Guideline of Camera & Imaging Products Association

CIPA DCG-007_Translation–2015

Description Method for Image Stabilization Performance of Digital Cameras (Electronic/Hybrid Systems)

This translation is based on the original Guideline (CIPA DCG-007-2015). In the event of any doubts arising as to the contents, the original Guideline in Japanese shall prevail.

Established on February, 2015

Prepared by
Standardization Committee

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Appendix (Informative)

1. Introduction

In 2012, the Camera and Imaging Products Association (CIPA) established CIPA DC-011 Measurement and Description Method for Image Stabilization Performance of Digital Cameras (Optical System) to define the measurement and description method for image stabilization performance of digital cameras.

The CIPA standard DC-011 is limited to optical systems only, excluding applications for electronic systems and for hybrid systems which use both optical and electronic image stabilization.

Since establishing standards for optical systems, CIPA has discussed standardization of the measurement method for image stabilization performance of electronic and hybrid systems. However, CIPA concluded that it would be difficult to determine a method of measurement as unambiguous as that for optical systems. Electronic image stabilization often employs a wide assortment of technical elements to achieve its effects and is used in combination with techniques other than image stabilization, such as optimizations for the exposure control program and image selection. Further, with some of the technical elements employed still under development, such as image restoration using inverse Fourier transform, there were questions as to the relevance and necessity of rushing to determine rules of measurement at this point in time.

Nevertheless, some cameras equipped with electronic and/or hybrid image stabilization systems are already on the market, a few of which list their image stabilization performance in terms of stops. Performance described in these terms is in essence based on measurement results of the camera suppliers themselves, but it is easy to imagine such performance being confused with the performance described by stops in the CIPA standard DC-011, which could lead to user misunderstanding and market confusion regarding image stabilization performance.

Given the background above, CIPA has established this guideline to put forward a description method and precautions for when publishing performance figures for electronic and hybrid image stabilization systems in advance of developing rules. This guideline defines rules of a description method for image stabilization performance of electronic and hybrid systems and also provides several description examples as reference.

In addition, for the purpose of supplementing the contents of this guideline, an explanation of terminology relating to “blur” has been added as the appendix.

2. Scope

This guideline applies to digital cameras for consumer use with electronic or hybrid image stabilization for still image shooting. The scope of this guideline excludes professional and industrial applications in which users and suppliers arrange

specifications dedicated for each case. Apparatuses such as camcorders, mobile phones and other devices with still image shooting functions shall not be precluded from adopting this guideline.

This guideline is mainly meant for application in describing image stabilization performance in brochures or other printed media and websites that specify the product. However, objectives of this guideline are also to be complied with in marks on camera bodies and individual packages, as well as expressions used in advertising campaigns and point-of-purchase advertising for sales promotions.

3. Overview of Guideline

3-1 Basic Approach

This guideline is established on the basis of the following concepts to promote robust growth of the industry by promoting fair competition.

3-1-1 This guideline is meant to define the description method for image stabilization performance of electronic and hybrid systems for still image shooting. Note here that any effects of motion blur reduction shall not be included in image stabilization performance. While motion blur reduction does suppress camera shake, it does not have any image stabilization effects.

3-1-2 Brochures are not obligated to describe image stabilization performance as set out in this guideline; rather, they shall serve as specifications in case such items are described.

3-1-3 Specific names, designations, Japanese long-sound symbols, and distinctions between single-byte and double-byte character expressions may be used in customary expressions or names used by the suppliers or measurers provided they do not cause misunderstanding. It shall be noted that:

- Items clearly specified to be uniformly used and names defined in this guideline shall follow such instructions; and
- Names that may be confused with those defined in this guideline shall not be used under a different definition.

3-1-4 The description method for image stabilization performance of electronic and hybrid systems as described in this guideline may be revised as necessary along with development of these image stabilization technologies.

3-2 Disclaimer

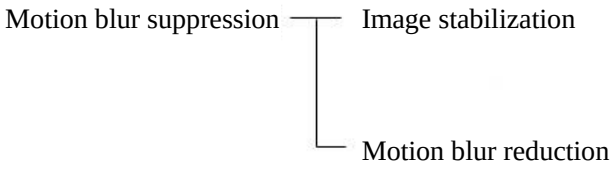
Suppliers are solely responsible for all claims and litigation from third parties for descriptions pertaining to image stabilization performance of electronic or hybrid systems following this guideline.

3-3 Definition of Terms

Definitions of terms used in this guideline are described below.

