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## Light Structuring and Reflecting Optical system.

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## Light Structuring and Reflecting Optical system.

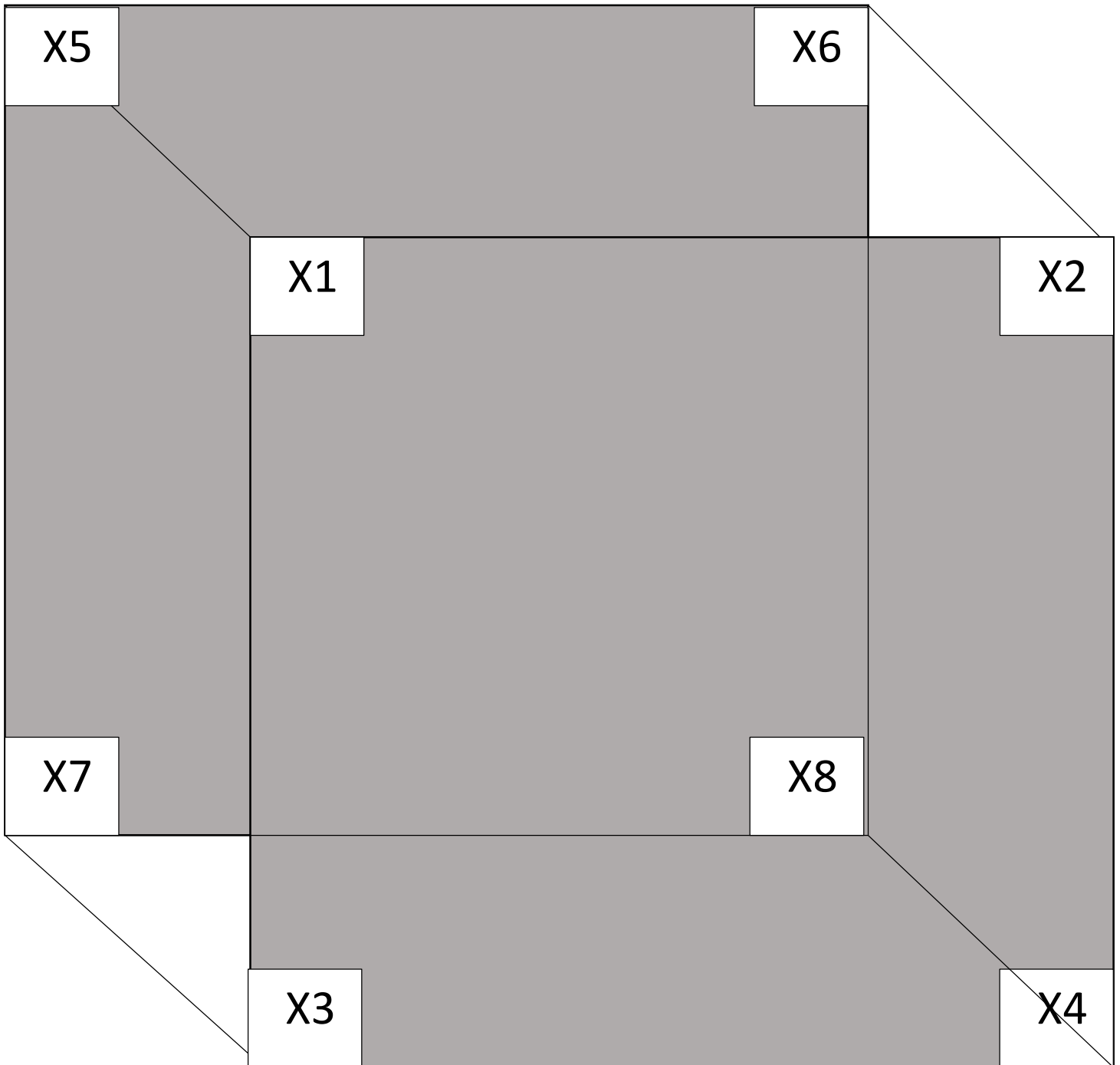
### ABSTRACT

This paper describes a method to structure the light collected by a primary lens stack and to reflect them towards a set of image sensors. A primary lens stack collects light and projects the light towards four cyclically arranged reflectors. These four cyclically arranged reflectors direct the reflected light beams into four cyclically arranged image sensors through four cyclically arranged secondary lens stacks. The four images that are generated at the four image sensors will be combined through the utilization of computing resources to form into a one single image.

