectory of an image capture

device. (*Id.*, Abstract, 1:18-46.) The capture trajectory has less jitter, less abrupt changes, and/or less discontinuous changes than the observed trajectory of the device. (*Id.*, 9:32-36.) The capture trajectory is determined based on a look ahead of the observed trajectory, *i.e.*, subsequent portions of the observed trajectory. (*Id.*, 9:46-48.)

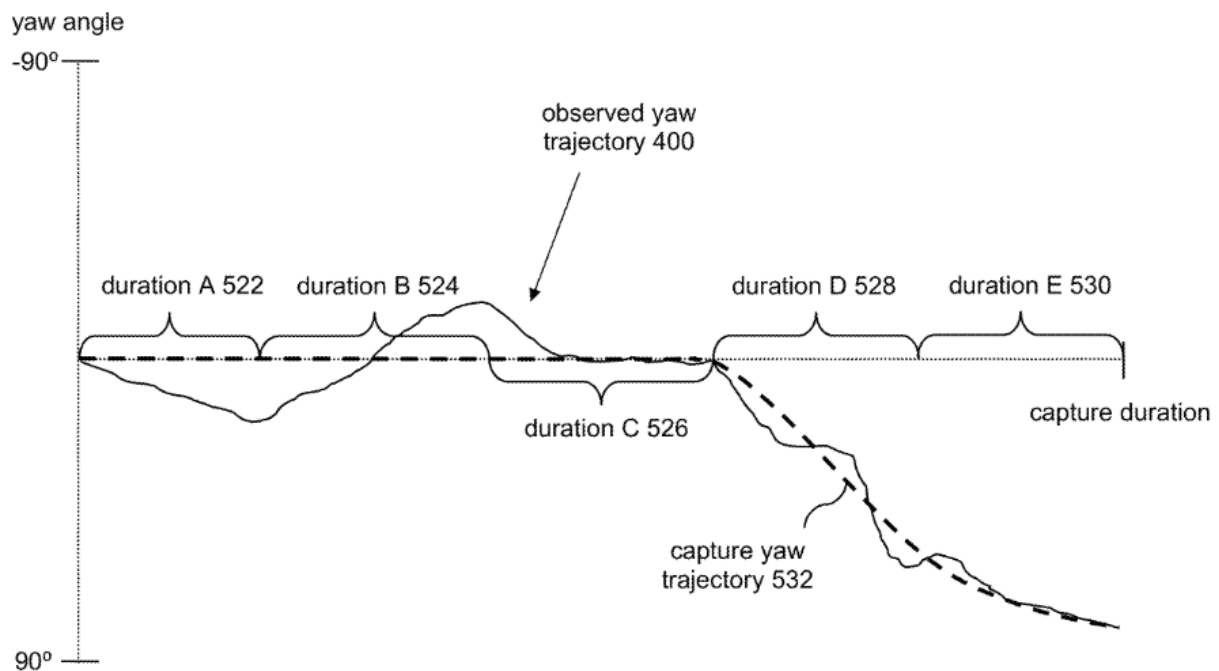


FIG. 5C

The generation of the stabilized video is based on the *capture field of view*, which is smaller than the *optical field of view* of the captured frame, as shown in Figure 6A.¹ (*Id.*, 11:64-12:8.)

¹ All emphasis and annotations, such as color, highlighting, etc., added, unless

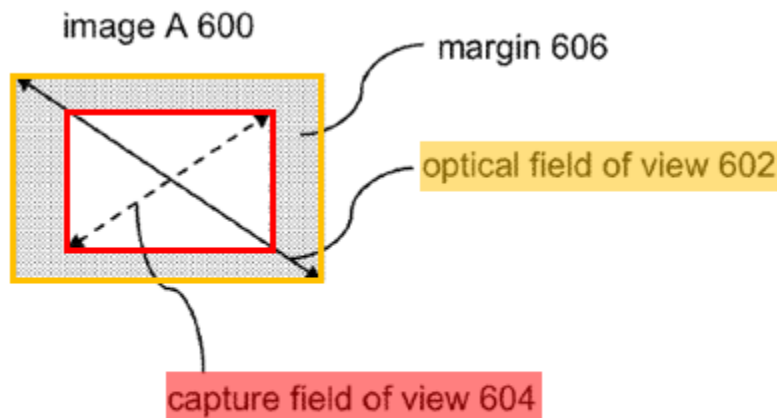


FIG. 6A

Orientation of the *capture field of view* with respect to the *optical field of view* is determined based on the capture trajectory. (*Id.*, 12:61-66.) For example, based on the capture trajectory, which represents smoother position changes of the device, the *capture field of view* may be “rotated” or “laterally/vertically positioned” with respect to the *optical field of view*, as shown in Figure 6B below. (*Id.*, 1:38-40, 13:12-17.)

otherwise noted.

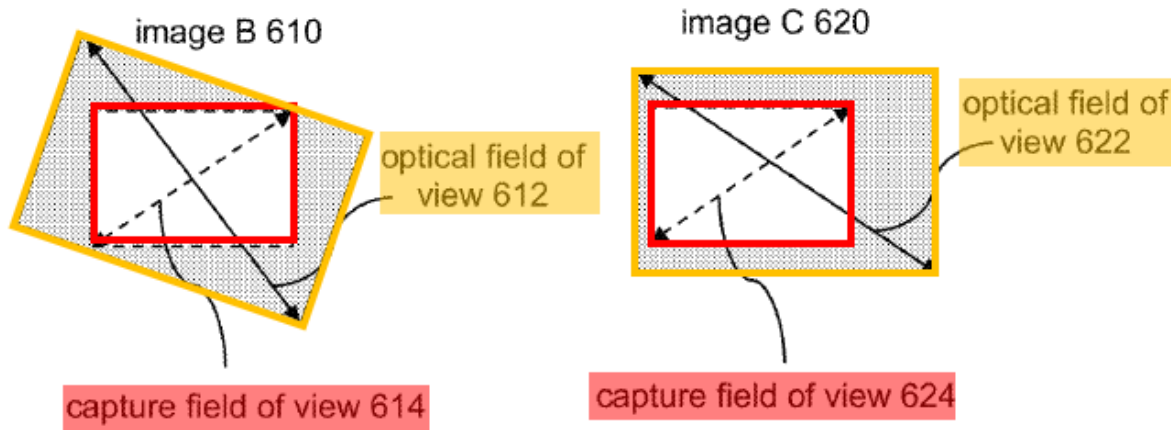


FIG. 6B

B. Effective Filing Date

The '894 patent was filed on August 22, 2019, issued on February 25, 2020, and claims priority to a provisional application filed on May 18, 2018. For purposes of this Petition only, Petitioner relies on May 18, 2018, as the earliest effective filing date. (EX1002, ¶9.)

C. Prosecution History of the '894 Patent

The Examiner issued one lone Office Action identifying Beysserie (EX1007) as the closest art to the claims in the original patent application. (EX1003, 86-120.) After an interview, Applicant responded by amending independent claims 1 and 11 to add “wherein the capture trajectory is determined to include a path that minimizes a combination of rotational velocity and rotational acceleration of the housing, the combination of the rotational velocity and the

rotational acceleration of the housing weighing the rotational velocity and the rotational acceleration equally or differently.” (*Id.*, 386-393.)

In the interview summary, the Examiner stated that Beysserie discloses motion sensors to measure rotational velocity and rotational acceleration, but appears to not disclose weighing rotational velocity and rotational acceleration in different ways. (*Id.*, 365.) The Examiner then issued the Notice of Allowance. (*Id.*, 401-411.)

D. Level of Ordinary Skill in the Art

A person of ordinary skill in the art (POSITA) in the field of the '894 patent would have a bachelor's degree in engineering or computer science, or equivalent field, and two years of experience working on image or video processing, or digital cameras. Alternatively, a POSITA would have four years of experience working on image or video processing, or digital cameras. An advanced graduate degree in the disciplines cited above may make up for the work experience indicated above. (EX1002, ¶¶36-37.)

III. CLAIM CONSTRUCTION

For purposes of this Petition only, Petitioner does not believe any terms require a formal construction.² Each of the terms carries its “ordinary and

² Petitioner interprets the challenged claims based on the breadth of GoPro's

customary meaning,” which is “the meaning that the term would have to a person of ordinary skill in the art in question” at the time of the invention.³ *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007) (citation omitted); (EX1002, ¶39).

IV. PRECISE REASONS FOR RELIEF REQUESTED

Pursuant to 37 C.F.R. § 42.104(b), Petitioner requests cancellation of the challenged claims based on the following references (*Id.*, ¶¶40-43):

Prior Art Reference	Abbreviation (Exhibit No.)
U.S. Patent No. 9,674,438	“Zhou” (EX1004)
U.S. Patent No. 8,531,535	“Kwatra” (EX1005)
U.S. Patent No. 10,462,370	“Shi” (EX1006)

The statutory grounds for the challenge of each claim are set forth below.

infringement allegations in the related International Trade Commission (ITC) proceeding. (EX1008; EX1009.) Petitioner reserves the right to argue in the ITC proceeding that GoPro’s construction of the terms are incorrect and/or not supported by the specification of the ’894 patent.

³ An IPR petition may only rely on prior art patents or printed publications. 35 U.S.C. § 311(b). Petitioner reserves the right to raise other invalidity issues, such as invalidity under § 101 or § 112, in the related ITC proceeding.

All of the statutory citations are AIA.

Ground	35 U.S.C. §	Claims	Prior Art Reference
1	103	1-20	Zhou, Kwatra
2	103	2, 3, 7, 12, 13, 17	Zhou, Kwatra, Shi

Below, Petitioner discusses why the challenged claims are unpatentable under the statutory grounds raised, including how and where the prior art satisfies each element of each challenged claim, as required by 37 C.F.R. § 42.104(b)(4). Petitioner’s showing establishes that there is a reasonable likelihood that it will prevail on each ground of unpatentability to each challenged claim.

A. Ground 1: Zhou and Kwatra Render Obvious Claims 1-20

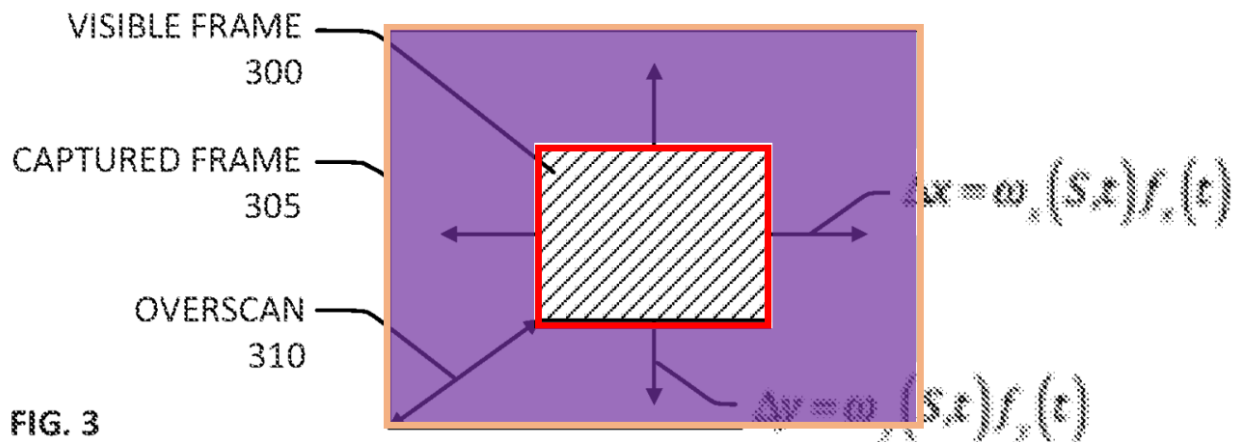
1. Summary of Zhou

Zhou was filed on August 25, 2014, and issued on June 6, 2017. It qualifies as prior art to the ’894 patent at least under §§ 102(a)(1) and 102(a)(2). The Examiner cited but never applied Zhou during prosecution. (EX1002, ¶45.)

Zhou discloses “[t]echniques to improve a digital image capture device’s ability to stabilize a video stream.” (EX1004, Abstract.) To avoid “abrupt or jarring changes in the . . . stabilized video,” Zhou determines the smoothed trajectory “based on past/future motion data” of the digital image capture device. (*Id.*, 8:50-52, 7:49.) Zhou discloses determining the “correction (difference) that needs to be applied to the motion data to make it equal the smoothed trajectory

and, using this information” to apply the transformations needed to the image to generate stabilized video. (*Id.*, 7:49-52.)

The videos as captured are comprised of *captured frames*. (*Id.*, 2:1-3.) However, only the visual content within *visible frame* is displayed to the user. (*Id.*, 3:1-3, 7:24-26.) Zhou’s video stabilization operation adjusts the smoothing of the trajectory and the resulting transformations applied to the image so that *visible frame* fits within its *overscan*, *i.e.*, stays within the boundary of the *captured frame*. (*Id.*, 7:47-51, Abstract.)



2. Summary of Kwatra

Kwatra was filed on February 8, 2011, and issued on September 10, 2013, qualifying as prior art to the '894 patent at least under §§ 102(a)(1) and 102(a)(2). The Examiner never found, and Applicant never cited, Kwatra during prosecution.

Kwatra discloses “[m]ethods and systems for processing a video for stabilization.” (EX1005, Abstract.) Kwatra states that its techniques “attempt to

render the recorded video as the video would have been recorded from a smooth or stable camera path.” (*Id.*, 1:37-40.) Kwatra explains that “[a] smooth camera path can be estimated using minimization of derivatives of the original camera path.” (*Id.*, 5:64-65.)

Because the original camera path includes rotational motion, the derivatives of the original camera path include rotational velocity (first derivative) and rotational acceleration (second derivative), and the minimization of the derivatives include minimizing rotational velocity and rotational acceleration. (*Id.*, 1:17-19, 16:13-32, 17:38-48, 18:54-56; EX1002, ¶¶51-54.)

3. Claim 1

a. Preamble: “A system that stabilizes videos, the system comprising:”

To the extent that the preamble is limiting (which Petitioner does not concede), Zhou discloses the preamble of claim 1.

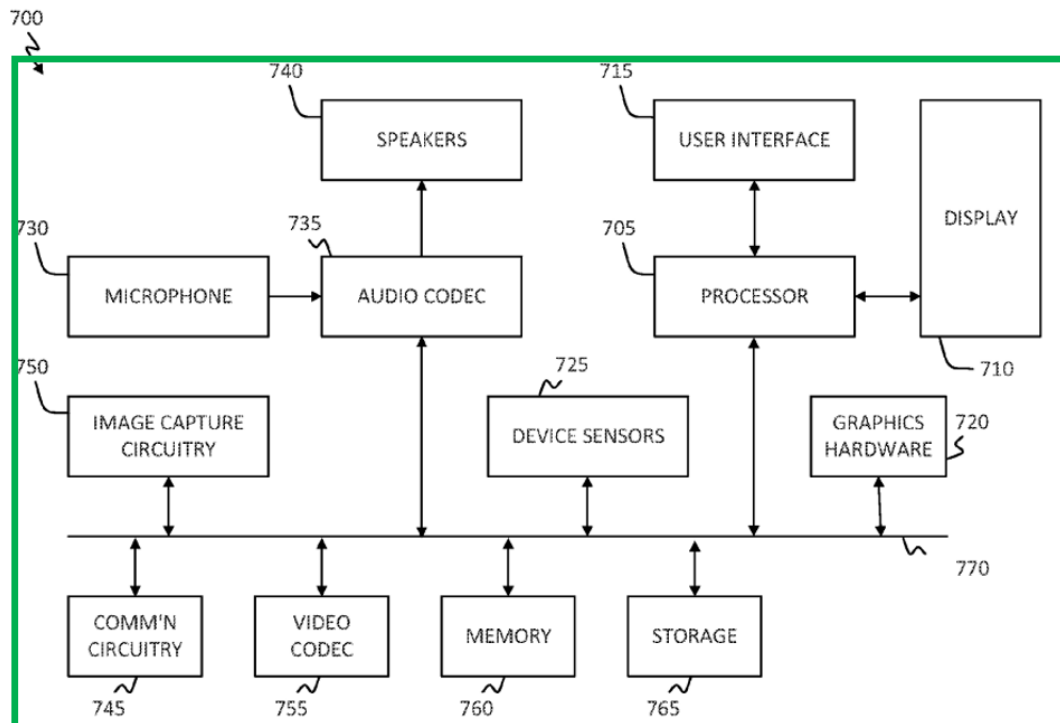
Zhou discloses “*systems* . . . to more effectively *stabilize* low light *video*.” (EX1004, 2:59-61.)

b. 1[a]: “a housing of an image capture device;”

Zhou discloses “[t]echniques to improve a *digital image capture device*’s ability to stabilize a video stream.” (*Id.*, Abstract.) Zhou discloses that the digital image capture device can be “a mobile telephone” or “portable camera.” (*Id.*, 11:58-59.) Figure 7 shows “a simplified functional block diagram” of the device.

(*Id.*, 11:55-56.) A POSITA would have understood that a mobile telephone or a portable camera has a **housing** that encloses the components shown in Figure 7.

(*Id.*, 11:60-67; EX1002, ¶56.)