3-3-1 Motion Blur Reduction

Here follows the definition given in CIPA standard DC-011.



3-3-2 Hybrid System

A “hybrid system” is one which uses both optical and electronic systems for image stabilization.

3-3-3 Image Selection

“Image selection” is a method of motion blur reduction. With image selection functions and modes, the camera takes several pictures continuously in rapid succession and selects one or more pictures with less bokeh as the output image(s).

3-4 Referenced Standards

3-4-1 Referenced Standards

- CIPA DCG-002 Specification Guideline for Digital Cameras
- CIPA DC-011 Measurement and Description Method for Image Stabilization Performance of Digital Cameras (Optical System)

NOTE: While CIPA DC-011 has not been made freely available to the public, the materials referenced in this guideline are the same as those found in the publicly available WTO/TBT draft, CIPA DC-X011.

3-4-2 Response to Revision of Reference Standard

If the standards and guidelines referred to in this guideline are revised, compliance shall be with

the revised editions.

4. Description Method

The method of description in brochures and other documentation shall be as follows.

There are no particular units specified for numerical representation for image stabilization performance of electronic and hybrid systems. Additionally, image stabilization performance may be described for multiple focal lengths and lighting conditions. It shall be noted that:

a) The method of image stabilization is to be clearly described as being an electronic or hybrid system.

b) When denoting image stabilization with electronic systems, hybrid systems, or other systems whose application is excluded from the CIPA standard DC-011, either clearly state that the results were measured using proprietary measuring methods, or add other expressions to that effect.

c) Figures for hybrid systems are not permitted to use hypothetical image stabilization performance figures based on use of the optical or electronic system alone.

d) For cameras with hybrid systems, if the camera has a mode for use of optical image stabilization alone, image stabilization performance of the optical system can be expressed in accordance with the CIPA standard DC-011.

e) The factory default setting is recommended for image stabilization mode. When image stabilization performance is described by itself in this mode, the name of the image stabilization mode used in the measurement may be omitted.

f) When using an image stabilization mode other than the factory default setting, the name of the image stabilization mode used for measurement shall be clearly described.

g) For zoom lenses, the focal length (35 mm film equivalent) at which measurement is made or information replacing the focal length (such as “maximum telephoto”) shall clearly be described.

h) Where both image stabilization and motion blur reduction are used, this shall be clearly described.

i) Reductions in camera shake with motion blur reduction shall not be denoted as image stabilization performance.

・When listing image stabilization performance for systems using both motion blur reduction and image stabilization, performance shall not include the effects of motion blur reduction.

・No descriptions or designations shall misrepresent use of both motion blur reduction and image stabilization as improving image stabilization performance.

・Where use of both image stabilization and motion blur reduction results in variable shooting

time span, increased noise or other possible drawbacks for the user, these shall be clearly stated.

5. Description Examples

5-1 Description Examples for Image Stabilization Performance of Electronic Systems

Description Example 1

• Image stabilization performance (electronic): 2.0 stops (In EIS1 mode at focal length of 100 mm (35 mm film equivalent: 450 mm) according to in-house measurements.)

Description Example 2

• Image stabilization performance (electronic): 1.5 stops (In EIS2 mode for all focal lengths according to in-house product quality measurements.)

Note: Shooting intervals may be extended due to image composition.

Description Example 3

• Image stabilization performance (electronic): 2.0 stops (In EIS3 mode for focal lengths of 100 mm or lower (35 mm film equivalent: 450 mm or lower) according to proprietary measurements.)

Note: This performance cannot be achieved in cases of extreme camera shake, because in such cases image stabilization replaces motion blur reduction.

5-2 Description Examples for Image Stabilization Performance of Hybrid Systems

Description Example 1: Camera with Independently Functioning Optical and Electronic Systems

• Image stabilization performance

Optical: 2.5 stops (Conforms with CIPA standards. In IS1 mode at focal length of 100 mm (35 mm film equivalent: 450 mm).)

Electronic: 2 stops (In EIS1 mode at all focal lengths according to proprietary measurements.)

Description Example 2: Camera with Independently or Concurrently Functioning Optical and Electronic Systems

• Image stabilization performance

Optical: 3.0 stops (Conforms with CIPA standards. With AB camera and AB lens in IS-auto mode at focal length of 55 mm (35 mm film equivalent: 85 mm).)

Electronic: 1.5 stops (According to proprietary measurements. For all interchangeable

lenses at all focal lengths.)

