**Reviewer comment 2**

Note: The reviewer comments are highlighted in blue, and the response in black.

In this work the authors present a model of imaging that can accurately predict the geometrical properties of the image in systems such as Scheimpflug cameras.

1. One can define the unit directional vectors of chief ray in the object and image space by and for the axis-symmetrical system, if skew rays are not considered. Without losing any generality, the whole problem can be treated in meridinal plane. Equation (3) leads the derivations of this manuscript complicated.

The premise of the first part of the above argument is that the optical system is axially symmetric. The authors concur with the reviewer that for axially symmetric systems, it is both easy and sufficient to treat image formation problems in the meridional plane (i.e. by defining the direction cosines of the chief ray in the object and image space as and respectively). However, in the paper, we aim to derive the image-object relationship for a system in which the lens and the sensor are free to rotate about independent pivots. Such a system is not axially symmetric. Therefore, we believe that restricting the analysis only to the meridional plane severely limits the applicability of the relationship.

While it is true that Eq. (3)—the definition of the chief ray’s direction cosine—leads the derivations to be complicated, the authors believe that it was necessary to derive the general expression for the mapping between object and image points without imposing any specific restrictions. Furthermore, we believe (having used in practice) that the mapping can be easily computed numerically, if needed, for any arbitrary orientation of the image and object planes. In addition, the focusing model—Eq. (19)—can be easily used for numerical computation.

We have realized that this confusion might have arisen because we didn’t clearly state the need for defining the direction cosines of the chief ray in the object and image space as and respectively, and why we cannot restrict our analysis just to the meridional plane. The authors would like to thank the reviewer for bringing this up, and helping us to improve the quality of the paper. We have added the following description just under Eq. (3) in the revised manuscript:

“Please note that if the optical axis and the z-axis of were always coincident, then, utilizing axial symmetry, we could simplify the definition of the direction cosines by letting (and ), and restricting our analysis to the meridional plane. However, since the lens and the sensor are free to rotate about their independent pivots, the system is not axially symmetric. Therefore, we use the full definition of direction cosines: using both azimuthal and zenith angles.”

Furthremore, it is found that both object plane and lens plane are tilted about x-axis only (Table 2). This finding supprots my point that the whole system can be simplified by defining and .

Table 2 enumerates the verification of Eq. (20) and Eq. (21) which relates the image, lens and object planes in the common Scheimpflug imaging configuration where only the lens tilt is used to focus on an object plane tilted about only the x-axis. Furthermore, Eqs. (20) and (21) were obtained from Eq. (19) which is a general relationship for focusing on an arbitrarily tilted object plane using, in general, both lens and sensor rotation. Although focusing on an object plane tilted about the x-axis using only lens tilt is a common configuration, the focusing relationships derived in this manuscript using the pupil parameters is new. Therefore, the authors thought it is pertinent to demonstrate the accuracy of the relationships (Eq. (20) and Eq.(21)). This particular configuration is also used in Section II to synthesize an omni-focus image from a set of images captured while rotating the lens.

Moreover, the authors have shown the verification for the general image-object relationship (Eq. (9)) wherein the lens and sensor planes are free to rotate arbitrarily (both planes are rotated about both x- and y-axes) about independent their pivots in Table 1.

1. I even do not know what is. It is very difficult for me to obtain Eqs. (4) and (5).

The original manuscript stated that following Eq. (5). The authors assumed, mistakenly, that readers would be familiar with which is a standard function in both MATLAB and NumPy to represent diagonal matrices. We thank the reviewer for pointing out that it is prudent to clearly state definitions. In the revised manuscript, we added the following statement instead of writing following Eq. (5):

“where, is a diagonal matrix with 1, 1, and as the diagonal elements.”

1. Complicated symbols are used in Section 1 so that I couldn’t read and to understand the contents.

The elaborate notation in the original manuscript is an unintended consequence of emphasizing mathematical rigor and incorporating all parameters that are required to utilize all the degrees of freedom available in a general Scheimpflug camera. The absence of such a mathematical model in literature that incorporates the pupil parameters compelled us to develop such a model. To help the reader navigate the mathematical notation, the original manuscript listed the set of symbols in Fig.1. However, we didn’t explicitly mention this in the original manuscript. The revised manuscript now contains the following statement (in Section 2.A.1) that aim to make the reader aware of the list of symbols in the manuscript:

“The figure also enumerates the set of symbols used in the mathematical derivation of our model.”

1. Many equations of this manuscript are difficult to understand. For example, matrices and vectors are used in denominator and numerator of many eqations.

The authors acknowledge difficulty associated with such an intricate model. However, as explained above, the comprehensiveness of the mathematical model comes at the cost of the intricate notation. The authors believe that tempering the mathematical rigor of the manuscript will compromise the integrity of the work. Moreover, the general relations readily yield imaging relationships for specific configurations of lens and sensor planes.

The manuscript is not clearly written. For this reason I cannot recommend the publication of this manuscript at least in its present form. I suggest rewrite the entire work in a clear and transparent way.

The authors have tried their best to balance the presentation of a comprehensive mathematical model, verification of the model and a motivating application of the model for imaging systems in which the lens and the sensor planes are free to rotate about their independent pivots. We understand that the model presented is intricate. However, we also believe that it was a necessary evil for the model that can accurately describe and predict the geometric properties of the image in such systems.