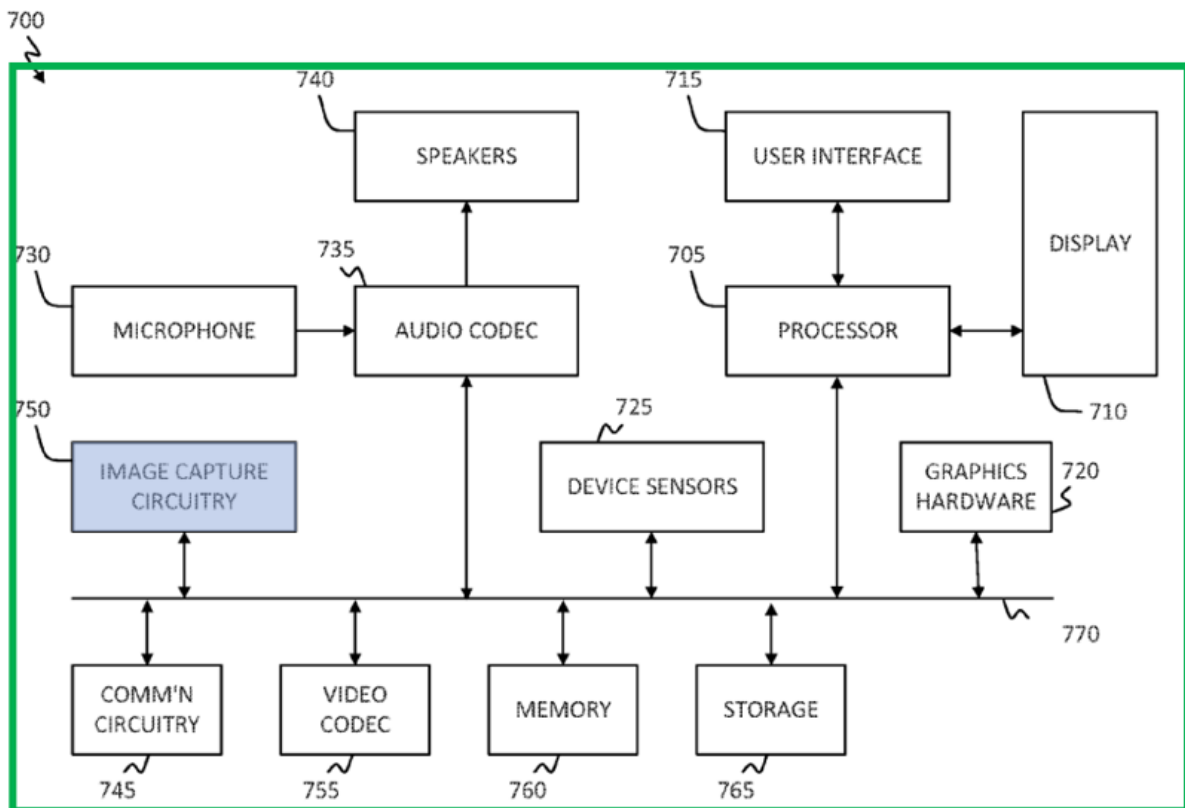
(EX1004, Fig. 7.)

- c. **1[b][i]: “an optical element carried by the housing and configured to guide light within an optical field of view to an image sensor,”**

Per the '894 patent, an “optical element” may include “one or more of *lens*, mirror, prism, and/or other optical elements.” (EX1001, 5:8-10.) A POSITA would have understood that a digital image capture device such as a portable camera has *a lens*, which is “an optical element.” (EX1002, ¶57.) Zhou further discloses that the stabilization techniques use “known camera (e.g., focus) and *lens*

characteristics.” (EX1004, 7:52-53; EX1002, ¶57.) A POSITA would also have understood that the lens is carried by the *housing* of the device. (EX1002, ¶57.)

Zhou discloses that “[a] video image capture device” comprises “*an image sensor*.” (EX1004, claim 14.) Zhou discloses that “[i]mage capture circuitry 750 may capture video images.” (*Id.*, 12:31.) A POSITA would have understood that the “[i]mage capture circuitry 750” in Figure 7 (reproduced below) encompasses *an image sensor*. (*Id.*, 11:62-65, 12:31-37.)



(*Id.*, Fig. 7.)

Per the '894 patent, an “optical field of view” may include “a scene that is

within the field of view of the optical element” and/or “the field of view of the scene that is delivered to the image sensor.” (EX1001, 5:14-18.) A POSITA would have further understood that the *lens* is configured to guide light within an optical field of view captured by the lens to *the image sensor*. (EX1002, ¶60.)

d. 1[b][ii]: “the optical field of view being greater than a capture field of view for generating video content;”

The *captured frame 305* corresponds to the “optical field of view.” (*Id.*, ¶61.) Zhou discloses a “capture field of view”: a “*visible frame 300* within *captured frame 305*,” as shown in Figure 3 below. (EX1004, 4:20-29, 7:24-25.) The field of view of *captured frame 305* is larger than the size of *visible frame 300*, with “the difference being *overscan 310*.” (*Id.*, 7:25-26; EX1002, ¶62.) In other words, *overscan* is the difference between the field of view of *captured frame 305* and the size of *visible frame 300*. (EX1002, ¶¶61-62.)

For comparison, Figure 6A of the ’894 patent is also presented below, showing the correspondences between Zhou’s *visible frame 300* and the ’894 patent’s *capture field of view 604*, and between Zhou’s *captured frame 305* and the ’894 patent’s *optical field of view 602*. (EX1002, ¶63.)

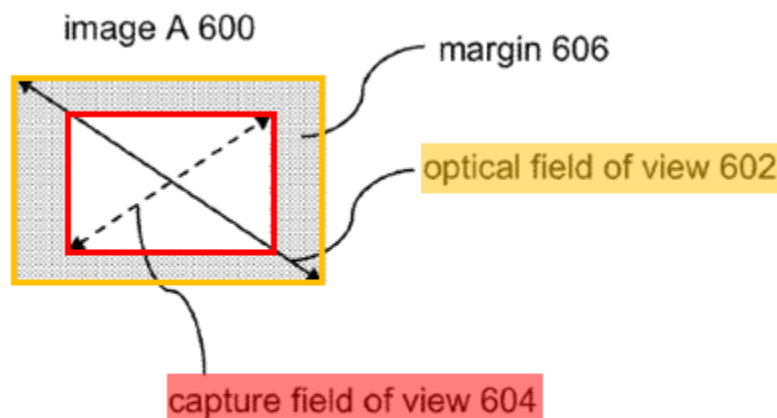
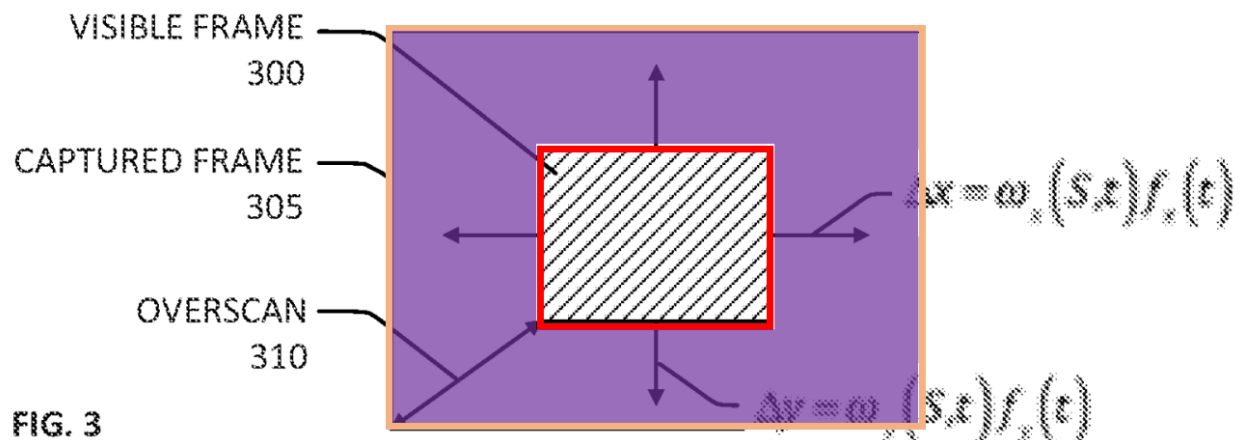


FIG. 6A

Zhou further discloses that **visible frame 300** is for generating video content. Zhou discloses that “[o]verscan” is the term given to the buffer of pixels around the edges of an image that are captured but not displayed to the user.” (EX1004, 3:1-3.) In other words, only the image within **visible frame 300** (i.e., “capture field of view”) is displayed to the user. (EX1002, ¶¶64-65.) As Zhou also discloses that “a stabilized version of a captured video” is displayed to the user (EX1004, 12:16-

18), a POSITA would have understood that *visible frame 300* is for generating video content. (EX1002, ¶¶64-65.)

- e. **1[c][i]: “the image sensor carried by the housing and configured to generate an image output signal based on light that becomes incident thereon during a capture duration,”**

As discussed for element 1[b][i], Zhou discloses the image sensor. (*Supra* § IV.A.3.c.) A POSITA would have understood that Zhou’s image sensor is carried by the *housing* of electronic device 700. (EX1002, ¶66.) A POSITA would also have understood that Zhou’s image sensor is configured to generate an image output signal based on light that strikes upon the image sensor. (*Id.*)

Zhou discloses “capturing a first time-sequenced set of images (e.g., a video stream).” (EX1004, 2:12-13.) The time sequence of the captured video stream is the capture duration. (EX1002, ¶67.)

- f. **1[c][ii]: “the image output signal conveying image information that defines images with the optical field of view;”**

Zhou discloses that from the video stream, “image data,” or “‘frame data’ . . . (e.g., R, G, and B values),” is placed into a buffer. (EX1004, 4:23-34, 8:62-63.) Image data constitutes “image information.” (EX1002, ¶68.) A POSITA would have understood that the image data is conveyed by the image output signal generated by the image sensor. (*Id.*) Zhou discloses that the image data corresponds to the incoming video frames, or “*captured frame[s]*,” which are the

“images.” (EX1004, 4:20-29, 7:24-25; EX1002, ¶68.) A POSITA would have understood that the entire field within the *captured frame 305* is the claimed “optical field of view.” (EX1002, ¶68.)

- g. 1[d][i]: “a position sensor carried by the housing and configured to generate a position output signal based on positions of the housing during the capture duration,”**

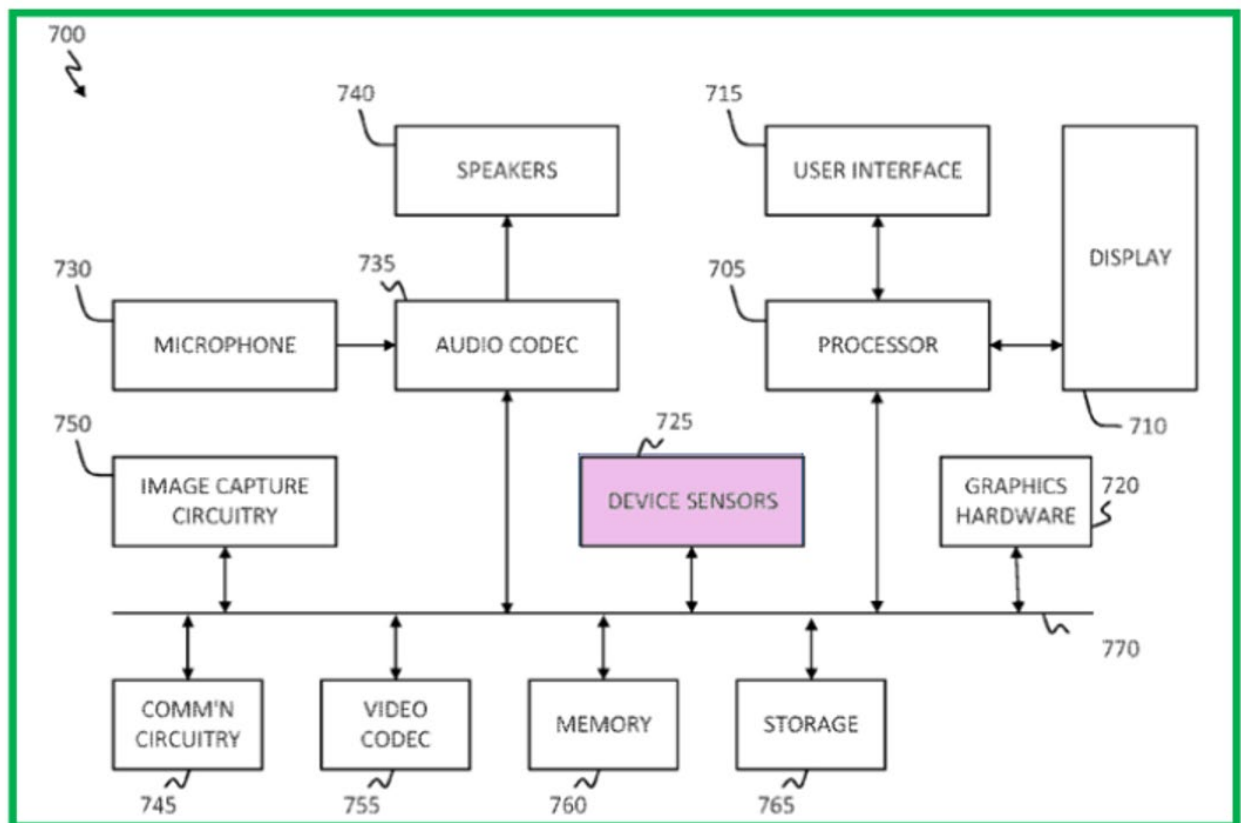
The time duration of the captured video stream in Zhou is the “capture duration.” (*Supra* § IV.A.3.e.)

According to the ’894 patent, “the position sensor may include one or more of a gyroscope, an accelerometer, and/or an inertial measurement unit.” (EX1001, 2:10-12.) Zhou discloses that the image capture device includes “*device sensors 725* (e.g., *proximity sensor*/ambient light sensor, *accelerometer and/or gyroscope*),” as Figure 7 shows. (EX1004, 11:62-63.) Zhou further discloses that “*motion sensors such as gyroscopes or accelerometers*” provide “motion information.” (*Id.*, 2:14-16.) The motion sensors in Zhou are therefore the claimed “position sensors.”

A POSITA would have understood that the *motion sensors* are carried by the *housing* of the device. (EX1002, ¶¶71-72.)

Zhou also discloses that each image within the captured video stream has corresponding “motion information . . . provided by one or more motion sensors

such as gyroscopes or accelerometers” and “motion data.” (EX1004, 2:13-16, 4:23-29; EX1002, ¶72.) The “motion information,” which can be “time stamped gyroscope data points,” reflects “the image capture device’s orientation . . . during the capture” (*i.e.*, position during the capture). (EX1004, 5:20-24.) Because the image capture device includes the *housing*, the motion information (*i.e.*, position information) of the device reflects the position information of the *housing*. (EX1002, ¶¶71-72.)



(EX1004, Fig. 7.)

- h. 1[d][ii]: “the position output signal conveying position information that characterizes the positions of the housing at different moments

within the capture duration, the positions of the housing including rotational positions of the housing; and”

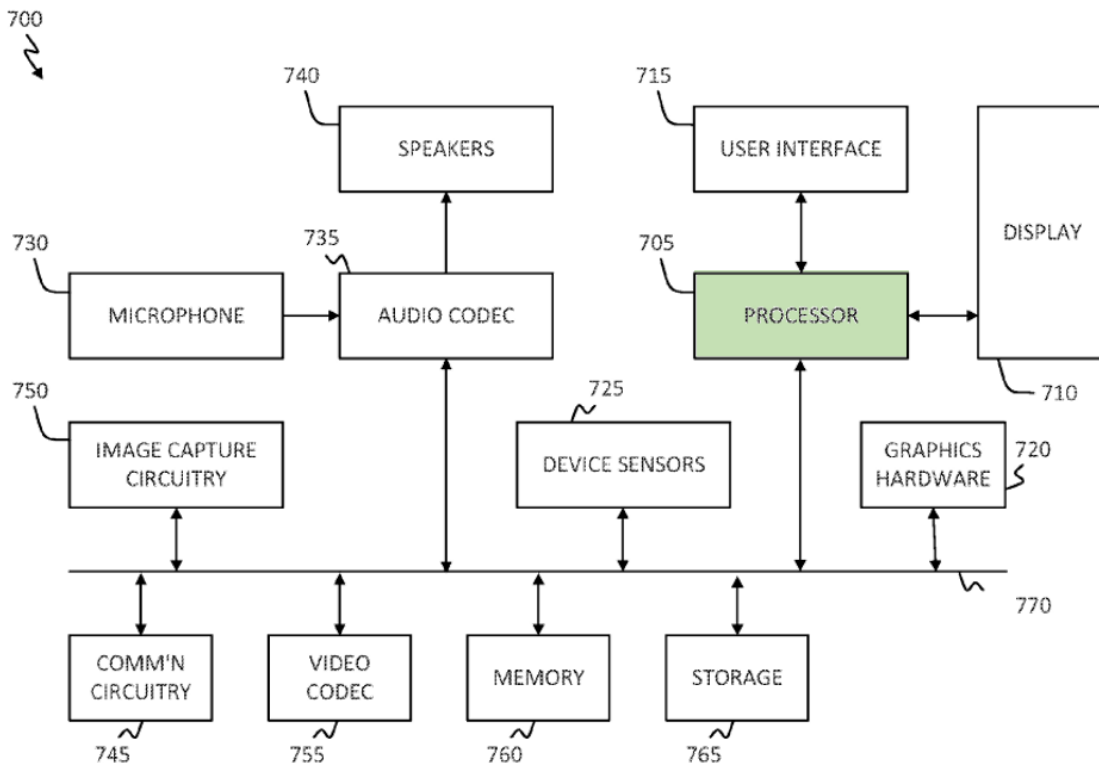
A POSITA would have understood that the position information is conveyed by the position output signals generated by the *motion sensors*. (EX1002, ¶¶74-75; *supra* § IV.A.3.g.)