Hybrid system: 5.0 stops (According to proprietary measurements. With AB camera and AB lens in IS-auto mode at focal length of 55 mm (35 mm film equivalent: 85 mm).)

Description Example 3: Camera with Independent Optical System and Hybrid System with Both Optical and Electronic Systems Concurrently Functioning

• Image stabilization performance

Optical: 2.0 stops (Conforms to CIPA standards. For all interchangeable lenses at all focal lengths.)

Hybrid system: 4.5 stops (Based on in-house measurements. For all interchangeable lenses at all focal lengths.)

Description Example 4: Camera with Independent Electronic System and Hybrid System with Both Optical and Electronic Systems Concurrently Functioning

• Image stabilization performance

Electronic: 1.5 stops (According to proprietary measurements. For all interchangeable lenses at all focal lengths.)

Hybrid system: 4.5 stops (According to proprietary measurements. With AB lens at maximum telephoto.)

Description Example 5: Camera with Concurrently Functioning Optical and Electronic Systems

• Image stabilization performance

Hybrid system: 4.5 stops (Based on proprietary measurements. For all interchangeable lenses at all focal lengths.)

5-3 Description Examples for Image Stabilization Performance of Image Stabilization in Combination with Motion Blur Reduction

Description Example 1: Camera Concurrently Using Electronic System and Motion Blur Reduction (1)

・Image stabilization performance (electronic): 2.0 stops (In EIS1 mode at focal length of 100 mm (35 mm film equivalent: 450 mm) according to in-house measurements. EIS1 mode combines electronic IS with motion blur reduction.)

Description Example 2: Camera Concurrently Using Electronic System and Motion Blur Reduction (2)

・Image stabilization performance: 1.5 stops (In EIS2 mode at all focal lengths according to in-house product quality measurements. EIS2 mode combines electronic IS and image

selection.)

Note: May experience varied shooting time span by shooting session due to selection of images with less motion blur.

Description Example 3: Camera with Independent Optical Image Stabilization Mode and Mode with Optical System and Motion Blur Reduction Concurrently Functioning

• Image stabilization performance

Optical: 3.0 stops (Conforms with CIPA standards. With AB camera and AB lens in IS-auto mode at focal length of 55 mm (35 mm film equivalent: 85 mm).)

Combined optical IS and motion blur reduction: 3.0 stops* (Conforms to CIPA standards. With AB camera and AB lens in IS-auto mode at focal length of 55 mm (35 mm film equivalent: 85 mm). *Performance figures for motion blur reduction not included.)

Combined optical IS and image selection: Image motion blur reduced by approx. 20% (According to proprietary measurements. For all interchangeable lenses at all focal lengths.)

Note: May experience varied shooting time span by shooting session due to selection of images with less motion blur.

6. Participating members

The bulk of the deliberations over the formulation of the standards described in this document was performed by the Anti-blur Sub-Working Group.
The members of the Sub-Working Group are listed below;

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Appendix (Informative)

Explanation of Terminology Relating to Motion Blur for Digital Cameras

A-1 Introduction

CIPA has issued the "CIPA DCG-002-2012 Specification Guideline for Digital Cameras (Revised Version)" as a guideline for describing the specifications of digital cameras in brochures and the like. The document includes definitions of terminology relating to motion blur, and how it should be used. Such terminology includes "image stabilization" and "motion blur reduction," and also "motion blur suppression," which is a generic term encompassing the former two expressions.

However, at present, it is possible to find examples in brochures and on the websites of suppliers where such expressions relating to motion blur have been defined differently or without clear distinctions between them. Aside from causing confusion for users, such misuse of terminology prevents fair competition between rival enterprises.

For the above reason, this Appendix seeks to systematically reorganize the terminology relating to motion blur used for digital cameras and provides a definition-based explanation.

The same information in this appendix also forms the content of the appendix of "CIPA DC-011-2015 Measurement and Description Method for Image Stabilization Performance of Digital Camera (Optical Systems) ."

A-2 Basic concept of this Appendix

"CIPA DCG-002-2012 Specification Guideline for Digital Cameras (Revised Version)" contains "Commentary (6)-3. Further clarifications of 'image stabilizer' and 'motion blur reduction'," in which examples are provided of how "(a) image stabilizer" and "(b) motion blur reduction {mode}" as described in "Item 17: Motion Blur Suppression" are respectively used. This appendix reproduces Commentary (6)-3 but provides more, detailed explanation.