### The diagrams

The diagrams of the components of the optical system are given below.

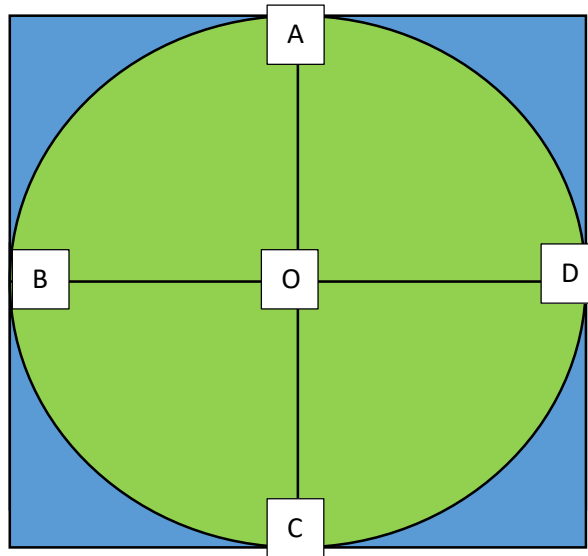
- The perspective reference model.



- Description of the perspective reference model.

The perspective reference model will be utilized in describing the diagrams of the optical system in their different perspectives of observation. This perspective reference model is a cubic shaped reference model. This cubic shape model has eight vertices. They are X1, X2, X3, X4, X5, X6, X7 and X8. Whenever a particular diagram of the optical system is described, the diagram will be presented visually in relative to the perspective reference model.

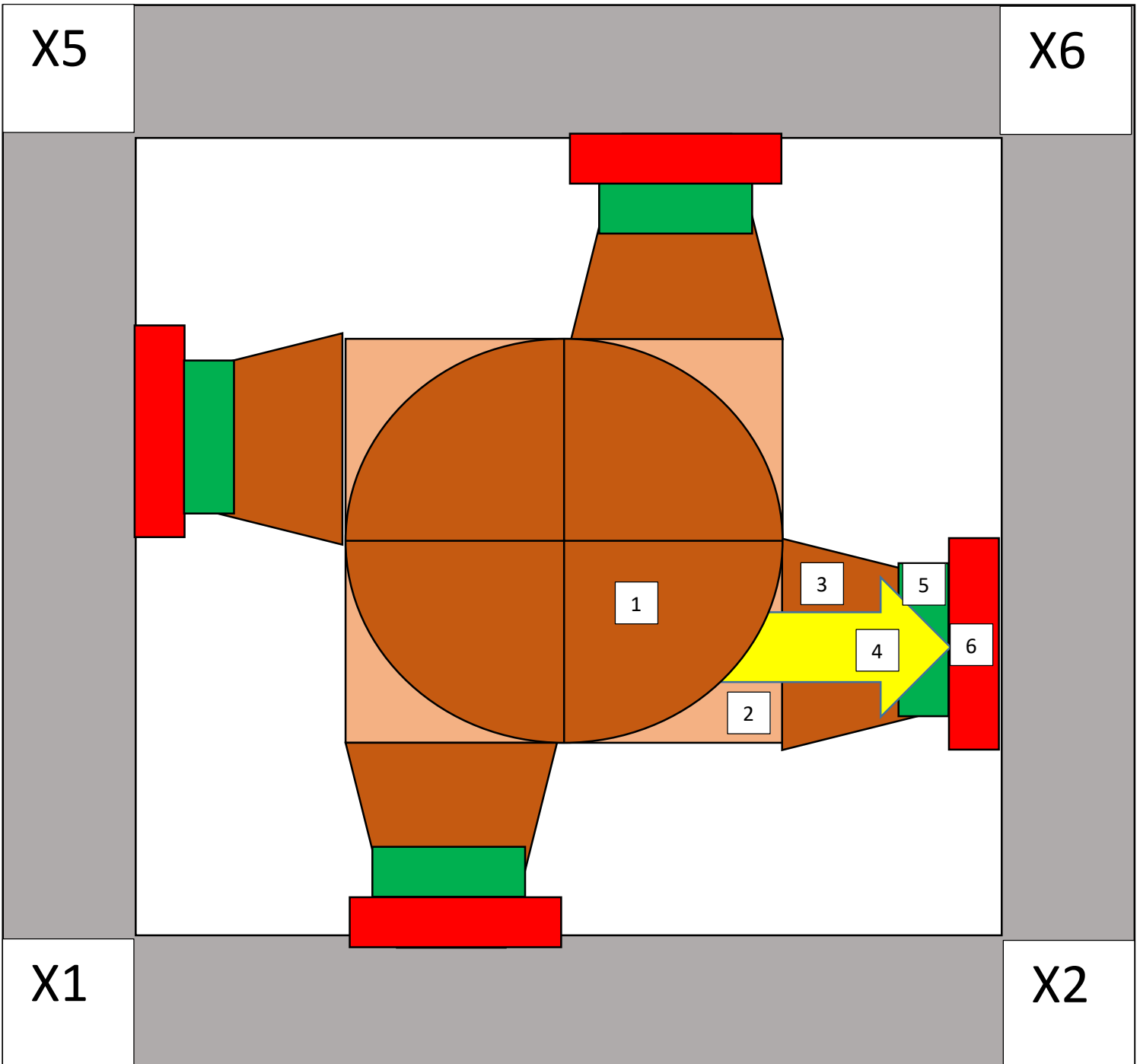
- The quadrant structure.