The position information may be “time stamped gyroscope data points” that “compute the image capture device’s orientation.” (EX1004, 5:21-22.) A POSITA would have understood that gyroscope data points characterize the rotational positions of the image capture device and, therefore, the housing. (EX1002, ¶74.) The gyroscope data points are conveyed by position output signals generated by the motion sensors, which include gyroscopes. (*Id.*, ¶¶75-76.)

Zhou discloses that the “time stamped gyroscope data points,” reflects “the image capture device’s orientation . . . during the capture” (*i.e.*, position during the capture). (EX1004, 5:20-24.) Zhou states that the motion information from “gyroscopes and/or . . . accelerometers . . . is matched with, or synchronized to, the capture of video frames.” (*Id.*, 4:36-38.) Zhou also discloses that each captured image “has a capture time and motion information.” (*Id.*, 2:12-16.) Thus, the motion information corresponds to different moments within the duration of the captured video. (EX1002, ¶¶74-76.)

- i. 1[e]: “one or more physical processors configured by machine-readable instructions to:”

Zhou discloses that “electronic device 700 may include *processor 705*,” as shown in Figure 7. (EX1004, 11:60-61.) “*Processor 705* may execute instructions necessary to carry out or control the operation of many functions performed by device 700.” (*Id.*, 12:1-3.)



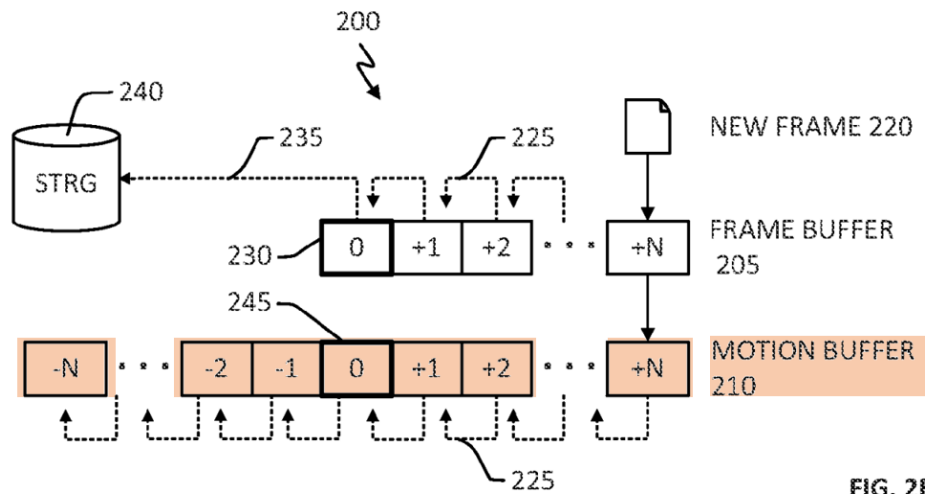
(*Id.*, Fig. 7)

- j. 1[f][i]: “determine an observed trajectory of the housing during the capture duration based on the position information, the observed trajectory reflecting the positions of the housing at the different moments within the capture duration,”

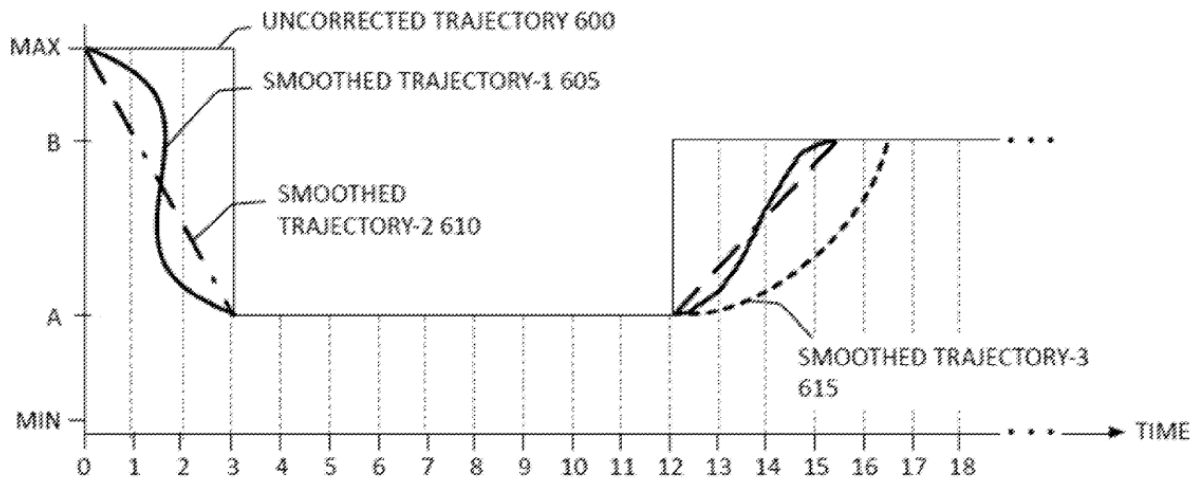
The time duration of the captured video stream in Zhou is the “capture duration.” (*Supra* § IV.A.3.e.) The motion information provided by the motion sensors is the “position information,” which characterizes the positions of the housing at different moments within the duration of the captured video. (*Supra* §§ IV.A.3.g-IV.A.3.h.)

Under GoPro’s infringement theory in the related ITC action, the accused products “form[] a moment-by-moment listing of the camera position based on the six-axis gyroscope generated position output signals to create *an observed trajectory* of the housing during the capture duration.” (EX1009, 14.)

Zhou discloses storing each frame of the video stream’s “corresponding *motion data* . . . into” a “motion buffer entry,” as Figure 2B shows. (EX1004, 4:33-34.) Zhou therefore discloses a moment-by moment listing of the image capture device’s motion information, and therefore determines an observed trajectory of the device. (EX1002, ¶¶78-79.)



Zhou also discloses an “*uncorrected trajectory 600*” that “represents the change in stabilization strength value needed to stabilize a video stream,” as shown in Figure 6. (EX1004, 10:19-21.) Zhou further discloses that “the ‘trajectory’ of the strength parameter . . . is a stand-in for the . . . trajectory of the image capture device.” (*Id.*, 9:63-65.) Therefore, a POSITA would have understood that an observed trajectory of image capture device, including its housing, is determined. (EX1002, ¶80.)



- k. 1[f][ii]: “the observed trajectory including a first portion corresponding to a first moment within the capture duration and a second portion corresponding to a second moment subsequent to the first moment within the capture duration;”

Zhou discloses a “current frame” as the “frame in frame buffer entry 230,” with the corresponding “*motion data in motion buffer entry 245*.” (EX1004, 5:9-11.) It further discloses that in the “buffer system 200” shown in Figure 2B, the “entries having positive prefixes” correspond to “*frames captured after* frame and *motion entry* 230 and 245 respectively.” (*Id.*, 4:40, 4:51-52.)

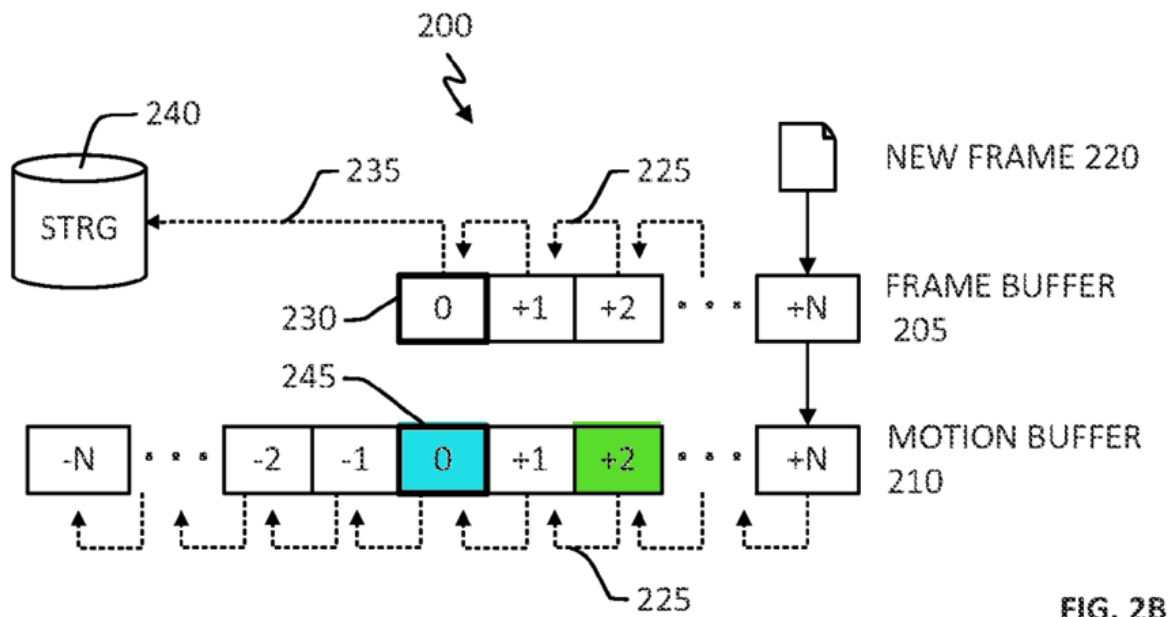


FIG. 2B

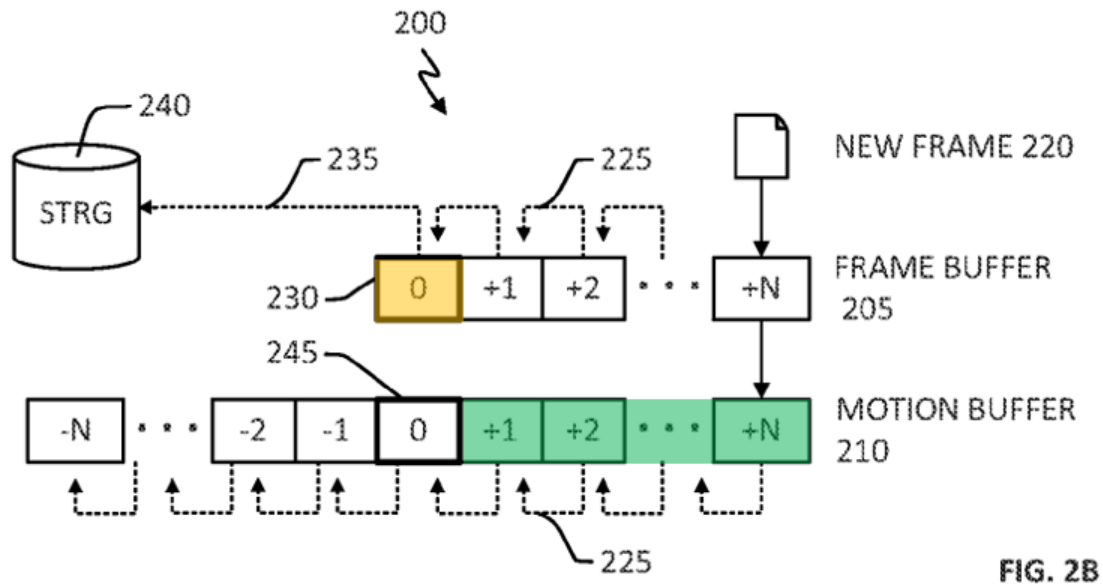
A POSITA would have understood that motion data in *motion entry 245* corresponds to a first moment within the captured video, and motion data in a motion entry after entry 245, such as *the “+2” entry*, corresponds to a second moment, subsequent to the first moment, within the captured video. (EX1002, ¶¶81-85.)

Because the observed trajectory reflects the motion data for all frames within the captured video, the observed trajectory includes (1) a point corresponding to motion data in *motion entry 245*, which corresponds to a first moment within the captured video, and (2) another point corresponding to motion data in later entry, such as *the “+2” motion entry*, which corresponds to a second moment subsequent to the first moment within the captured video. (*Id.*)

I. 1[g][i]: “determine a capture trajectory of the housing based on a look ahead of the observed trajectory,”

According to the '894 patent, the capture trajectory “may have smoother changes in the positions of the image capture device than the observed trajectory,” and a “look ahead may include use of one or more subsequent portions of an observed trajectory to determine a preceding portion of the capture trajectory.” (EX1001, 1:38-40, 9:46-48.)

Zhou discloses “techniques . . . for stabilizing video images using . . . a *look-ahead* buffer comprising a number of video input frames.” (EX1004, 2:61-64.) Zhou discloses that its “ability to *look into the ‘future’* provides it a unique ability to anticipate abrupt movements in the future.” (*Id.*, 10:1-2.) Zhou further discloses that “for each current frame, video stabilization operation 100 determines the smoothed motion sample based on past/*future motion data*, and determines the correction (difference) that needs to be applied to the motion data to make it equal the *smoothed trajectory*.” (*Id.*, 7:47-51.) For example, to stabilize the *frame in frame buffer entry 230*, *future motion data in one or more later entries of motion buffer 210* is used. (EX1002, ¶¶86-90.)



In other words, Zhou discloses determining the portion of the capture trajectory corresponding to the current frame based on future motion data, which corresponds to a later portion of the observed trajectory after the current frame. (*Supra* §§ IV.A.3.j - IV.A.3.k; EX1002, ¶¶86-90.) Zhou therefore discloses determining a capture trajectory based on a look ahead of the observed trajectory. (EX1002, ¶91.)

- m. **1[g][ii]: “the capture trajectory reflecting actual and/or virtual positions of the housing from which orientations of the capture field of view with respect to the optical field of view of the images are determined,”**

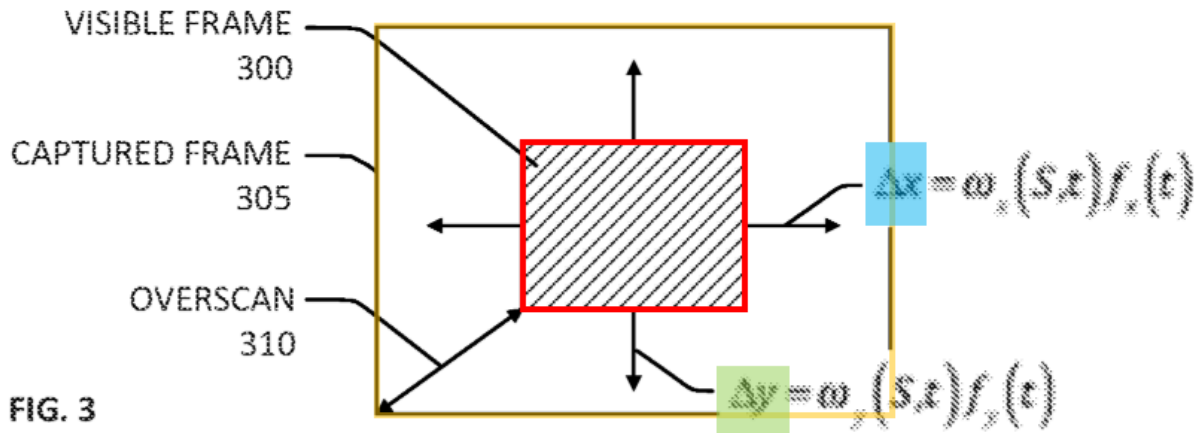
The '894 patent states that “[a] virtual position may be offset (rotationally and/or translationally) from the actual position.” (EX1001, 9:26-29.)

Referring to Figure 3, Zhou discloses moving *visible frame 300* with respect to *captured frame 305*: “ Δx and Δy represent the amount of motion along x and y coordinate axes that the current frame should be moved in accordance with stabilization operation.” (EX1004, 7:32-34.) That is, to determine the smoothed trajectory, Zhou discloses applying offsets Δx and Δy to *visible frame 300* relative to the *captured frame 305*, which corresponds to actual device position at a corresponding moment of capture. (*Id.*, 2:12-13; EX1002, ¶93.)

Further, Zhou discloses that its smoothed trajectory is a “smoothed/stabilized trajectory of the image capture device,” which includes a housing. (EX1002, ¶94; *supra* § IV.A.3.b.) Therefore, Zhou discloses “the capture trajectory reflecting . . . virtual positions of the housing.”

The *visible frame 300* corresponds to the “capture field of view,” and the *captured frame 305* corresponds to the “optical field of view.” (*Supra* § IV.A.3.d; EX1002, ¶95.) Applying offsets Δx and Δy involves adjusting the orientation (*e.g.*, rotational, horizontal/lateral positions (EX1001, 12:66-13:17)) of the *visible frame 300* relative to the *captured frame 305*. (EX1004, 7:32-34; EX1002, ¶95.)

Therefore, Zhou also discloses “virtual positions of the housing from which orientations of the capture field of view with respect to the optical field of view of the images are determined.” (EX1002, ¶95.)