A-3 Explanation

In line with the establishment of "CIPA DCG-002-2012 Specification Guideline for Digital Cameras (Revised Version)," "CIPA DC-011-2015 Measurement and Description Method for Image Stabilization Performance of Digital Camera (Optical Systems)," and this present guideline, further

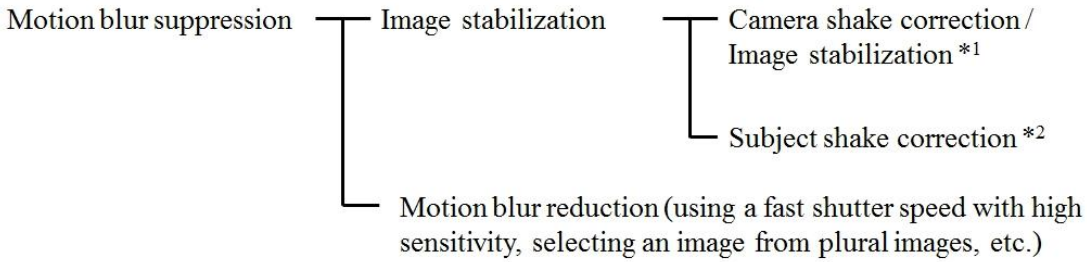
clarification is given of the definitions of “image stabilization” and “motion blur reduction.” Also indicated are “terminology relating to blurring,” examples of “output by blur detecting devices,” definition of the “image stabilizer” function and examples, the definition of “motion blur reduction” and examples, cases where the image stabilizer function has a different method and subject, and when both the image stabilizer function and motion blur reduction are present.

A-3-1 Terminology relating to blurring

“Blur” is interpreted as displacement from a given position, and when used as camera terminology, blur can be broadly classified into “camera shake” and “subject shake.”

“Camera shake” refers to blurring of the subject in shot images as a result of camera movement due to instability of the hand(s) holding the camera. “Subject shake” refers to blurring of the subject in shot images as a result of movement of part or all of the subject during photography irrespective of whether or not there is camera shake.

Note that although “vibration isolation” is known as a method of preventing shake, “vibration isolation” refers to equipment that prevents vibration from being applied to the camera itself, and is therefore terminology from a different field to image stabilization.



*1 Optical systems (VAP, lens shift system, sensor shift system, etc.)
Electronic systems (image synthesis, image restoration, etc.)
Hybrid systems (concurrently using an optical system and an electronic system)
*2 Electronic systems (image synthesis, etc.)

The tree diagram given above shows terminology relating to blur. The following content about motion blur suppression is given in the “CIPA DCG-002-2012 Specification Guideline for Digital Cameras (Revised Version),” but here contains more, detailed explanation.

A-3-1-1 Motion blur suppression

The expressions “image stabilizer” and “motion blur reduction” are generic terms and refer to the

suppression of “camera shake” and/or “subject shake” by some kind of control means provided in a camera. “Motion blur suppression” is broadly classified into “image stabilizer” and “motion blur reduction.”

a) Image stabilizer

This refers to a function that uses the output by a blur detection device to correct blurring in output images caused by movement of the camera itself (due to camera shake or the like) and/or movement of the subject. However, even if the output by a blur detection device is used, methods where shooting is carried out using a fast shutter speed as a result of optimization by an exposure control program and methods where no significant improvement is observed in output images in which motion blur has been corrected are regarded as b) “Motion blur reduction.”

The category “image stabilizer” is divided into “camera shake correction” and “subject shake correction.” Optical, electronic and hybrid methods exist for “camera shake correction.”

b) Motion blur reduction

This refers to a function or mode that reduces blurring in output images caused by movement of the subject and/or camera shake and its main means is using a fast shutter speed as a result of optimization by an exposure control program. Although motion blur reduction is one method of an exposure control mode and a sensitivity control mode, there are no problems with this function being separately referred to as a motion blur reduction function or mode.

A-3-2 Examples of “output by blur detection device”

a) Measurement using a gyro-sensor or the like.
b) Measurement by comparing images from continuous shooting (motion vectors between continuously shot images or the like)
c) Measurement through analysis of blur (bokeh) in single images (calculation of the blur (bokeh function))

A-3-3 Explanation of “image stabilizer” and examples

A-3-3-1 Explanation

The image stabilizer function is interpreted here to mean a function that uses the output by a blur detection device to correct blurring in output images caused by movement of a camera itself (due to camera shake or the like) and/or movement of the subject. Accordingly, if there is significant deterioration in image quality as a side effect of correction when no significant correcting effect has

been achieved, or when the probability of a correcting effect being obtained is extremely low, it is not possible to regard the technology being used as “image stabilizer.”