- Description of the quadrant structure.

The quadrant structure which is a circle consisting of four quadrants will be utilized in describing the shape of the secondary lens stack that will be utilized in directing the reflected light beam into the image sensor.

- The top diagram of the optical system for side one. (X5, X6, X1,X2 )



- Description of the top diagram of the optical system for side one. (X5, X6, X1, and X2)

This is the top diagram of the optical system oriented in the perspective described by the perspective reference model as the orientation X5, X6, X1, X2. The entities of this perspective model of the optical system are given below.

Entity one: the structure of part of the primary lens stack (lens stack in the structure of a quadrant), allocated for the optical mechanism of side one.

Entity two: the structure of the part of the transparent material plate (structure of a square shaped part) allocated for the optical mechanism of side one.

Entity three: the secondary lens stack that will used to direct the reflector reflected light beam into the image sensor for the optical mechanism of side one.

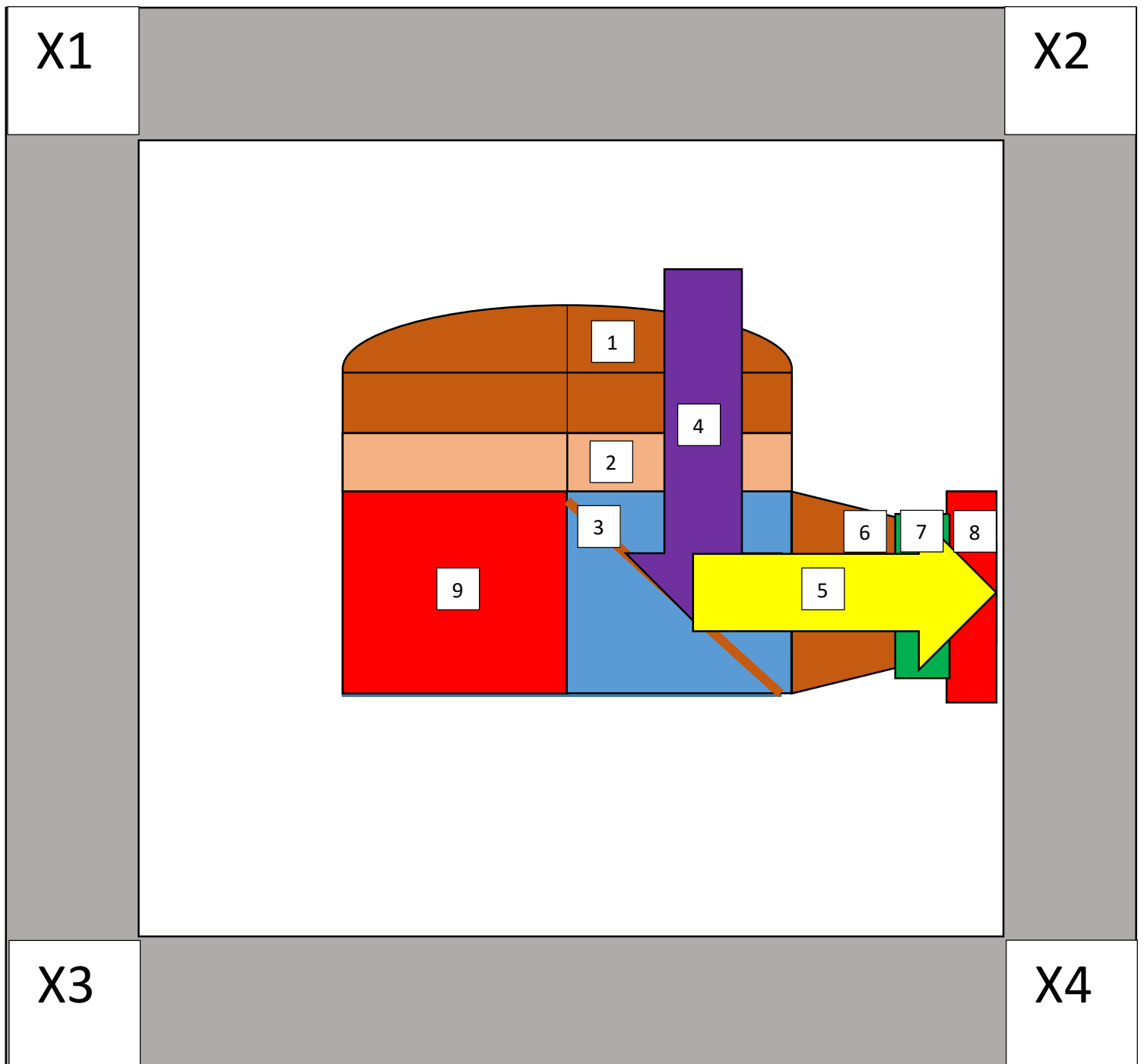
Entity four: the reflector reflected light beam of the optical mechanism of side one.