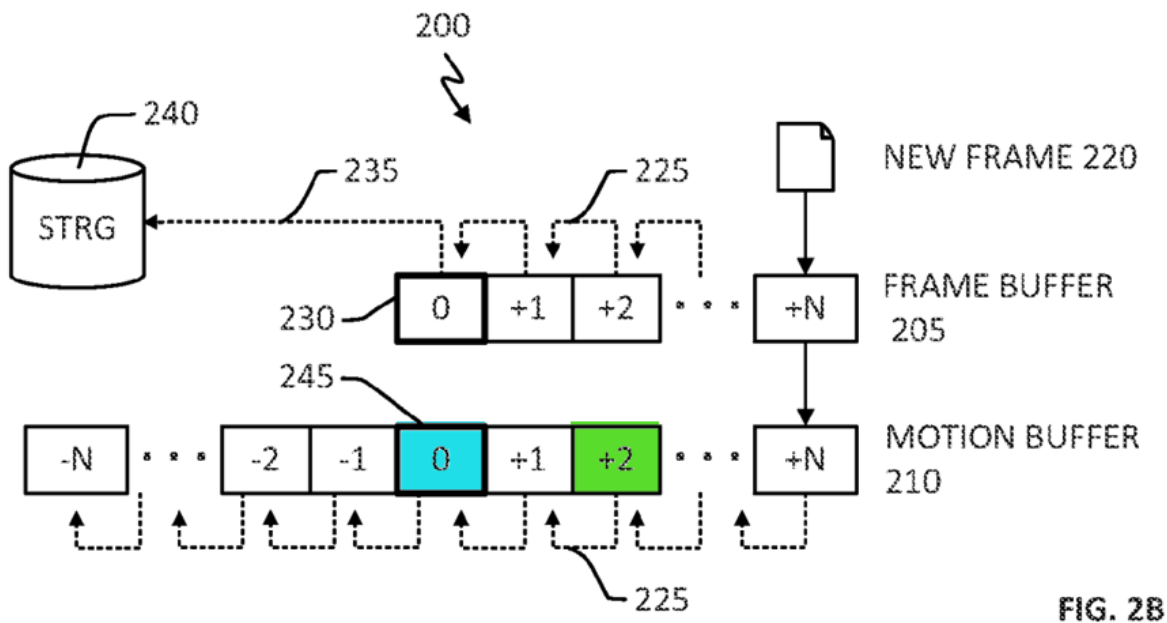


Additionally, Zhou discloses allowing its smoothed trajectory to follow the actual camera movements “by letting the image sequence jitter slightly . . . [to] follow the natural trail of movement in the image sequence.” (EX1004, 6:51-53; EX1002, ¶96.) Therefore, Zhou further discloses that its smoothed trajectory reflects actual positions of the housing.

- n. 1[g][iii]: “the look ahead of the observed trajectory including use of a subsequent portion of the observed trajectory to determine a preceding portion of the capture trajectory such that a portion of the capture trajectory corresponding to the first portion of the observed trajectory, which corresponds to the first moment within the capture duration, is determined based on the second portion of the observed trajectory, which corresponds to the second moment within the capture duration,”

The observed trajectory and its corresponding capture trajectory. As discussed for element 1[f][i], each point on the observed trajectory reflects the corresponding motion data of a particular frame. (*Supra* § IV.A.3.j.) The

observed trajectory includes (1) a point corresponding to motion data in *motion entry 245*, which corresponds to the current frame and the first moment within the capture duration, and (2) another point corresponding to motion data in a later entry, such as *the “+2” motion entry*, which corresponds to a subsequent frame and the second moment within the captured video. (*Supra* § IV.A.3.k.)

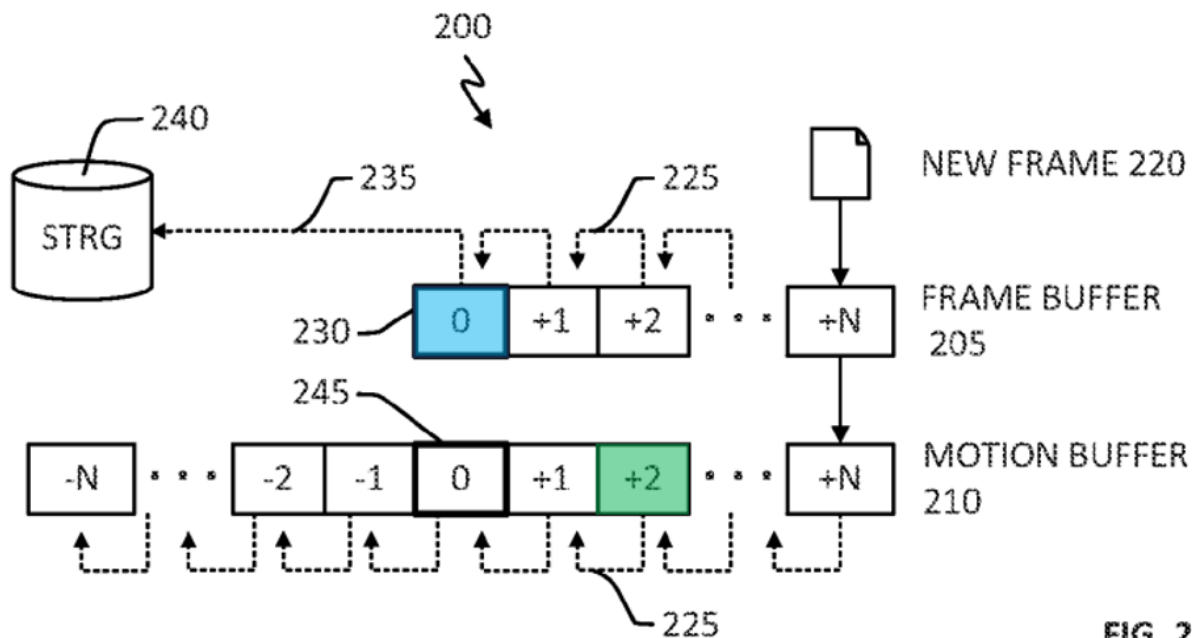


Zhou further discloses that the smoothed trajectory (the “capture trajectory”), generated after video stabilization, corresponds to the trajectory of the device (the “observed trajectory”). (EX1002, ¶¶97-98.) Zhou discloses that “for each current frame, video stabilization operation 100 . . . determines the correction (difference) that needs to be applied to the motion data to make it equal the smoothed trajectory.” (EX1004, 7:47-51.)

Look ahead of observed trajectory. Zhou discloses “techniques . . . for

stabilizing video images using . . . a *look-ahead* buffer comprising a number of video input frames.” (*Id.*, 2:61-64.) Zhou discloses “stabilization adjustments . . . of a *current frame* in a way that prepares for, or anticipates, the motion in *future frames*.” (*Id.*, 4:2-4.) Zhou further discloses that “for each *current frame*, video stabilization operation 100 determines the *smoothed motion sample* based on past/*future motion data*.” (*Id.*, 7:47-49.)

Stabilization adjustments and smoothed motion sample of the *current frame* correspond to the first portion of the capture trajectory, and the *future frames* correspond to the second portion of the observed trajectory. (EX1002, ¶100; *supra* § IV.A.3.k.) Therefore, Zhou discloses determining a first or preceding portion of the capture trajectory corresponding to the *current frame* and the first moment within the capture duration, based on a second, or subsequent portion of the observed trajectory, which corresponds to *subsequent, future frames* and the second moment within the capture duration. (EX1002, ¶¶100-101.)



- o. **1[g][iv]: “the capture trajectory having smoother changes than the observed trajectory,”**

Zhou discloses that “video stabilization operation [] determines the smoothed motion sample . . . and determines . . . the smoothed trajectory.” (EX1004, 7:47-51.) Zhou further discloses that its stabilized videos would “avoid[] any abrupt or jarring changes in . . . the resulting stabilized video.” (*Id.*, 8:50-52.) Therefore, a POSITA would have understood that the smoothed trajectory (the “captured trajectory”) generated after video stabilization has smoother changes compared to the trajectory of the device (the “observed trajectory”), which is not stabilized. (EX1002, ¶¶102-103.)

- p. **1[g][v]: “wherein the capture trajectory is determined to include a path that minimizes a**

**combination of rotational velocity and
rotational acceleration of the housing,”**

Zhou and Kwatra disclose this claim limitation under GoPro’s infringement theory. Under GoPro’s infringement theory, the accused products include this limitation because “angular velocity and angular acceleration are considered as part of the process for smoothing videos.” (EX1009, 23.)

Zhou discloses that “video stabilization operation [] determines . . . the correction (difference) that needs to be applied to the motion data to make it equal the smoothed trajectory” and that “strength parameter . . . is a stand-in for the smoothed/stabilized trajectory of the image capture device.” (EX1004, 7:47-51, 9:64-65; EX1002, ¶104.) Therefore, the stabilization strength parameter determines the amount of smoothing applied to generate the smoothed trajectory. (EX1002, ¶104.)

Zhou also discloses that “video may be stabilized . . . against rotation,” but does not specify the rotational motion characteristics to adjust. (EX1004, 7:41-42.) Hence, a POSITA would have been motivated to turn to a prior art reference that discloses the specific rotational motion characteristics to adjust to stabilize a video. (EX1002, ¶¶105-106.)

A path that minimizes a combination of rotational velocity and rotational acceleration of the housing. Kwatra discloses “determining a modified motion

camera path of the original motion path of the camera including for each time t the substantially constant path, the substantially constant velocity, or the substantially constant acceleration of the original motion path of the camera.” (EX1005, 1:52-57.) Kwatra discloses that “[i]mage stabilization techniques may compensate for . . . **angular** movement[] of a camera.” (*Id.*, 1:17-19.) Additionally, “constraints can be imposed on the optimal camera path” such that “a range of change in zoom and **rotation**” can be limited. (*Id.*, 16:13-32.) Kwatra further discloses camera rotation as examples of original camera motion. (*Id.*, 17:38-48, 18:54-56.) A POSITA would have understood that the original camera path includes rotational movement of the housing. (EX1002, ¶¶107-108.)

Kwatra discloses that a “smooth camera path can be estimated using minimization of derivatives of the original camera path,” “where P is a function representing the camera path.” (EX1005, 5:64-6:5.) For example, “a constant path [may] represent[] a static camera,” denoted as: $\frac{dP}{dt} = 0$; “a path of constant velocity [may] represent[] a panning or a dolly shot,” denoted as: $\frac{d^2P}{dt^2} = 0$; and “a path of constant acceleration [may] represent[] an ease-in and out transition between static and panning cameras,” denoted as: $\frac{d^3P}{dt^3} = 0$. (*Id.*, 13:23-48.)

A POSITA would have understood that $\frac{dP}{dt}$ represents velocity of the original

camera path while $\frac{d^2P}{dt^2}$ represents acceleration of the original camera path.

(EX1002, ¶¶109-110.) Constant path means zero velocity, and constant velocity means zero acceleration. (*Id.*)

Because the original camera path includes rotational movement of the housing, as discussed above, the velocity (first derivative) of the original camera path includes rotational velocity of the housing, and the acceleration (second derivative) of the original camera path includes rotational acceleration of the housing. (*Id.*, ¶¶107-111.) Therefore, the minimization of the first derivative and the second derivative includes minimization of rotational velocity and rotational acceleration of the housing.

Kwatra further discloses “determin[ing] a stable camera path” by minimizing the below “cost function”:

$$a \left| \frac{dP}{dt} \right| + b \left| \frac{d^2P}{dt^2} \right| + c \left| \frac{d^3P}{dt^3} \right|$$

Weights a, b, and c determine how much the stabilization technique controls the path, velocity, and acceleration being constant, respectively. (EX1005, 13:66-14:37; EX1002, ¶112.)

Therefore, the “cost function,” used to stabilize camera path, is used to generate a smoothed camera path that includes minimizing a combination of rotational velocity ($\frac{dP}{dt}$) and rotational acceleration ($\frac{d^2P}{dt^2}$) of the housing.

It would have been obvious to stabilize against rotation by minimizing a combination of rotational velocity and rotational acceleration. (EX1002, ¶114.) Zhou discloses that video stabilization “dampen[s] the effects of camera shake” in a video. (EX1004, 1:41-45.) Kwatra discloses using “the smooth camera path to remove shake from [a] recorded video.” (EX1005, 3:58-59.) Zhou and Kwatra use known techniques to improve similar methods in the same way. (EX1002, ¶114.)

A POSITA would have understood that camera shake may include rotational motion. (EX1002, ¶115.) Kwatra’s smooth camera path, determined by minimizing a combination of rotational velocity and rotational acceleration, would further reduce rotational components of camera shake that Zhou seeks to dampen. (*Id.*)

Rotational velocity and acceleration are one of a “finite number of identified, predictable solutions” for defining rotational motion. *KSR v. Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 402 (2007). A POSITA would have reasonably expected the combination to succeed. Both Zhou and Kwatra disclose positioning a crop window to generate stabilized video content. (EX1004, 7:47-54; EX1005, Abstract; EX1002, ¶116.) Both Zhou and Kwatra disclose using similar mobile device components for video stabilization. (EX1004, 11:55-67, Fig. 7; EX1005, 26:12-21, Fig. 13.) Further, the Zhou-Kwatra combination is simply a combination

of prior art elements according to known methods to yield predictable results.

(EX1002, ¶117.)

- q. 1[g][vi]: “the combination of the rotational velocity and the rotational acceleration of the housing weighing the rotational velocity and the rotational acceleration equally or differently;”**

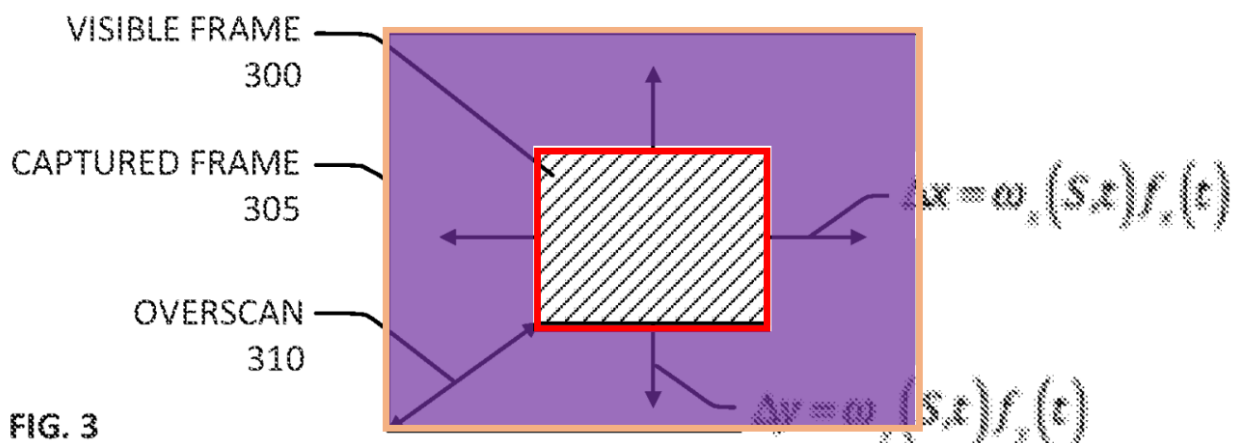
As discussed above for element 1[g][v], Kwatra discloses “the combination of the rotational velocity and the rotational acceleration of the housing.” (*Supra* § IV.A.3.p.) Kwatra discloses “determin[ing] a stable camera path” by minimizing the below “cost function”:

$$a \left| \frac{dP}{dt} \right| + b \left| \frac{d^2P}{dt^2} \right| + c \left| \frac{d^3P}{dt^3} \right|$$

Weights a, b, and c determine how much the stabilization techniques control the path, velocity, and acceleration being constant, respectively. (EX1005, 13:66-14:37.) Kwatra discloses that the weights a and b, corresponding to rotational velocity and rotational acceleration, respectively, can be equal or different. “[W]eights chosen such that a=1, and b=c=0 . . . weights chosen such that a=b . . . weights chosen such that a=10, b=1.” (*Id.*, 14:32-45.) Therefore, Kwatra discloses “weighing the rotational velocity and the rotational acceleration equally or differently.” (EX1002, ¶119.)

- r. 1[h]: “determine the orientations of the capture field of view for the images with respect to the optical field of view of the images based on the capture trajectory of the housing; and”

The captured video frames are the “images.” (*Supra* § IV.A.3.f.) The entire field within the *captured frame 305* is the optical field of view. (*Supra* § IV.A.3.f.) “*Visible frame 300* within *captured frame 305*” is the “capture field of view.” (*Supra* § IV.A.3.d.) *Overscan* is the difference between the field of view of *captured frame 305* and the size of *visible frame 300*. (*Supra* § IV.A.3.d.)



Zhou discloses calculating the amount of movement for “*visible frame 300* within *captured frame 305* (the difference being overscan 310).” (EX1004, 7:24-26.) Zhou also discloses “keep[ing] the current frame within its *overscan*.” (*Id.*, Abstract), which means keeping *visible frame 300* within the boundary of *captured frame 305*. (EX1002, ¶¶120-122.) To determine how to move *visible frame 300* within *captured frame 305* is determining the orientation of it. (*Id.*)

Zhou discloses that the amount of movement is determined by the “video stabilization operation 100 [which] determines *the smoothed motion sample* based on past/future motion data, and determines the correction (difference) that needs to be applied to the motion data to make it equal *the smoothed trajectory*.” (EX1004, 7:47-51.) Therefore, the orientation of *visible frame 300* with respect to the field within *captured frame 305* is based on Zhou’s smoothed trajectory (the “capture trajectory”). (EX1002, ¶¶123-129.)