A-3-3-2 Optical, electronic, and hybrid systems

Out of the examples of the image stabilizer function given below in A-3-3-3, a) and b) are called optical systems, while c) to e) are called electronic systems. Systems that use a combination of optical and electronic technology are called “hybrid systems” and usually have characteristics of both types of technology. Examples of hybrid systems are listed below.

・ Systems where optical and electronic technology operates simultaneously.

・ Systems that appropriately switch between optical and electronic technology according to the shooting conditions and the extent of the camera shake.

・ Systems where correction according to an optical system and correction according to an electronic system are carried out on different axes, with both systems being present.

A-3-3-3 Examples of methods that are considered to be suitable for classification as “image stabilizer” (NB. These are just examples, and the image stabilizer function is not limited to such.)

a) A method where subject displacement in the image caused by camera shake is corrected by moving part or all of the lens in parallel relative to the image sensor using the output by a blur detection device.

b) A method where subject displacement in the image caused by camera shake is corrected by rotating or moving in a perpendicular direction relative to the optical axis using the output by a blur detection device.

c) A method where multiple images with reduced blur are taken at a fast shutter speed and such images are combined (aligned etc.) using the output by a blur detection device to obtain an output image with reduced blur and virtually the same image quality (S/N) as an image shot at the usual shutter speed.

d) A method where an image with reduced blur shot at a fast shutter speed and an image shot at the usual shutter speed are combined (aligned etc.) using the output by a blur detection device to obtain an output image with reduced blur and virtually the same image quality (S/N) as an image shot at just the usual shutter speed.

e) A method that is based on processing using a point spread function, an inverse filter or the like and uses information output by a blur detection device to restore an image with little blur from a shot image.

A-3-4 Explanation of “motion blur reduction” and examples

A-3-4-1 Explanation

Motion blur reduction is interpreted here to mean a function or mode of reducing blurring in output images that is caused by movement of the subject and/or camera shake. It is mainly achieved using a fast shutter speed as a result of optimization by an exposure control program. In this way, since “image stabilization” and “motion blur reduction” have very different technical aspects, such expressions should not be confused.

A-3-4-2 Characteristics of “motion blur reduction”

Example characteristics of motion blur reduction are given below.

Merits: Since motion blur reduction can be achieved simply by optimization of an exposure control program, implementation is simple and such technology is also effective against subject shake.

Demerits: Since high ISO sensitivity is required in many cases, there is increased noise in the shot images.

A-3-4-3 Difference in image quality between “image stabilizer” and “motion blur reduction”

Fig. 1 shows an example comparison between the motion blur suppression effects of the image stabilizer function and motion blur reduction. Although setting the functions of image stabilizer and motion blur reduction to ON results in a similar reduction in motion blur, an increase in noise is observed in the image with motion blur reduction.

In this way, since motion blur reduction is a method that suppresses motion blur while mainly sacrificing image quality (and S/N in particular), it is appropriate to regard motion blur reduction as having no image stabilization effect. Accordingly, when measuring and describing image stabilization effects, it is necessary to pay particular attention to excluding effects achieved by motion blur reduction.