.

Entity five: the gap between the secondary lens stack and the image sensor for the optical mechanism of side one.

Entity six: the image sensor for the optical mechanism of side one.

- The side diagram of the optical system for side one. (X1, X2,X3,X4)





- Description of the diagram of the optical system for side one. (X1, X2, X3, X4)

This is the side diagram of the optical system oriented in the perspective described by the perspective reference model as the orientation X1, X2, X3, X4. The entities of this perspective model of the optical system are given below.

Entity one: the structure of part of the primary lens stack (lens stack in the structure of a quadrant), allocated for the optical mechanism of side one.

Entity two: the structure of the part of the transparent material plate (structure of a square shaped part) allocated for the optical mechanism of side one.

Entity three: the reflector which will reflect the entity one (lens stack in the structure of a quadrant) collected light beam allocated for the optical mechanism of side one.

Entity four: the light beam collected by the primary lens stack (entity one).

Entity five: the reflector (entity three) reflected light beam.

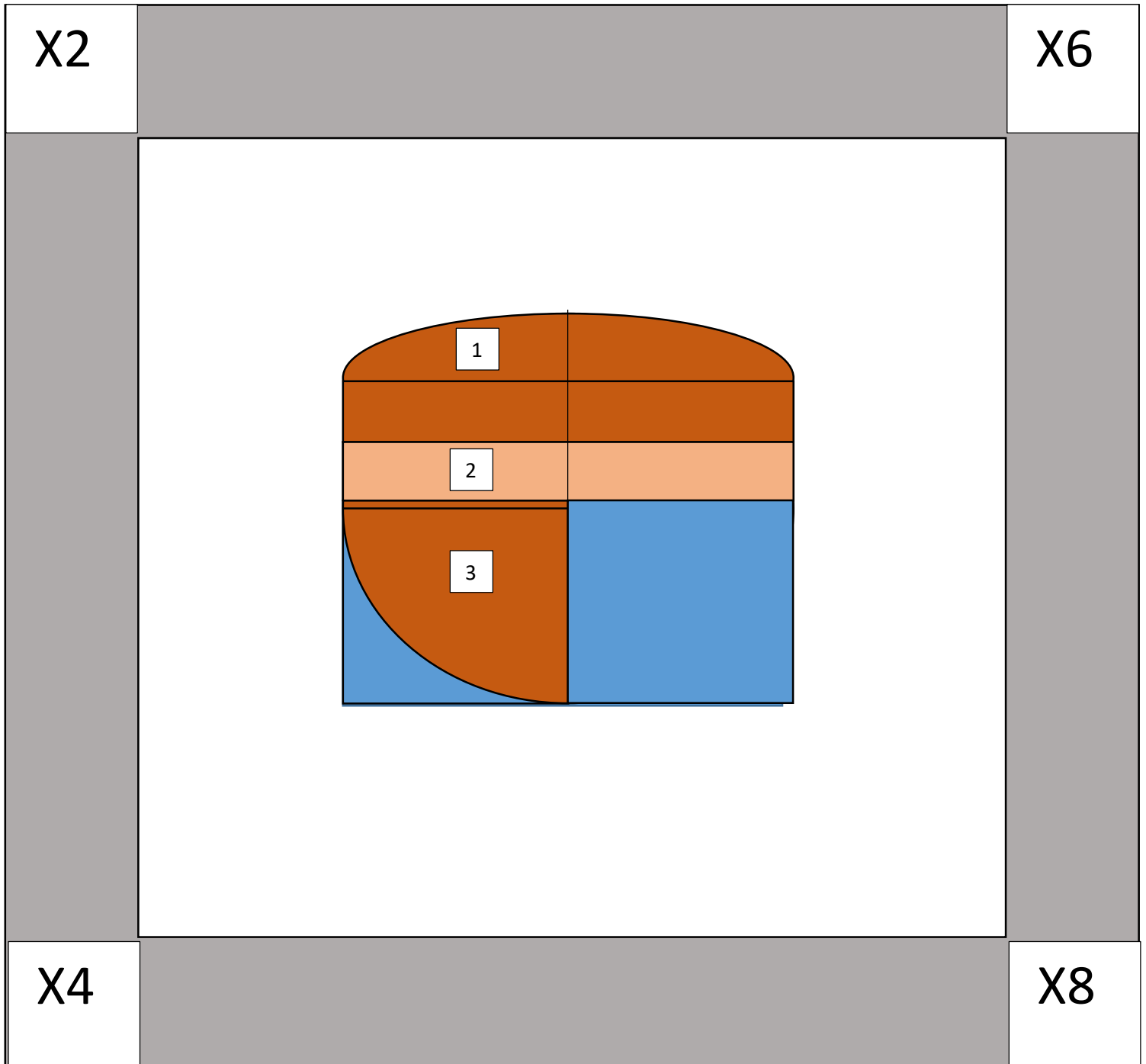
Entity six: the secondary lens stack that will used to direct the reflector reflected light beam into the image sensor for the optical mechanism of side one.

Entity seven: the gap between the secondary lens stack and the image sensor for the optical mechanism of side one.

Entity eight: the image sensor for the optical mechanism of side one.

Entity nine: the image sensor allocated for the optical mechanism of the side with the perspective relative to the perspective model as (X5, X1, X7, and X3).

- The secondary lens stack diagram of the optical system for side one. (X2, X6, X4, X8)



- Description of the diagram of the optical system for side one. (X2, X6, X4, X8)