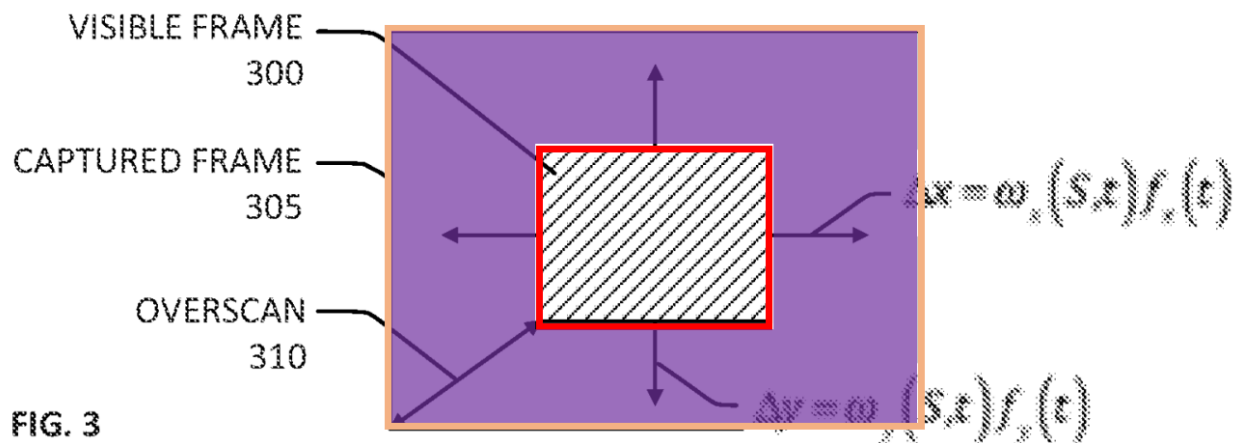
- s. **1[i][i]: “generate the video content based on a punch-out of visual content of the images within the capture field of view,”**

According to the ’894 patent, a “punch-out of an image may refer to one or more portions of the image that is used for presentation, such as a cut-out of the image or a cropped portion of the image.” (EX1001, 8:10-12.) The ’894 patent additionally states that “[t]he capture field of view [] may provide a punch-out.” (*Id.*, 12:7.) In other words, the claimed “punch-out of visual content of the images” defines the portion of the displayed video frames and is of the same size of the capture field of view. (EX1002, ¶¶130-131.)

As discussed for element 1[b][ii], only the image within *visible frame 300* is displayed to the user. (*Supra* § IV.A.3.d.) A POSITA would have understood that the field of view of *visible frame 300* is the “punch-out.” (EX1002, ¶132.)

Therefore, *visible frame 300* defines the extents of content in the *captured frame*

305 included within the field of view of *visible frame 300*. (EX1002, ¶132.)



Zhou discloses “generat[ing] a stabilized version of the captured video stream,” which may be displayed. (EX1004, 12:13-14.) As discussed for element 1[b][ii], only the image within *visible frame 300* is displayed to the user. (*Supra* § IV.A.3.d.) Thus, a POSITA would have understood that the generation of the stabilized video is based on *visible frame 300*, and that the stabilized video includes the field of view within *visible frame 300*, which, as discussed, is the “punch-out.” (EX1002, ¶130.)

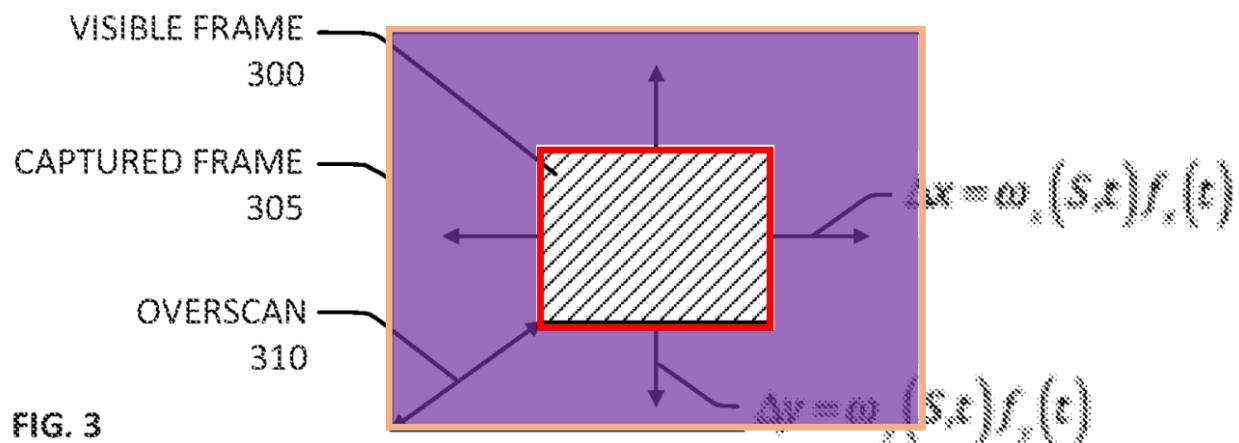
- t. **1[i][ii]: “wherein use of the visual content of the images within the capture field of view to generate the video content provides stabilization that creates a more stable view than use of entire visual content of the images.”**

As discussed for element 1[i][i], the image within *visible frame 300* is the “visual content of the images within the capture field of view.” (*Supra* § IV.A.3.s.)

As discussed for element 1[b][ii], the *visible frame 300* is for generating stabilized

video content. (*Supra* § IV.A.3.d.) As discussed for element 1[c][ii], the *captured frame 305* corresponds to “the images” (*supra* § IV.A.3.f.), so the image in the *captured frame 305* is the “entire visual content of the images.” (EX1002, ¶¶134-136.)

A POSITA would understand that Zhou’s stabilized video, generated using the *visible frame 300*, is more stable than the *captured frames 305* of the captured video. (*Id.*) For example, Zhou discloses that its stabilized video is “a stabilized version of a captured video sequence.” (EX1004, 12:13-19.) Therefore, Zhou discloses this limitation.



4. **Claim 2: “The system of claim 1, wherein the determination of the capture trajectory of the housing based on the look ahead of the observed trajectory preserves a user’s intended motion of the image capture device during the capture duration.”**

The ’894 patent states that “intended motion may refer to the motion of the image capture device that the user planned/meant to carry out.” (EX1001, 9:56-sf-5949017

58.)

Kwatra discloses “a proximity constraint that requires the smooth camera path motion to preserve an original intent of the recorded video.” (EX1005, 13:10-12.) As discussed for element 1[g][v], the smooth camera path motion is a “capture trajectory of the housing.” (*Supra* § IV.A.3.p.) Preserving an original intent of the recorded video is “preserving a user’s intended motion of the image device during the capture duration.” (EX1002, ¶138.)

As discussed for element 1[g][i], Zhou discloses “determine a capture trajectory of the housing based on a look ahead of the observed trajectory.” (*Supra* § IV.A.3.1.)

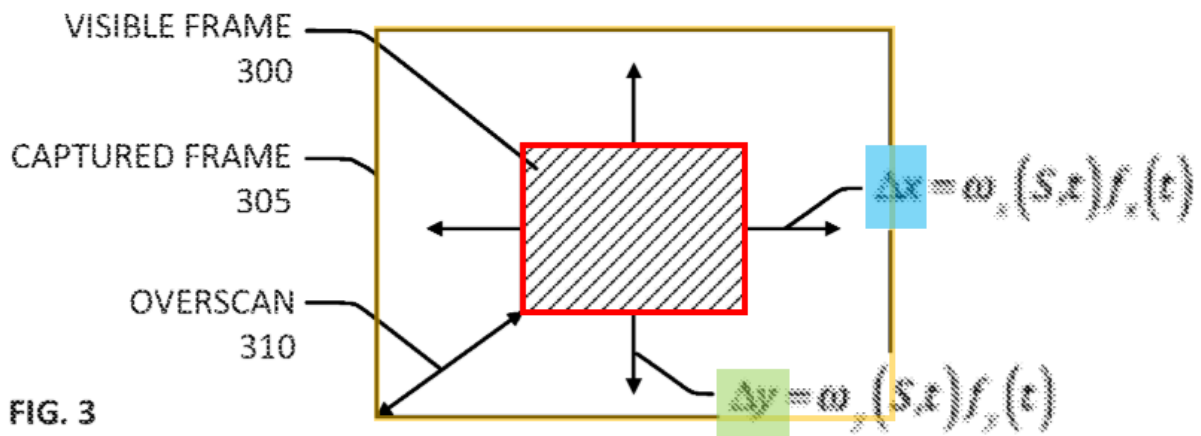
It would have been obvious to combine Zhou and Kwatra to meet claim 2. (EX1002, ¶140.) For example, it would have been obvious to use Kwatra’s smooth camera path motion determination to improve Zhou’s video stabilization. (*Id.*) Zhou discloses adjusting stabilization strength based on “what sort of activity is causing the detected camera motion” but does not specify how. (EX1004, 3:49-59; EX1002, ¶141.) Kwatra discloses determining an original intent of a recorded video, such as zooming and capturing an object of interest – the “sort of activity causing the detected camera motion,” and adjusting the smooth camera path motion accordingly. (EX1005, 13:6-17.)

5. **Claim 3: “The system of claim 2, wherein past positions of the image capture device supply context for the user’s intended motion of the image capture device.”**

As discussed for claim 2, Kwatra’s “original intent of the recorded video” is “the user’s intended motion of the image capture device.” (*Supra* § IV.A.4.) Kwatra further discloses estimating “an original path of a camera that recorded the video” and using “previous N frames” to reduce error accumulation related to the original camera path estimate. (EX1005, Abstract, 8:16-17, 12:18-42.) A POSITA would understand that the “previous N frames” encompass past positions of the image capture device. (EX1002, ¶143.) In other words, past positions of the image capture device are used to determine camera motions of the current frame more accurately. (*Id.*, ¶144.) Therefore, when a current frame is associated with an “original intent,” these past positions supply context for the “user’s intended motion.” (*Id.*)

6. **Claim 4: “The system of claim 1, wherein the positions of the housing further include translational positions of the housing, and at least some of the virtual positions of the housing are translationally offset from the actual positions of the housing.”**

At least some of the virtual positions of the housing are translationally offset from the actual positions of the housing. Figure 3 in Zhou “illustrates the movement that can be applied to *a visible region of a frame* within its overscan during stabilization operations.” (EX1004, 2:42-44.)



Specifically, the “motion of **visible frame 300** within **captured frame 305** (the difference being overscan 310)” can be shown as

$$\Delta x = \omega_x(S, t) f_x(t) \quad \text{EQ. 1A}$$

$$\text{and } \Delta y = \omega_y(S, t) f_y(t), \quad \text{EQ. 1B}$$

“where Δx and Δy represent the amount of *motion along x and y coordinate axes*,” and “describe translation.” (*Id.*, 7:24-34, 7:39.) As discussed for element 1[g][ii], the position of **visible frame 300** is determined by the virtual positions of the housing, and the position of the **captured frame 305** corresponds to the actual positions of the housing. (*Supra* § IV.A.3.m.) Further, Zhou discloses applying offsets Δx and Δy to **visible frame 300** relative to the **captured frame 305**. (*Id.*)

A POSITA would understand that at least some of Zhou’s camera motions (corresponding to actual positions of the housing) include translational motions. (EX1002, ¶¶145-146.) As the movement of **visible frame 300** is along x and y coordinate axes, *i.e.*, translational, Zhou discloses “at least some of the virtual

positions of the housing are translationally offset from the actual positions of the housing.” (*Id.*)

Kwatra also discloses this limitation. Kwatra discloses that the smooth camera path motion is updated against “motion along the x-axis (or horizontal motion)” and “motion along the y-axis (or vertical motion).” (EX1005, 19:6-7; 19:33-34.)

For example, Figure 8A shows the differences between the *smooth camera path motion 804* (e.g., virtual positions of the housing) and the *original camera path motion 802* (e.g., actual positions of the housing) along the x-axis (e.g., translational positions). (EX1005, Fig. 8A; EX1002, ¶148.) Figure 8B shows the differences between the *smooth camera path motion 804* (e.g., virtual positions of the housing) and the *original camera path motion 802* (e.g., actual positions of the housing) along the y-axis (e.g., translational positions). (EX1005, Fig. 8B; EX1002, ¶148.) The differences between the *smooth camera path motion 804* and the *original camera path motion 802* along the x-axis or the y-axis are translational offsets from virtual positions of the housing to the actual positions of the housing. (EX1002, ¶149.)

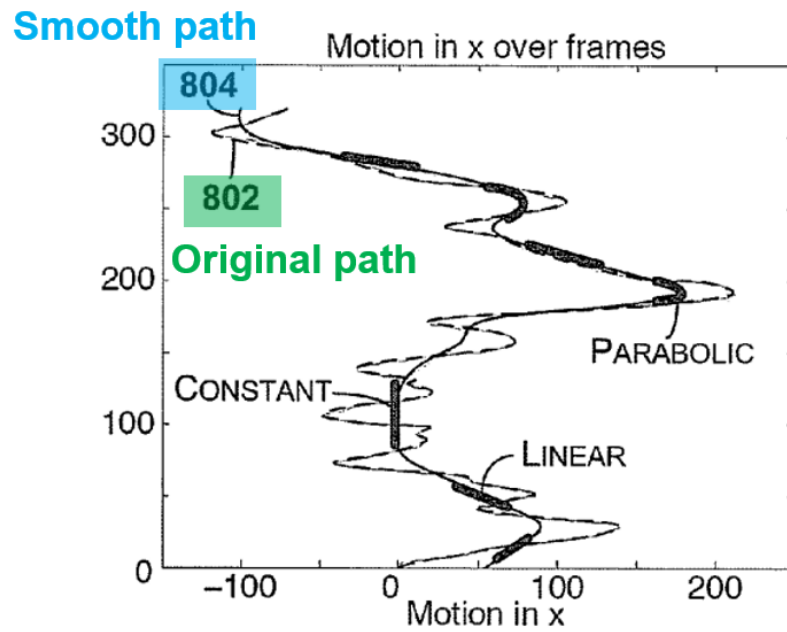


FIGURE 8A

(EX1005, Fig. 8A.)

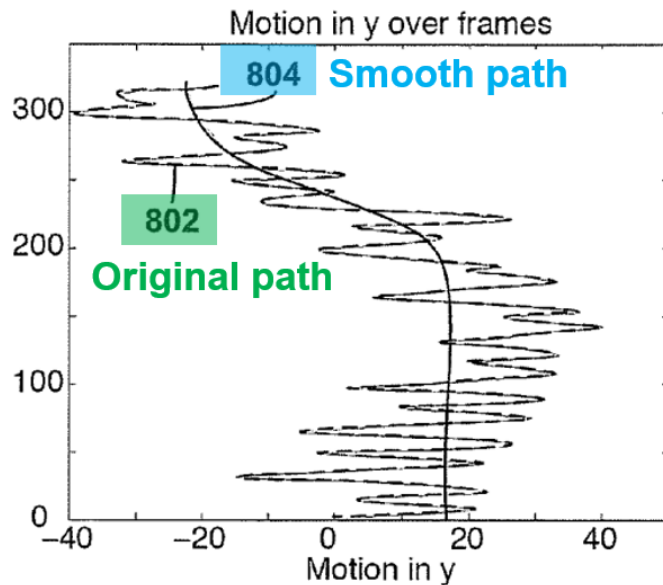


FIGURE 8B

(*Id.*, Fig. 8B.)

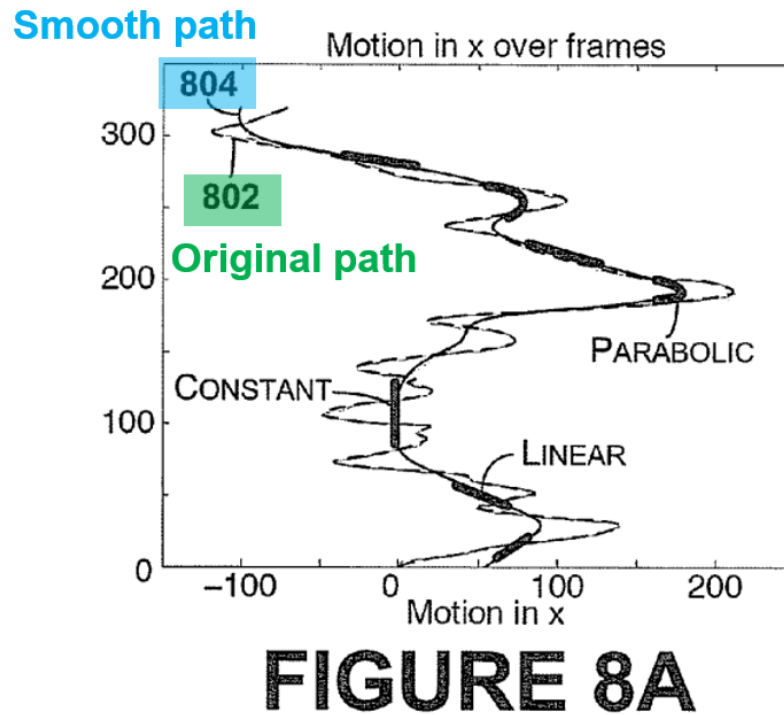
The positions of the housing further include translational positions of the housing. Zhou discloses “translation of [an] image during the frame capture.” (EX1004, 5:54-55.) A POSITA would understand that this corresponds to translational device movement, which includes translational positions of the housing. (EX1002, ¶¶150-152.) Additionally, Zhou discloses that its video stabilization operation allows “visible jumps or glitches in the final video sequence [] be reduced or eliminated.” (EX1004, 10:4-5.) A jump is a translational movement. (EX1002, ¶151.)