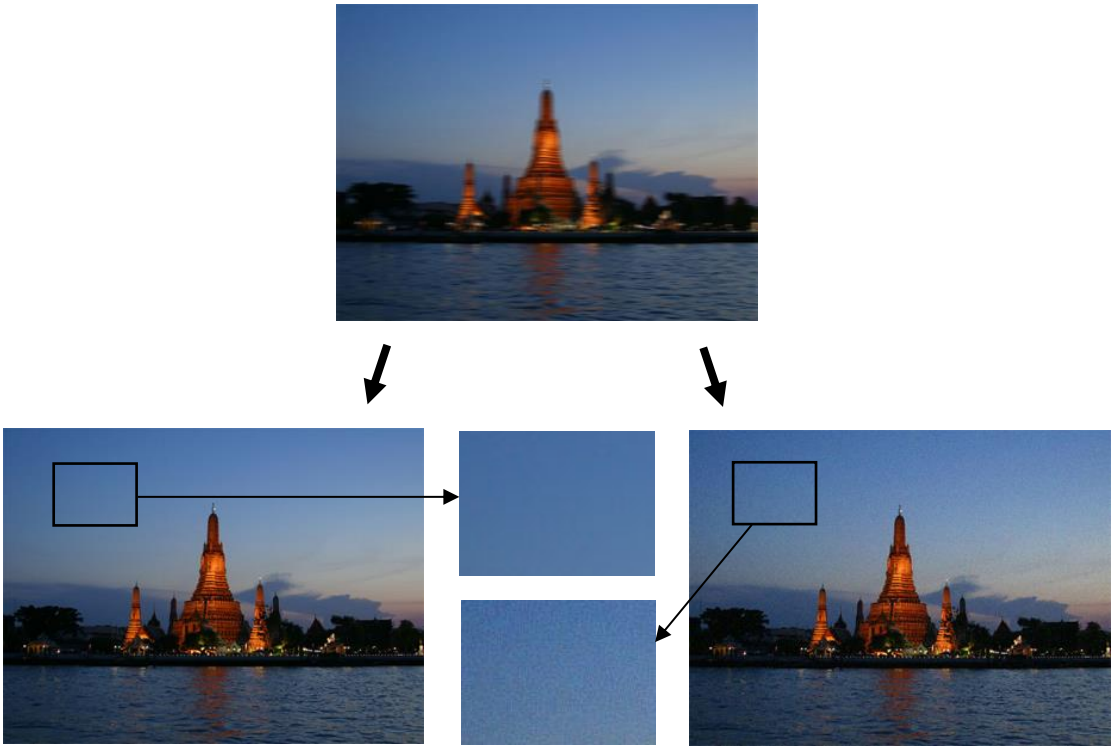


Fig. 1. Difference in image quality between image stabilizer and motion blur reduction

A-3-4-4 Examples of methods that are considered to be suitable for classification as "motion blur reduction" (NB. These are just examples, and motion blur reduction is not limited to such.)

a) A method that sets sensitivity higher than in the usual shooting mode, shoots an image with a higher-than-usual shutter speed, and carries out image processing such as edge enhancement to compensate for loss of resolution in the shot image.
b) A method that sets sensitivity higher than in the usual shooting mode, shoots an image with a higher-than-usual shutter speed, and carries out image processing such as noise reduction to compensate for S/N deterioration in the shot image.
c) A method that sets sensitivity higher than in the usual shooting mode and shoots an image with a higher-than-usual shutter speed when motion detection for the subject has found that all or part of the subject is moving at a given speed or faster.
d) A method that sets sensitivity higher than for the usual shooting mode, takes multiple shots with a higher-than-usual shutter speed, and records only images that the camera has determined to have the least blurring.
e) A method that shoots multiple images while gradually changing the sensitivity and shutter

speed, and records only images that the camera has determined to have the best balance between the amount of blur and S/N.

f) A method that shoots at both the usual shutter speed and a higher-than-usual shutter speed, and records the image shot at the usual shutter speed if there is little blurring, or records the image shot at the higher-than-usual shutter speed if there is significant blurring with the usual shutter speed.

A-3-5 Objective axis-dependent and still- or video-dependent image stabilization

In a camera equipped with a hybrid image stabilizer function, if such camera has several axes where correction is carried out optically and other axes where correction is carried out electronically, this should be clearly indicated to users (see a) below). If the image stabilizer function is also enabled during the shooting of video images, when the correcting system or objective axes for correction are different to those used in shooting still images, care should be taken to clearly indicate such to users (see b) below).

a) Yaw/pitch is optically corrected, while up-down, left-right, and rotation are electronically corrected.
b) Correction is carried out on two axes (yaw and pitch) when shooting still images and correction is further carried out on the up-down, left-right, and rotational axes (i.e., a total of five axes) when shooting video images.

A-3-6 Combined use of image stabilizer function and motion blur reduction

As described earlier, since the effect of the image stabilizer function and the effect of motion blur reduction cannot be directly compared, when measuring the effect of the electronic image stabilizer function, it is necessary to completely eliminate the effect of motion blur reduction. However, since there are many cameras that exhibit the properties described in a) and b) below, sufficient attention needs to be paid when measuring and describing the effect of the image stabilizer function.

a) A configuration that functions only as an image stabilizer when there is little blurring, but increasingly functions as a motion blur reducer according to blurring level. It functions as only a motion blur reducer at or above a given level of blurring.
b) A configuration that functions as an image stabilizer and motion blur reducer when there is little blurring, but functions as only a motion blur reducer at or above a given level of blurring.

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