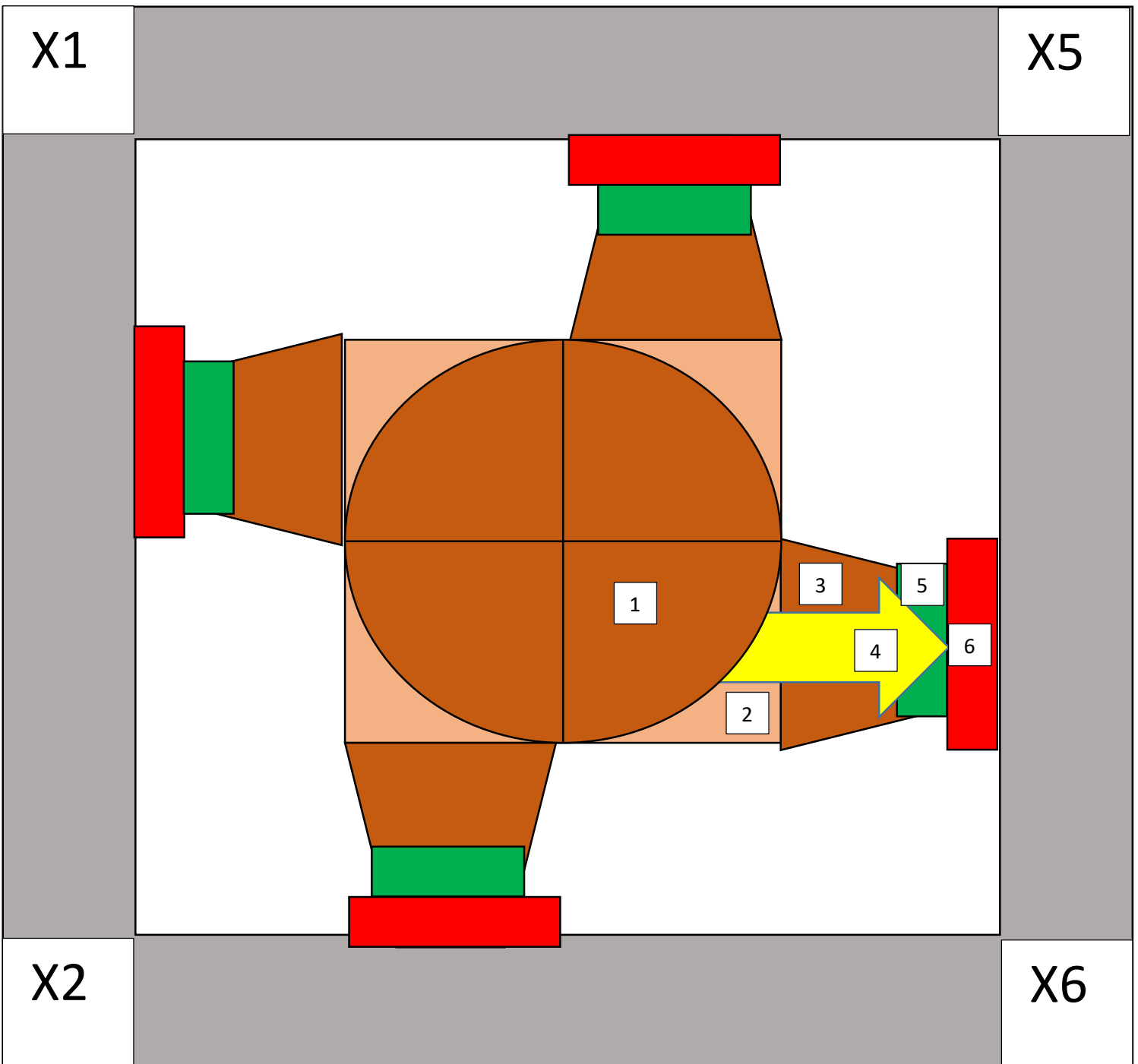
This is the side diagram of the optical system oriented in the perspective described by the perspective reference model as the orientation X2, X6, X4, X8. The entities of this perspective model of the optical system are given below.

Entity one: the structure of part of the primary lens stack (lens stack in the structure of a quadrant), allocated for the optical mechanism of side one.

Entity two: the structure of the part of the transparent material plate (structure of a square shaped part) allocated for the optical mechanism of side one.

Entity three: the secondary lens stack that will used to direct the reflector reflected light beam into the image sensor for the optical mechanism of side one. All the lenses contained in this lens stack are of the shape of the third quadrant (BOC) of the quadrant structure diagram.

- The top diagram of the optical system for side two. (X1, X6, X2,X6 )



- Description of the top diagram of the optical system for side two. (X1, X5, X2, and X6)

This is the top diagram of the optical system oriented in the perspective described by the perspective reference model as the orientation X1, X5, X2, X6. The entities of this perspective model of the optical system are given below.

Entity one: the structure of part of the primary lens stack (lens stack in the structure of a quadrant), allocated for the optical mechanism of side two.

Entity two: the structure of the part of the transparent material plate (structure of a square shaped part) allocated for the optical mechanism of side two.

Entity three: the secondary lens stack that will used to direct the reflector reflected light beam into the image sensor for the optical mechanism of side two.