Moreover, because the movement of *visible frame 300* is translational, a POSITA would have understood that the corresponding correction to the observed trajectory is also translational. (*Id.*, ¶153.) Therefore, both the observed trajectory and the capture trajectory reflect translational positions of the device within the duration of the video. (*Id.*, ¶154.) Because the observed trajectory reflects positions of the housing (*supra* § IV.A.3.j), the positions of the housing also include translational positions of the housing. (EX1002, ¶154.)

Kwatra also discloses this limitation. Kwatra discloses that the original camera path motion comprises “motion along the x-axis (or horizontal motion)” and “motion along the y-axis (or vertical motion).” (EX1005, 19:6-7; 19:33-34.) For example, Figure 8A shows *original camera path motion 802* (e.g., actual positions of the housing) along the x-axis (e.g., translational positions). (*Id.*, Fig.

8A; EX1002, ¶155.) Figure 8B shows *original camera path motion 802* (e.g., actual positions of the housing) along the y-axis (e.g., translational positions).

(EX1005, Fig. 8B; EX1002, ¶155.)



(EX1005, Fig. 8A.)

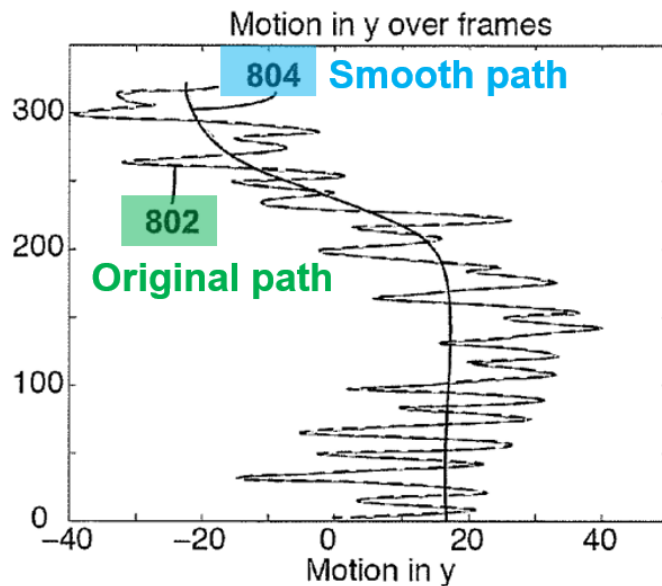
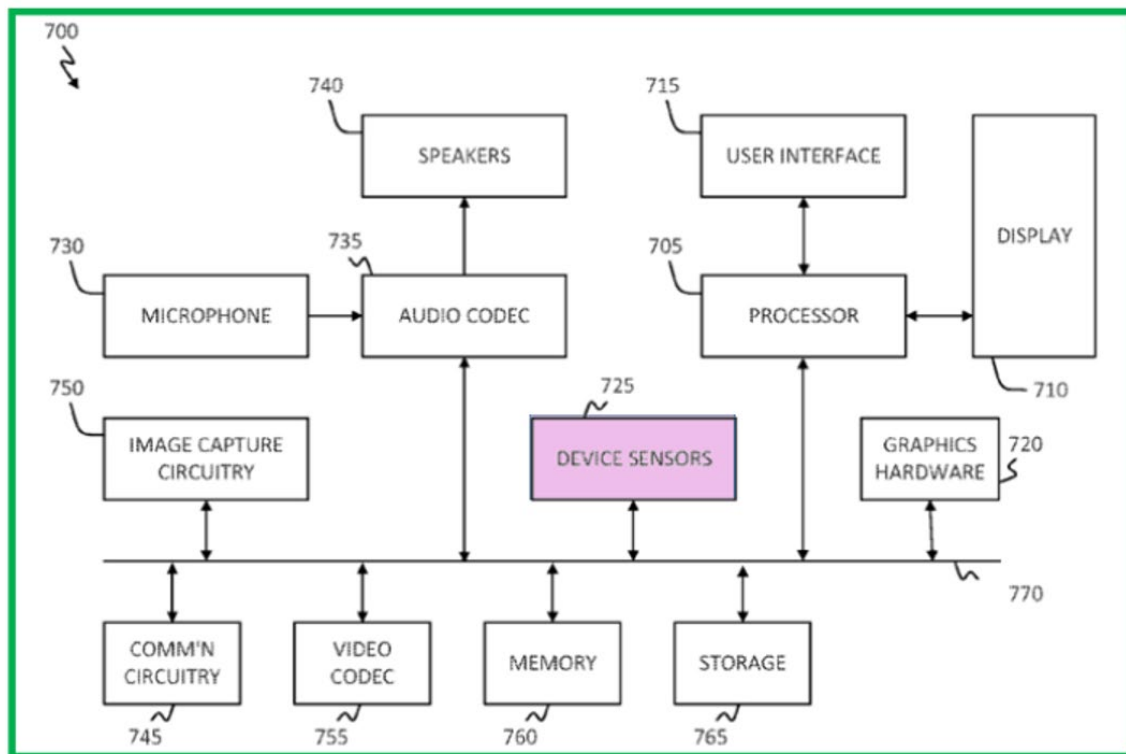


FIGURE 8B

(*Id.*, Fig. 8B.)

7. **Claim 5:** “The system of claim 1, wherein the position sensor includes a gyroscope, an accelerometer, and/or an inertial measurement unit, and the position information is determined independent of the image information.”

As discussed for element 1[d][i], Zhou’s motion sensors are the “position sensors” and they convey “position information.” (*Supra* § IV.A.3.g.) Zhou discloses that the image capture device includes “*device sensors 725* (e.g., *proximity sensor*/ambient light sensor, *accelerometer and/or gyroscope*),” as Figure 7 shows. (EX1004, 11:62-63.)



(*Id.*, Fig. 7.)

Zhou discloses matching “motion data . . . from . . . *one or more gyroscopes and/or one or more accelerometers*” to “the capture of video frames,” and that “motion data” is “not image data.” (*Id.*, 4:35-37, 8:65.) Figure 2B of Zhou shows separate buffers for storing motion data (*e.g.*, *motion data in motion entry 245*) and image data (*e.g.*, *image data in frame buffer entry 230*). (*Id.*, 5:9-11, Fig. 2B.)

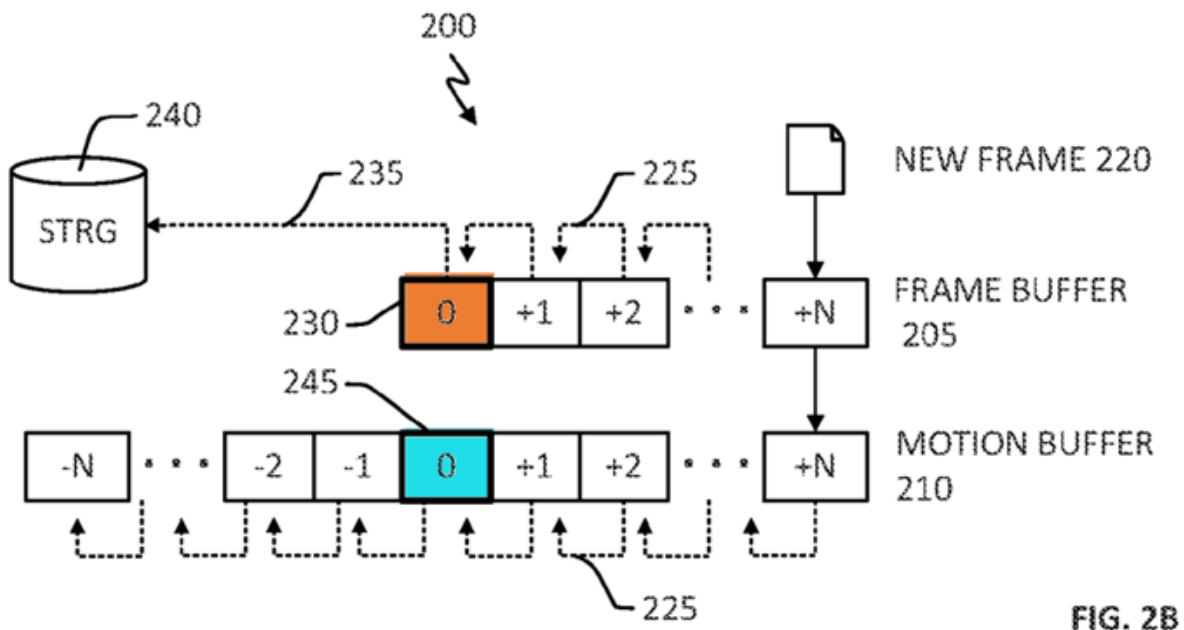


FIG. 2B

From these, a POSITA would have understood that the image data is not used for determining position information. (EX1002, ¶¶156-159.) As discussed for element 1[c][ii], image data constitutes “image information.” (*Supra* § IV.A.3.f.) Therefore, the position information is determined independent of the image information. Therefore, Zhou discloses claim 5.

8. Claim 6

a. Preamble: “The system of claim 1,”

To the extent the preamble is limiting (which Petitioner does not concede), the Zhou-Kwatra combination teaches the preamble of claim 6. (*Supra* § IV.A.3.)

b. 6[a]: “wherein the capture trajectory of the housing is determined to minimize inter-frame motion while preserving intra-frame motion,”

Preserving intra-frame motion. The '894 patent explains that because “it may take a certain amount of time for image sensor pixel sites to gather light,” “intra-frame motion . . . may be ‘encrusted’ in the image and may not be removed.” (EX1001, 11:38-44.) To provide “[b]etter visual characteristics . . . when the intra-frame motion is taken into account,” “the capture trajectory may move/follow in the same direction and with the same speed as during the exposure phase.” (*Id.*, 11:44-51.) The '894 patent further states that “intra-frame motion . . . may contain [] high frequencies,” such as jitters. (*Id.*, 11:34-35, 11:23-24.)

Similarly, Zhou discloses that “[m]otion blur results when . . . the image being recorded changes during the recording of a single frame . . . due to rapid movement.” (EX1004, 1:51-54.) Zhou further discloses that the motion blur is associated with “shimmering artifacts” and “may make the stabilized videos look unnatural.” (*Id.*, 1:61-64.)

To “mitigate the appearance of . . . unwanted ‘shimmering’ artifacts,” Zhou discloses “letting the image sequence jitter.” (*Id.*, 6:48-52.) A POSITA would understand that the jitter includes rapid movement recorded during recording of a single frame, which is an example of “intra-frame motion.” (EX1002, ¶¶163-165.) That is, to make the stabilized video appear more natural, Zhou discloses preserving jittering movements during frame capture (*e.g.*, intra-frame motion), allowing “motion blur [to] follow the natural trail of movement in the image

sequence.” (EX1004, 6:52-53.)

This is done by employing “smaller stabilization strengths.” (*Id.*, 6:48.) A POSITA would have understood that employing smaller stabilization strengths means setting a portion of the capture trajectory to follow a corresponding portion of the observed trajectory more closely, allowing the portion of the capture trajectory to preserve original device motion, including “intra-frame motion.” (EX1002, ¶167.) Therefore, Zhou discloses preserving intra-frame motion.

The capture trajectory of the housing is determined to minimize inter-frame motion. The ’894 patent states that an example of minimizing inter-frame motion is smoothing inter-frame motion. (EX1001, 11:33-34.)

A POSITA would have understood that Zhou’s captured video would not entirely include the unwanted shimmering artifacts and “smaller stabilization strengths” would not be applied to the entire captured video. (EX1002, ¶169.) For example, Zhou discloses that “larger stabilization strengths may be employed without affecting the aforementioned unwanted ‘shimmering’ artifacts in the stabilized video.” (EX1004, 6:43-45.) Thus, higher stabilization strengths would be used in other portions of the video that do not include the unwanted shimmering artifacts. (EX1002, ¶170.)

As discussed for claim element 1[g][v], Zhou discloses that the stabilization strength parameter controls the amount of smoothing (correction) applied to

generate the smoothed trajectory. (*Supra* § IV.A.3.p.) Therefore, in these other portions, more smoothing would be applied to motion between frames (“inter-frame motion”) to determine Zhou’s smoothed trajectory (the “capture trajectory”). (EX1002, ¶171.) Therefore, Zhou discloses “the capture trajectory of the housing is determined to minimize inter-frame motion.” (*Id.*)

c. 6[b]: “wherein the intra-frame motion is preserved based on intra-frame motion of the housing during frame exposure such that the capture trajectory follows the intra-frame motion.”

As discussed above, “intra-frame motion” contains jitters, and Zhou discloses “preserving the intra-frame motion” by employing “smaller stabilization strengths” to “let[] the image sequence jitter.” (EX1001, 11:33-35, 11:23-24; EX1004, 6:48, 6:51-52.) Zhou recognizes the jitter motion includes device jitter motion during frame exposure periods, because it discloses “[c]alculating the camera rotation during the exposure period” to estimate motion blur caused by rapid movement, such as jitter. (EX1004, 5:48-49; EX1002, ¶173.) Therefore, Zhou discloses that “the intra-frame motion is preserved based on intra-frame motion of the housing during frame exposure.” (EX1002, ¶173.)

As discussed for claim element 1[g][v], Zhou discloses that the stabilization strength parameter controls the amount of smoothing (correction) applied to generate the smoothed trajectory. (*Supra* § IV.A.3.p.) Employing “smaller

stabilization strengths” means less smoothing is applied, and the smoothed trajectory (the “capture trajectory”) follows the device jitter motion more closely. (EX1002, ¶174.) Therefore, by “letting the image sequence jitter,” the capture trajectory follows the image sequence jitter, which includes following the image sequence jitter during exposure periods (the “intra-frame motion”). (*Id.*, ¶¶173-175.)

9. Claim 7: “The system of claim 6, wherein the capture trajectory following the intra-frame motion includes motion of the capture trajectory being aligned with motion blur caused by the intra-frame motion.”

As discussed for claim 6, Zhou’s jittering motion during frame exposure is the “intra-frame motion,” and Zhou’s “letting the image sequence jitter” is “the capture trajectory following the intra-frame motion.” (*Supra* § IV.A.8.)

Zhou further discloses that “[m]otion blur results when . . . the image being recorded changes during the recording of a single frame . . . due to rapid movement,” such as jitter, which is an example of “intra-frame motion.” (EX1004, 1:51-54; *supra* § IV.A.8.) Therefore, Zhou discloses “motion blur caused by the intra-frame motion.” (EX1002, ¶177.)

Zhou states that “by letting the image sequence jitter . . . the motion blur will follow the natural trail of movement in the image sequence.” (EX1004, 6:50-53.) A POSITA would understand that “follow[ing] the natural trail of movement in the

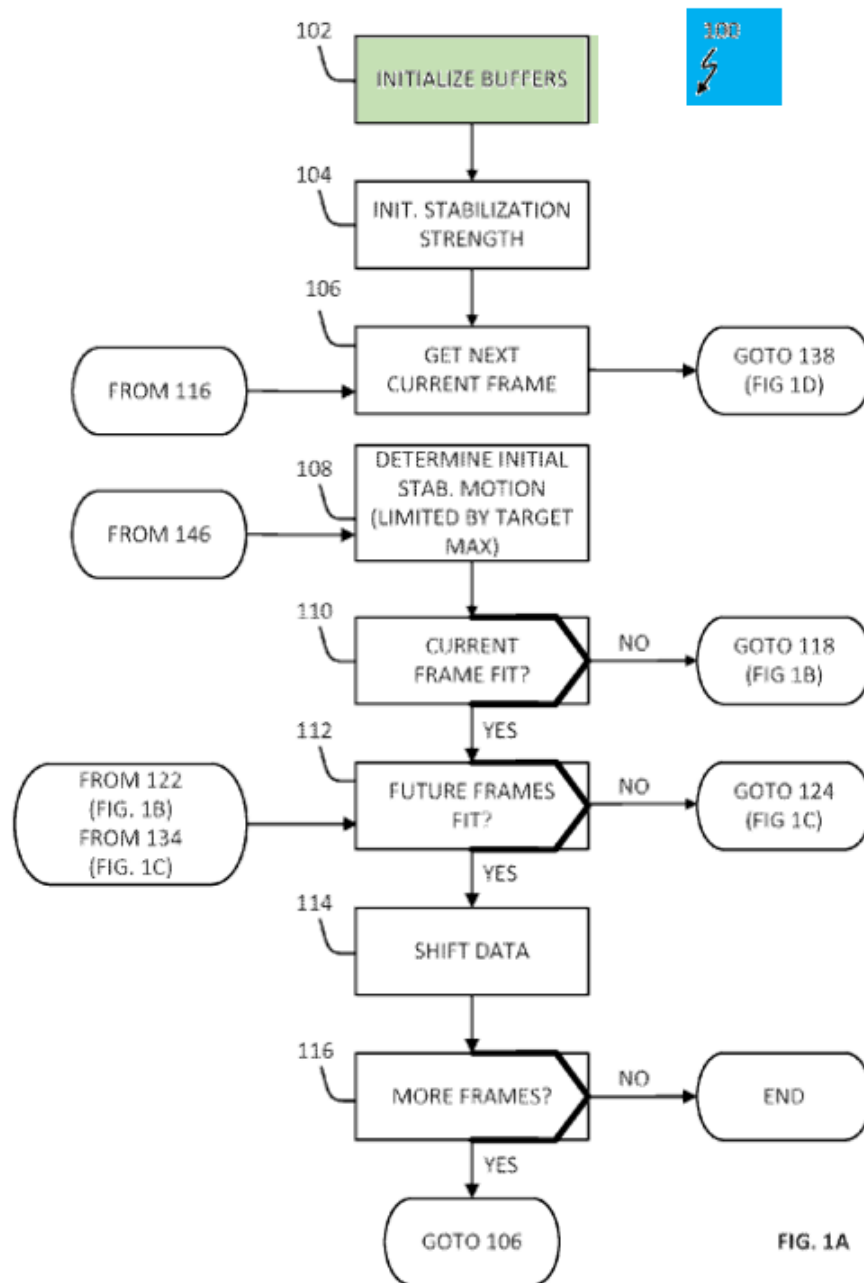
image sequence” is aligning motion of the capture trajectory with motion blur.
(EX1002, ¶178.)

Further, Zhou discloses employing “smaller stabilization strengths” to mitigate motion blur artifacts that make stabilized video appear unnatural. (EX1004, 6:48, 6:51-52; EX1002, ¶179.) A POSITA would have understood that employing smaller stabilization strengths means setting a portion of the capture trajectory to follow a corresponding portion of the observed trajectory more closely. (EX1002, ¶179.) Because the observed trajectory includes intra-frame motion (*e.g.*, jitter during exposure period), employing smaller stabilization strengths allows the capture trajectory to align with the intra-frame motion. (*Id.*, ¶¶179-180.)

10. Claim 8: “The system of claim 1, wherein the images are stored in a buffer during capture trajectory generation.”

Incoming video frames, or “captured frames,” are the “images.” (*Supra* § IV.A.3.f.)

Zhou discloses that “*video stabilization operation 100* . . . begins by *initializing a buffer system* with an incoming stream of video frames (block 102).” (EX1004, 4:20-23.)



Zhou discloses that as shown in Figure 2A, “buffer system 200 . . . includes (N+1) *entry frame buffer 205*.” (*Id.*, 4:30-31.) Zhou discloses that “[a]s each frame 215 arrives, it is placed into the +Nth *frame buffer entry*.” (*Id.*, 4:32-34.) Therefore, Zhou discloses storing incoming frames, *i.e.*, images, in a buffer during

video stabilization operation 100, which “determines . . . the smoothed trajectory.”

(*Id.*, 7:49-51.) Therefore, Zhou discloses claim 8. (EX1002, ¶¶181-185.)

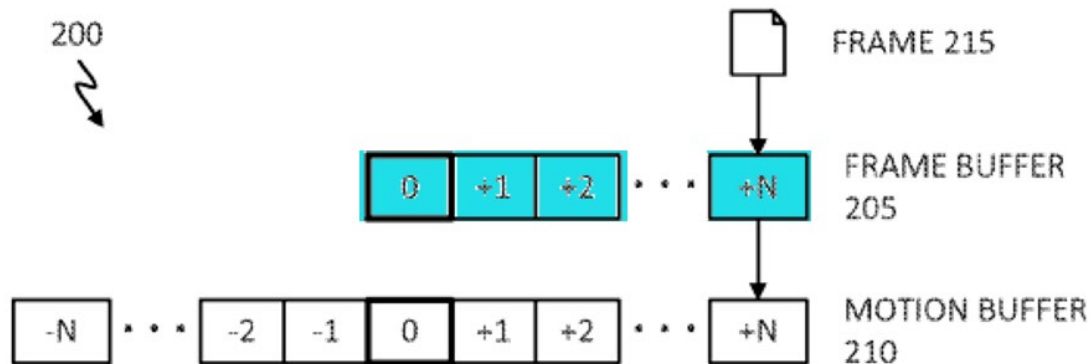


FIG. 2A

11. Claim 9

a. Preamble: “The system of claim 8,”

To the extent the preamble is limiting (which Petitioner does not concede), the Zhou-Kwatra combination teaches the preamble of claim 9. (*Supra* § IV.A.10.)

b. 9[a]: “wherein the images are stored in the buffer during the capture trajectory generation such that individual ones of the images corresponding to the portion of the capture trajectory are stored in the buffer during the determination of the portion of the capture trajectory using the look ahead of the observed trajectory,”

As discussed for claim 8, Zhou discloses storing images in its *buffer system* during the capture trajectory generation. (*Supra* § IV.A.7.)

“The portion of the capture trajectory” refers to “a portion of the capture trajectory corresponding to the first portion of the observed trajectory” in claim 1.

(EX1002, ¶186.) The claimed “the portion of the capture trajectory” therefore is a point on the capture trajectory that corresponds to *motion data in motion entry*

245. (*Supra* § IV.A.3.n.) Zhou discloses that “motion data . . . is matched with . . . the capture of video frames.” (EX1004, 4:35-38.) Therefore, the *motion data in motion entry 245* corresponds to *current frame in frame buffer entry 230*.

(EX1002, ¶187.) As discussed, each capture frame has an “image.” (*Supra* § IV.A.3.f.) Therefore, the *current frame in frame buffer entry 230* is an “individual ones of the images corresponding to the portion of the capture trajectory [] stored in the buffer.” (EX1002, ¶188.)

A POSITA would have understood that “a portion” can correspond to more than one frame. (EX1002, ¶189.) Therefore, the *motion data in motion entry 245* can correspond to a first point on the portion of the capture trajectory. (*Id.*) An adjacent frame, such as *motion data in the +1 entry* of the motion buffer 210, can correspond to a second point on the portion of the capture trajectory. (*Id.*, ¶190.) Similar to *motion data in motion entry 245*, the *motion data in the +1 entry* of the motion buffer 210 corresponds to *frame in +1 entry* of frame buffer entry 230, which also has “an image.” (*Id.*) The “image” corresponding to *frame in +1 entry* of frame buffer entry 230 can be another one of “individual ones of the images corresponding to the portion of the capture trajectory [] stored in the buffer.” (EX1002, ¶190.)

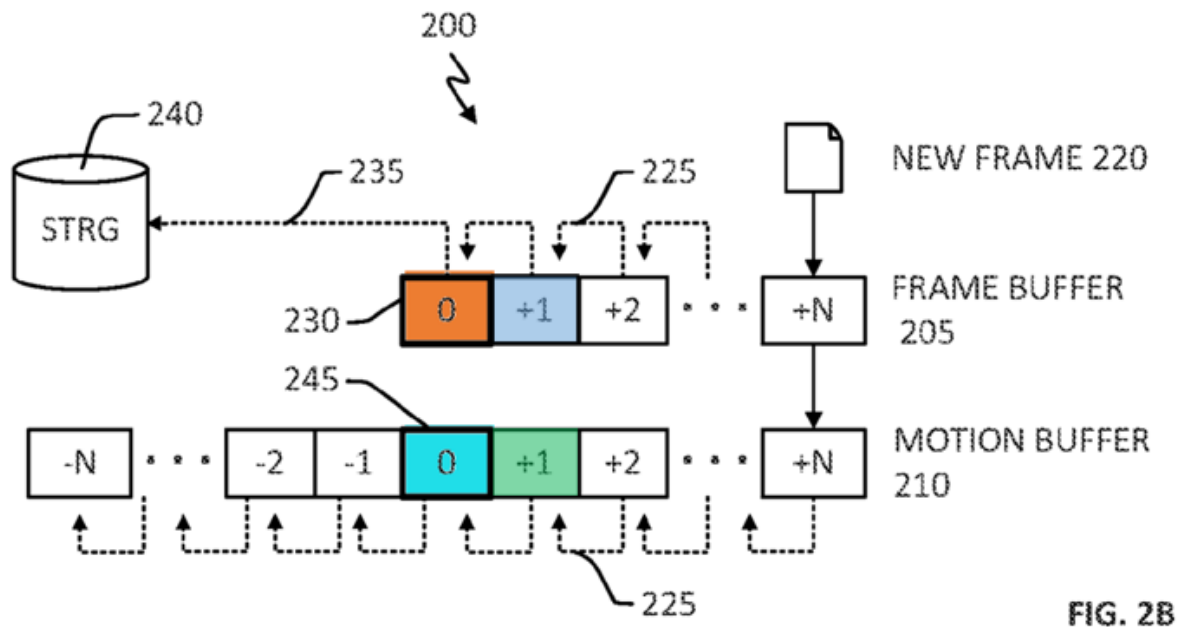


FIG. 2B

As discussed for element 1[g][i], Zhou discloses determining a capture trajectory based on a look-ahead of the observed trajectory. (*Supra* § IV.A.3.1.)

Zhou discloses that “after a *current frame* . . . and its future frames . . . have been evaluated and its stabilization strength modified as necessary . . . the *current frame* may be shifted out of the *buffer system* (e.g., buffer system 200).”

(EX1004, 11:39-46.) Zhou therefore discloses that the frames are stored in the buffer during stabilization of those frames. (EX1002, ¶¶185-192.)

As discussed for element 1[g][i], “for each current frame, video stabilization operation 100 determines . . . the smoothed trajectory.” (EX1004, 7:47-51.)

Therefore, Zhou discloses that the frames, which contain images, are stored in the

buffer during the determination of the portion of the capture trajectory

corresponding to those frames. (EX1002, ¶¶185-193.)

- c. 9[b]: “and the visual content of the individual ones of the images stored in the buffer are used after the determination of the portion of the capture trajectory to generate the video content.”

Zhou discloses that “after a current frame . . . and its future frames . . . have been evaluated and its stabilization strength modified as necessary, *the current frame’s image data* (or metadata) may be updated . . . to reflect the determined stabilization motions.” (EX1004, 11:39-45.) For example, after the portion of the smoothed trajectory corresponding to the *current frame* and *frame in +1 entry* (which are stored in the frame buffer 205) is determined, *the current frame’s image data* and *frame in +1 entry’s image data* are updated reflect the smoothed trajectory. (EX1002, ¶194.) A POSITA would have understood that the updated image data reflecting the determined stabilization motions is used to “generate a stabilized version of the captured video stream.” (EX1004, 12:13-15; EX1002, ¶¶194-195.)

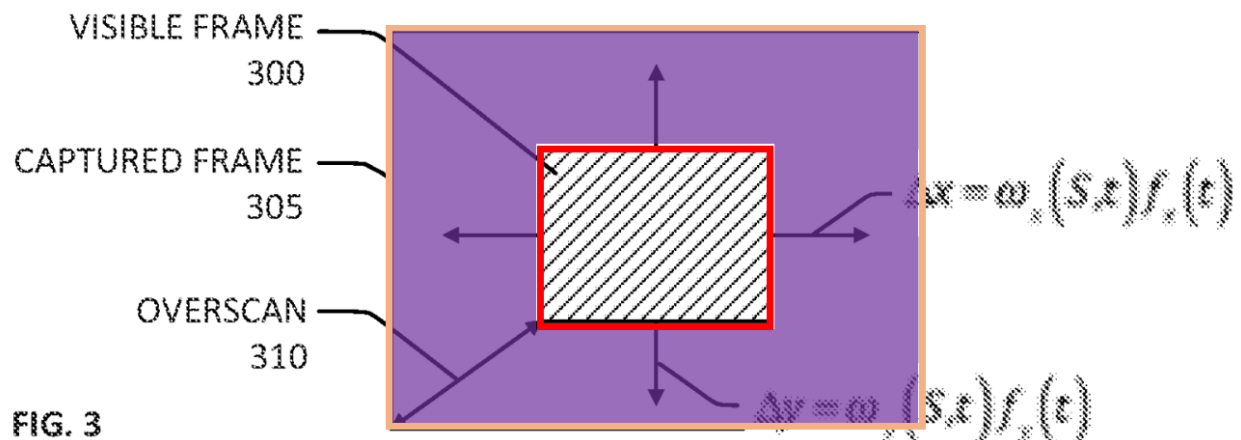
12. **Claim 10:** “The system of claim 9, wherein the one or more physical processors are, to generate the video content based on the punch-out of the visual content of the images within the capture field of view, further configured by machine-readable instructions to crop the visual content of the images based on the capture field of view.”

As discussed for element 1[e], Zhou discloses *processor 705* for performing video stabilization. (*Supra* § IV.A.3.i.) Additionally, Zhou discloses that the *processor 705* “may execute instructions necessary to carry out or control” the video stabilization operations. (EX1004, 12:1-4.)

As discussed for element 1[i][i], the field of view of *visible frame 300* is the “punch-out of the visual content of the images within the capture field of view.” (*Supra* § IV.A.3.s.)

Zhou discloses “*stabilizing* video images using an *overscan* region.” (EX1004, Abstract.) Zhou also discloses that “[*o*]*verscan*’ is . . . the buffer of pixels around the edges of an image that are captured but not displayed to the user.” (*Id.*, 3:1-3.) A POSITA would have understood that for the *overscan* to be within the *captured frame* but not eventually displayed to the user, the *overscan* must be selectively removed, or cropped, so that only the image within *visible frame 300* is left. (EX1002, ¶¶197-198.) Therefore, Zhou discloses cropping the image within *visible frame 300* based on the *visible frame 300* to generate the video content. (*Id.*, ¶¶197-199.)

As discussed for element 1[i][i], the image within *visible frame 300* is the “visual content of the images within the capture field of view.” (*Supra* § IV.A.3.s.) Therefore, Zhou discloses claim 10.



13. Claim 11

- a. **Preamble: “A method for stabilizing videos, the method performed by an image capture device including a housing and one or more processors, the housing carrying an optical element, an image sensor, and a position sensor, the optical element configured to guide light within an optical field of view to the image sensor, the optical field of view being greater than a capture field of view for generating video content, the method comprising:”**

To the extent the preamble is limiting (which Petitioner does not concede), Zhou discloses the preamble of claim 11.

As shown for the preamble of claim 1, Zhou discloses “[t]echniques to improve a *digital image capture device*’s ability to *stabilize a video stream*.”

(*Supra* § IV.A.3.a.) Zhou further discloses or renders obvious the components included in the claimed “system that stabilized videos,” as shown in elements 1[a]-

1[e]. (*Supra* §§ IV.A.3.b - IV.A.3.i.)

- b. **11[a]: “generating, by the image sensor, an image output signal based on light that becomes incident thereon during a capture duration, the image output signal conveying image information that defines images with the optical field of view;”**

Element 11[a] recites limitations similar to 1[c][i] and 1[c][ii], except that it requires that the image sensor generate an image output signal. (EX1002, ¶202.)

Image sensors generate an image output signal. (*Id.*, ¶203.)

- c. **11[b]: “generating, by the position sensor, a position output signal based on positions of the housing during the capture duration, the position output signal conveying position information that characterizes the positions of the housing at different moments within the capture duration, the positions of the housing including rotational positions of the housing;”**

Element 11[b] recites limitations similar to 1[d][i] and 1[d][ii], except that it requires that the position sensor generate a position output signal. (EX1002, ¶204.)

Motion sensors generate a position output signal. (*Id.*, ¶205.)

- d. **11[c] – 11[f]**

Elements 11[c]-11[f] mirror elements 1[f]-1[i], respectively. (*Id.*, ¶¶206-207.)

14. Claim 12

Claim 12 mirrors claim 2. (*Id.*, ¶208.)

15. Claim 13

Claim 13 mirrors claim 3. (*Id.*, ¶209.)

16. Claim 14

Claim 14 mirrors claim 4. (*Id.*, ¶210.)

17. Claim 15

Claim 15 mirrors claim 5. (*Id.*, ¶211.)

18. Claim 16

Claim 16 mirrors claim 6. (*Id.*, ¶212.)

19. Claim 17

Claim 17 mirrors claim 7. (*Id.*, ¶213.)

20. Claim 18

Claim 18 mirrors claim 8. (*Id.*, ¶214.)

21. Claim 19

Claim 19 mirrors claim 9. (*Id.*, ¶215.)

22. Claim 20

Claim 20 mirrors claim 10. (*Id.*, ¶216.)

B. Ground 2: Zhou, Kwatra, and Shi Render Obvious Claims 2, 3, 7, 12, 13, and 17

1. Summary of Shi

Shi was filed on October 3, 2017, and issued on October 29, 2019. It qualifies as prior art to the '894 patent at least under § 102(a)(2). The Examiner never found, and Applicant never cited, Shi during prosecution. (*Id.*, ¶217.)

Shi relates to video stabilization. (EX1006, Abstract; EX1002, ¶¶217-220.)

Shi discloses determining a virtual camera position, which “can represent an adjusted or hypothetical pose of the recording device [] that would stabilize the video being recorded.” (*Id.*, 10:62-66.)

Shi further discloses adjusting the virtual camera position “based on movement detected before and after a frame, based on an amount of blur in the frame, [and] based on a” “likelihood of panning/intentional movement.” (*Id.*, 11:18-24, Fig. 2.) In an embodiment, Shi discloses using frames in a range of time [T-L, T+L] to determine the virtual camera position for the frame at time T. (*Id.*, 12:15-29; EX1002, ¶219.)