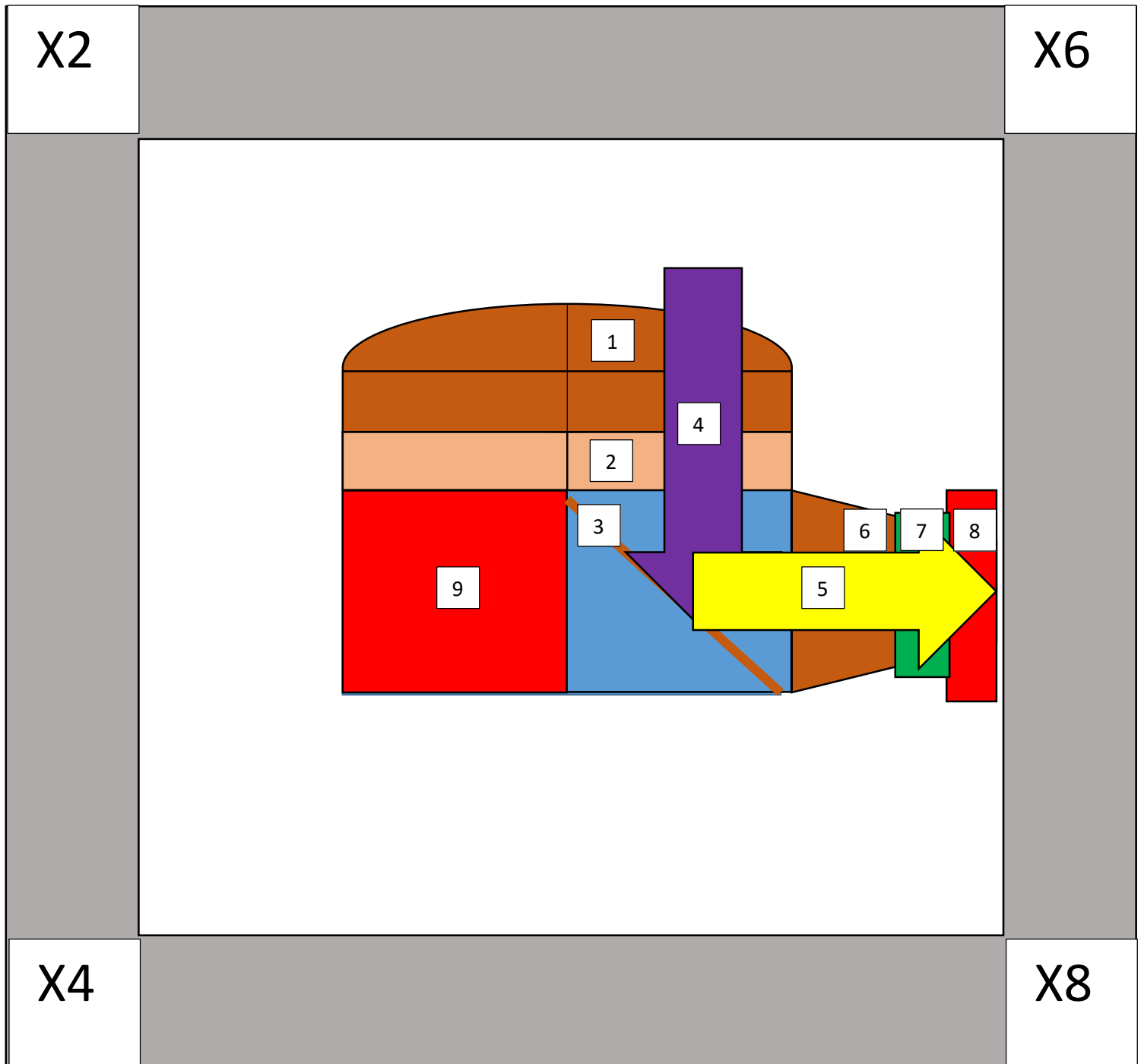
Entity four: the reflector reflected light beam of the optical mechanism of side two.

.

Entity five: the gap between the secondary lens stack and the image sensor for the optical mechanism of side two.

Entity six: the image sensor for the optical mechanism of side two.

- The side diagram of the optical system for side two. (X2, X6,X4,X8)



- Description of the diagram of the optical system for side two. (X2, X6, X4, X8)

This is the side diagram of the optical system oriented in the perspective described by the perspective reference model as the orientation X2, X6, X4, X8. The entities of this perspective model of the optical system are given below.

Entity one: the structure of part of the primary lens stack (lens stack in the structure of a quadrant), allocated for the optical mechanism of side two.

Entity two: the structure of the part of the transparent material plate (structure of a square shaped part) allocated for the optical mechanism of side two.

Entity three: the reflector which will reflect the entity one (lens stack in the structure of a quadrant) collected light beam allocated for the optical mechanism of side two.

Entity four: the light beam collected by the primary lens stack (entity one).

Entity five: the reflector (entity three) reflected light beam.