2. Claim 2: “The system of claim 1, wherein the determination of the capture trajectory of the housing based on the look ahead of the observed trajectory preserves a user’s intended motion of the image capture device during the capture duration.”

The ’894 patent states that “intended motion may refer to the motion of the image capture device that the user planned/meant to carry out.” (EX1001, 9:56-58.)

Shi discloses that the stabilization of a current frame uses “future frames during processing” and that the future frames correspond to the motion of the device. (EX1006, 12:25-29, 2:62-65, 5:56-64, 10:43-59, Fig. 2; EX1002, ¶222.)

Additionally, Shi discloses that consistent movement, such as panning, is

“intentional movement.” (EX1002, ¶222; EX1006, 1:24-27, 13:35-40.) Shi discloses that its “system can reduce the impact of large or sudden movements using look-ahead frames” and “evaluate whether consistent movement, such as panning, is occurring and adjust the video frames to reflect the consistent movement.” (EX1006, 5:17-24, Fig. 2.) Shi therefore discloses using motion experienced by the device in future frames to preserve intentional movements, such as panning. (EX1002, ¶¶222-223.)

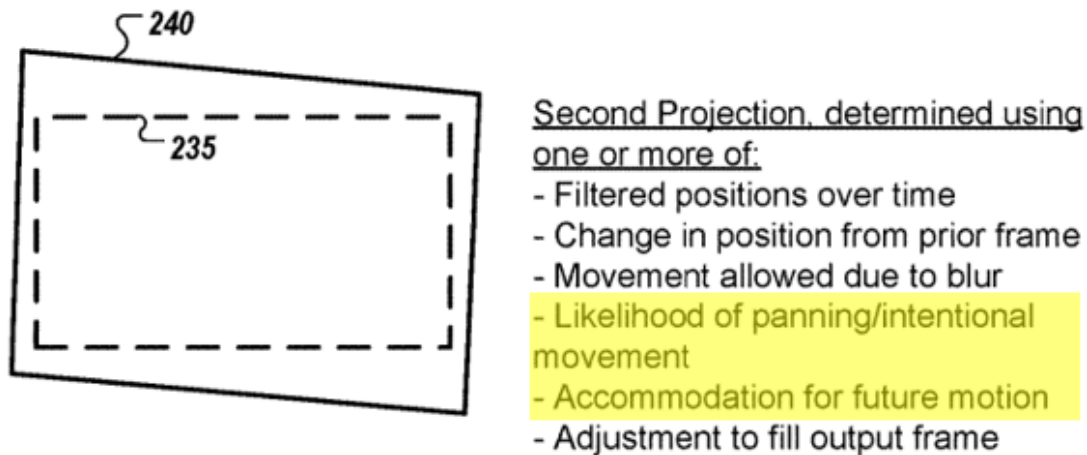


FIG. 2

A POSITA would have been motivated to combine the known technique disclosed in Shi with Zhou and Kwatra. (*Id.*, ¶224.) Zhou discloses adjusting stabilization strength based on motion type and “what sort of activity is causing the detected camera motion,” but does not specify how. (EX1004, 3:49-59; EX1002, ¶224.) Hence, a POSITA would have been motivated to turn to a prior art

reference that discloses video stabilization based on specific motion types and specific activity causing detected camera motion. (EX1002, ¶224.) Shi discloses determining smoothed camera trajectory based on determined intentional movement, such as panning. (EX1006, 5:17-24.)

Additionally, it would have been obvious to use the known intended motion preservation technique in Shi to improve Zhou's similar video stabilization technique for mobile devices. (EX1002, ¶225.) Combining Shi with Zhou and Kwatra would improve Zhou's stabilization strength determination accuracy because Shi discloses determining a smoothed camera trajectory according to a determination of intended motion. (*Id.*, ¶226.)

Zhou, Kwatra, and Shi use known techniques to improve similar methods in the same way. (*Id.*, ¶227.) The combination of Zhou, Kwatra, and Shi would have had a reasonable expectation of success as both Zhou and Shi use the look-ahead frames to determine the capture trajectory and perform video stabilization.

(EX1002, ¶228; *supra* § IV.A.3.1; EX1006, 12:25-29, 2:62-65, 5:56-64, 10:43-59.)

Both Zhou and Shi disclose using similar mobile device components for video stabilization. (EX1004, 11:55-67, Fig. 7; EX1006, 5:56-6:12, 7:27-8:3, 8:24-39, Fig. 1.)

3. Claim 3: “The system of claim 2, wherein past positions of the image capture device supply context

for the user’s intended motion of the image capture device.”

As discussed above, Shi discloses preserving intended motion, such as panning. (*Supra* § IV.B.2.)

Shi further discloses that “a large amount of context prior to the time T can be beneficial to assessing the probability of panning.” (EX1006, 18:59-60.) This is because “panning may occur over a second or several seconds, usually significantly more than the value of L.” (*Id.*, 18:61-62.) Therefore, Shi’s “system can take advantage of a relatively long history of device positions determined over the course of the video capture” to determine intended motion more accurately. (*Id.*, 18:64-66.) That is, Shi discloses using a history of device positions prior to the time T (past positions of the image capture device) to provide context for better assessing the probability of panning and preserving intended panning motion in virtual camera positions. (EX1002, ¶¶230-231.)

A POSITA would have been motivated to combine Shi with Zhou and Kwatra, as discussed for claim 2. (*Id.*, ¶232; *supra* § IV.B.2.) In addition, Shi’s use of device position history to provide context for intended motion to determine intended motion more accurately would further improve Zhou’s stabilization strength determination accuracy. (EX1002, ¶232.)

4. Claim 7: “The system of claim 6, wherein the capture trajectory following the intra-frame motion includes

**motion of the capture trajectory being aligned with
motion blur caused by the intra-frame motion.”**

As explained in Zhou and discussed with respect to claim 6, “[m]otion blur results when . . . the image being recorded changes during the recording of a single frame . . . due to rapid movement,” such as jitter, which is an example of “intra-frame motion.” (EX1004, 1:51-54; *supra* § IV.A.8.) Shi also recognizes that motion blur is caused by movements during frame exposure because it discloses estimating an amount of motion blur by comparing difference in projection matrices between the beginning and end of an exposure period. (EX1006, 18:7-16; EX1002, ¶233.)

Therefore, a POSITA would understand that “motion blur [is] caused by the intra-frame motion,” as claimed. (EX1002, ¶233.)

Shi’s “system can assess camera motion blur and align the motion path estimated using [electronic image stabilization (EIS)] with the movement indicated by the blur.” (EX1006, 2:15-17.) A POSITA would have understood that “the motion path estimated using EIS” is a “capture trajectory.” (EX1002, ¶234.) Therefore, Shi discloses “motion of the capture trajectory being aligned with motion blur.” (*Id.*, ¶¶233-234.)

Furthermore, Shi discloses that “[t]o reduce a viewer’s perception of the blur” and “hide the blur,” “the change in the virtual camera position from one

frame to the next may be allowed to at least partially track the real camera position, consistent with the natural blur in the image.” (EX1006, 17:63-67.) A POSITA would have understood that being “consistent with the natural blur in the image” means following, or aligning with, “motion blur caused by the intra-frame motion.” (EX1002, ¶235.)

As discussed for claim 6, Zhou discloses following intra-frame motion by “letting the image sequence jitter” (the “intra-frame motion”) to “mitigate the appearance of . . . unwanted ‘shimmering’ artifacts.” (EX1004, 6:48-52; *supra* § IV.A.8.) Zhou discloses that the “shimmering artifacts” are associated with motion blur, which is caused by rapid movement during an exposure period. (EX1004, 1:51-54, 1:56-63; EX1002, ¶236.)

Zhou further discloses that the “shimmering artifacts” “may make the stabilized videos look unnatural and does not provide the user with the perceptual clues of video movement.” (EX1004, 1:56-65.)

To further mitigate the shimmering artifacts associated with motion blur caused by motion during an exposure period, a POSITA would have been motivated to combine the known technique disclosed in Shi with Zhou and Kwatra. (EX1002, ¶237.)

Additionally, it would have been obvious to use Shi’s technique for reducing motion blur perception to improve Zhou’s technique for reducing effects of motion

blur artifacts. (*Id.*, ¶238.) Zhou discloses “letting the image sequence jitter” to reduce motion blur artifacts caused by motion during an exposure period.

(EX1004, 1:51-54, 6:48, 6:51-52; EX1002, ¶238.) Shi discloses additional ways of reducing motion blur artifacts, also caused by motion during an exposure period, by “track[ing] the real camera position, consistent with the natural blur in the image.” (EX1006, 17:66-67, 18:7-16; EX1002, ¶238.)

The combination of Zhou, Kwatra, and Shi would have had a reasonable expectation of success as both Zhou and Shi use the look ahead frames to determine the smoothed trajectory and perform video stabilization. (EX1002, ¶239; *supra* § IV.A.3.1; EX1006, 12:25-29, 2:62-65, 5:56-64, 10:43-59.) Both Zhou and Shi disclose using similar mobile device components for video stabilization. (EX1004, 11:55-67, Fig. 7; EX1006, 5:56-6:12, 7:27-8:3, 8:24-39, Fig. 1.)

Zhou, Kwatra, and Shi use known techniques to improve similar devices or methods in the same way. For example, Shi discloses “reduc[ing] the amount of stabilization applied to reduce a viewer’s perception of the blur . . . to produce a more natural result.” (EX1006, 13:19-23.) Similarly, Zhou discloses employing “smaller stabilization strengths” to mitigate motion blur artifacts that make stabilized video appear unnatural. (EX1004, 6:48, 6:51-52; EX1002, ¶240.)

5. Claim 12

Claim 12 mirrors claim 2. (EX1002, ¶241.)

6. Claim 13

Claim 13 mirrors claim 3. (*Id.*, ¶242.)

7. Claim 17

Claim 17 mirrors claim 7. (*Id.*, ¶243.)

V. THE BOARD SHOULD NOT DENY INSTITUTION UNDER *FINTIV*

As the USPTO Interim Procedure for Discretionary Denials stated, “[t]he plain language of the *Fintiv* factors is directed to district court litigation and does not apply to parallel U.S. International Trade Commission (ITC) proceedings, as the ITC lacks authority to invalidate a patent and the ITC’s invalidity rulings are not binding on the Office or on the district courts.” (June 21, 2022 USPTO Interim Procedure for Discretionary Denials, 2-3.) Accordingly, the Board should not exercise its discretion to deny institution.

VI. THE BOARD SHOULD NOT DENY INSTITUTION UNDER § 325(D)

The Board should not deny institution under § 325(d) on the basis of the prosecution of the ’894 patent. Section 325(d) is inapplicable to this proceeding, because the Petition does not raise substantially the same art or arguments in the same way as the examination of the ’894 patent; to the extent the Petition does, the Office erred in a material manner. *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6, 8 (P.T.A.B. Feb. 13,

2020) (designated precedential on March 24, 2020).

The Board applies a two-part framework for determining whether to deny institution under § 325(d) in view of prosecution of the original patent application and any subsequent reexamination: “(1) whether the same or substantially the same art previously was presented to the Office or whether the same or substantially the same arguments previously were presented to the Office; and (2) if either condition of first part of the framework is satisfied, whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims.” *Advanced Bionics*, IPR2019-01469, Paper 6, 8.

Here, the Board need not reach the second part of the test, because the first part fails: neither the same (or substantially the same) art or arguments were previously presented to the Office.

Two of the three references presented in this Petition—Kwatra and Shi—were not considered during prosecution of the ’894 patent. And while Zhou was cited during prosecution, the Examiner never substantively discussed or applied it against the claims. The Examiner instead applied Beysserie against the claims. *See Amazon.com Inc. v. M2M Sols. LLC*, IPR2019-01204, Paper 14, 16 (P.T.A.B. Jan. 23, 2020) (“reference that ‘was neither applied against the claims nor discussed by the Examiner’” weighs against denying institution under section 325(d)).

Zhou also is not cumulative of Beysserie. The Examiner found that Beysserie did not disclose “details of the intra-frame motion.” (EX1003, 365.) Zhou, however, as discussed, discloses limitations relating to intra-frame motion. Moreover, Zhou in combination with Kwatra teach “the capture trajectory is determined to include a path that minimizes a combination of rotational velocity and rotational acceleration of the housing” and “the combination of the rotational velocity and the rotational acceleration of the housing weighing the rotational velocity and the rotational acceleration equally or differently” in elements 1[g][v] and 1[g][vi], and claim 11 that the Examiner found were missing from Beysserie. Further, Zhou in combination with Kwatra and Shi teach “the capture trajectory following the intra-frame motion includes motion of the capture trajectory being aligned with motion blur caused by the intra-frame motion,” in claims 7 and 17 that the Examiner found was missing from Beyserrie.

Moreover, the Examiner also never considered the combination of Zhou with Kwatra or with Shi. That “one piece of art” in a combination “was previously presented and/or argued” is “insufficient to satisfy the first prong of *Advanced Bionics*.” *Thorne Rsch., Inc. v. Trustees of Dartmouth Coll.*, No. IPR2021-00491, Paper 18, 8 (P.T.A.B. Aug. 12, 2021) (no denial where other reference in combination was not before the examiner); *Samsung Elecs. Co. v. Headwater Rsch. LLC*, No. IPR2023-01226, Paper 9, 6-7 (P.T.A.B. Feb. 8, 2024) (same);

BMW of N. Am., Inc. v. Mich. Motor Techs., LLC, No. IPR2023-01031, Paper 12, 13 (P.T.A.B. Jan. 23, 2024) (same). Thus, the inquiry should end there.

To the extent that the same art or arguments were previously presented to the Office, the second step of the *Advanced Bionics* inquiry—whether the examiner erred in a manner material to patentability—would still preclude discretionary denial. This is because the Office erred to the extent that it failed to fully consider the significance of the art or arguments as set forth in this Petition. Accordingly, even if the first part of the test is satisfied, the Board further should not deny institution based on the second part of the test.

Thus, the Board should not exercise its discretion to deny institution under § 325(d).

VII. NOTICES AND STATEMENTS

Pursuant to 37 C.F.R. § 42.8(b)(1), Arashi Vision Inc. (d/b/a Insta360) is the real party-in-interest for Petitioner.

Pursuant to 37 C.F.R. § 42.8(b)(2), Petitioner identifies the following related matters:

- *In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith*, Inv. No. 337-TA-1400 (USITC).

- *GoPro, Inc. v. Arashi Vision Inc. et al.*, No. 8:24-cv-00681-HDE-JCV
(C.D. Cal.).⁴

Pursuant to 37 C.F.R. § 42.8(b)(3), Petitioner identifies the following counsel (and a power of attorney accompanies this Petition).

Lead Counsel	First Backup Counsel
Mehran Arjomand Registration No.: 48,231 MORRISON & FOERSTER LLP 707 Wilshire Blvd., Suite 6000 Los Angeles, CA 90017 Email: MArjomand@mofo.com Tel: 213-892-5200 Fax: 213-892-5454	Alex S. Yap Registration No.: 60,609 MORRISON & FOERSTER LLP 707 Wilshire Blvd., Suite 6000 Los Angeles, CA 90017 Email: AYap@mofo.com Tel: 213-892-5200 Fax: 213-892-5454
	Second Backup Counsel Jean Nguyen Registration No.: 71,051 MORRISON & FOERSTER LLP 707 Wilshire Blvd., Suite 6000 Los Angeles, CA 90017 Email: JNguyen@mofo.com Tel: 213-892-5200 Fax: 213-892-5454

Pursuant to 37 C.F.R. § 42.8(b)(4), service information for lead and back-up counsel is provided above. Petitioner consents to electronic service by email to MoFo_Insta360-IPRs@mofo.com.

⁴ IPR2024-00984, IPR2024-01052, IPR2024-01164, and IPR2024-01165 also are related to the ITC and C.D. Cal. litigations.

Pursuant to 37 C.F.R. § 42.104(a), Petitioners certify that the '894 patent is available for *inter partes* review and that Petitioners are not barred or estopped from requesting an *inter partes* review challenging the patent claims on the grounds identified in this Petition.

The USPTO is authorized to charge any required fees, including the fee as set forth in 37 C.F.R. § 42.15(a) and any excess claim fees, to Deposit Account No. **03-1952** referencing Docket No. **33316-00000.02.**

Dated: July 18, 2024

Respectfully submitted,

By /s/ Alex S. Yap
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Counsel for Petitioner

Certification of Word Count (37 C.F.R. § 42.24)

I hereby certify that this Petition for *Inter Partes* Review has 12,084 words (as counted by the “Word Count” feature of the Microsoft Word™ word-processing system), exclusive of “a table of contents, a table of authorities, mandatory notices under § 42.8, a certificate of service or word count, or appendix of exhibits or claim listing.”

Dated: July 18, 2024

By /s/ Alex S. Yap
Alex S. Yap

IPR2024-01186
Patent No. 10,574,894

Certificate of Service (37 C.F.R. § 42.6(e)(4) and 42.205(a))

I hereby certify that the attached Petition for *Inter Partes* Review and supporting materials were served as of the below date by UPS, which is a means at least as fast and reliable as U.S. Express Mail, on the Patent Owner at the correspondence address indicated for U.S. Patent No. 10,574,894:

GoPro Issuance
3025 Clearview Way
San Mateo, CA 94402

Dated: July 18, 2024

/s/ Alex S. Yap

Alex S. Yap