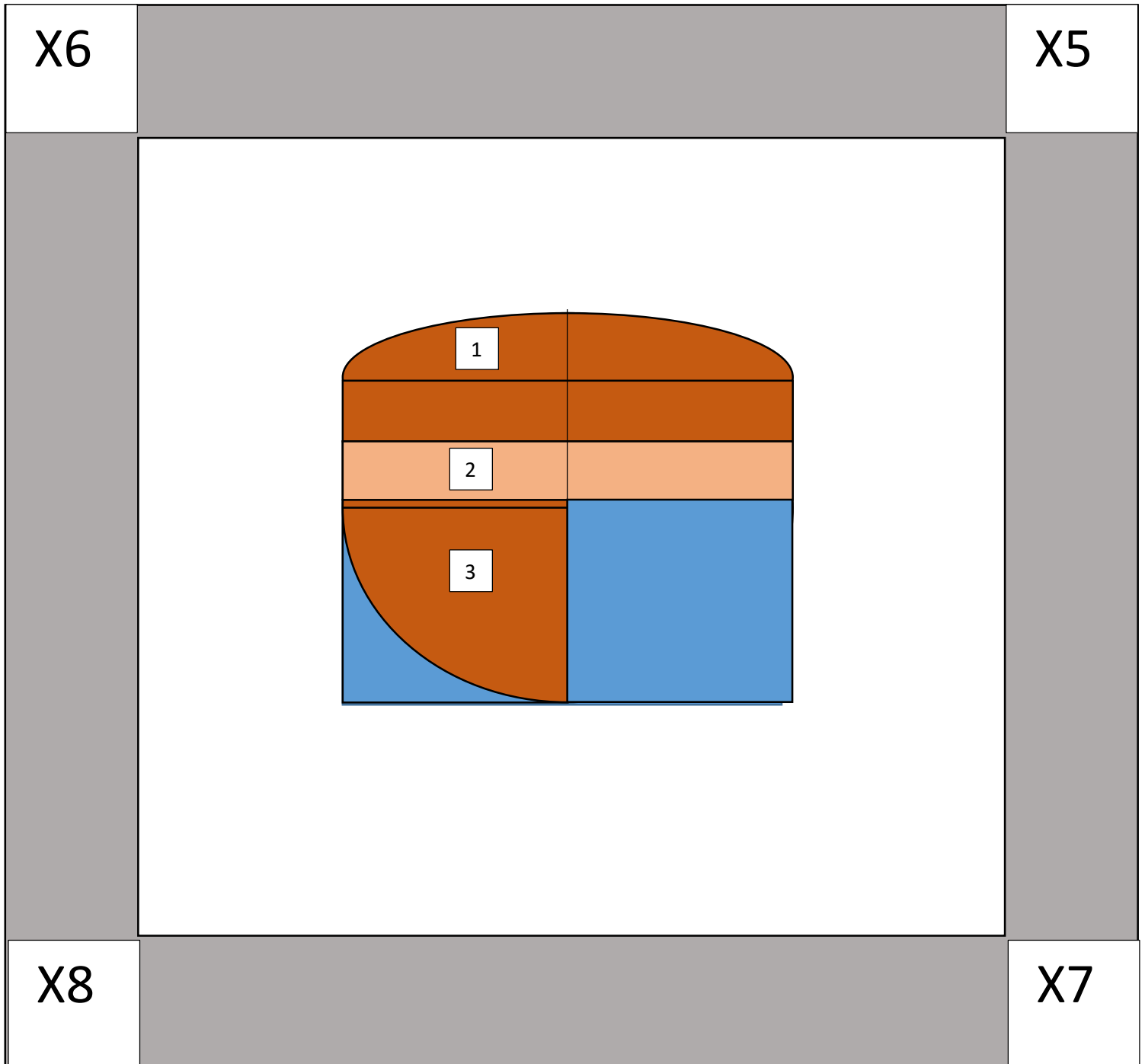
Entity six: the secondary lens stack that will used to direct the reflector reflected light beam into the image sensor for the optical mechanism of side two.

Entity seven: the gap between the secondary lens stack and the image sensor for the optical mechanism of side two.

Entity eight: the image sensor for the optical mechanism of side two.

Entity nine: the image sensor allocated for the optical mechanism of the side with the perspective relative to the perspective model as (X5, X1, X7, and X3).

- The secondary lens stack diagram of the optical system for side two. (X6, X5, X8, X7)





- Description of the diagram of the optical system for side two. (X6, X5, X8, X7)

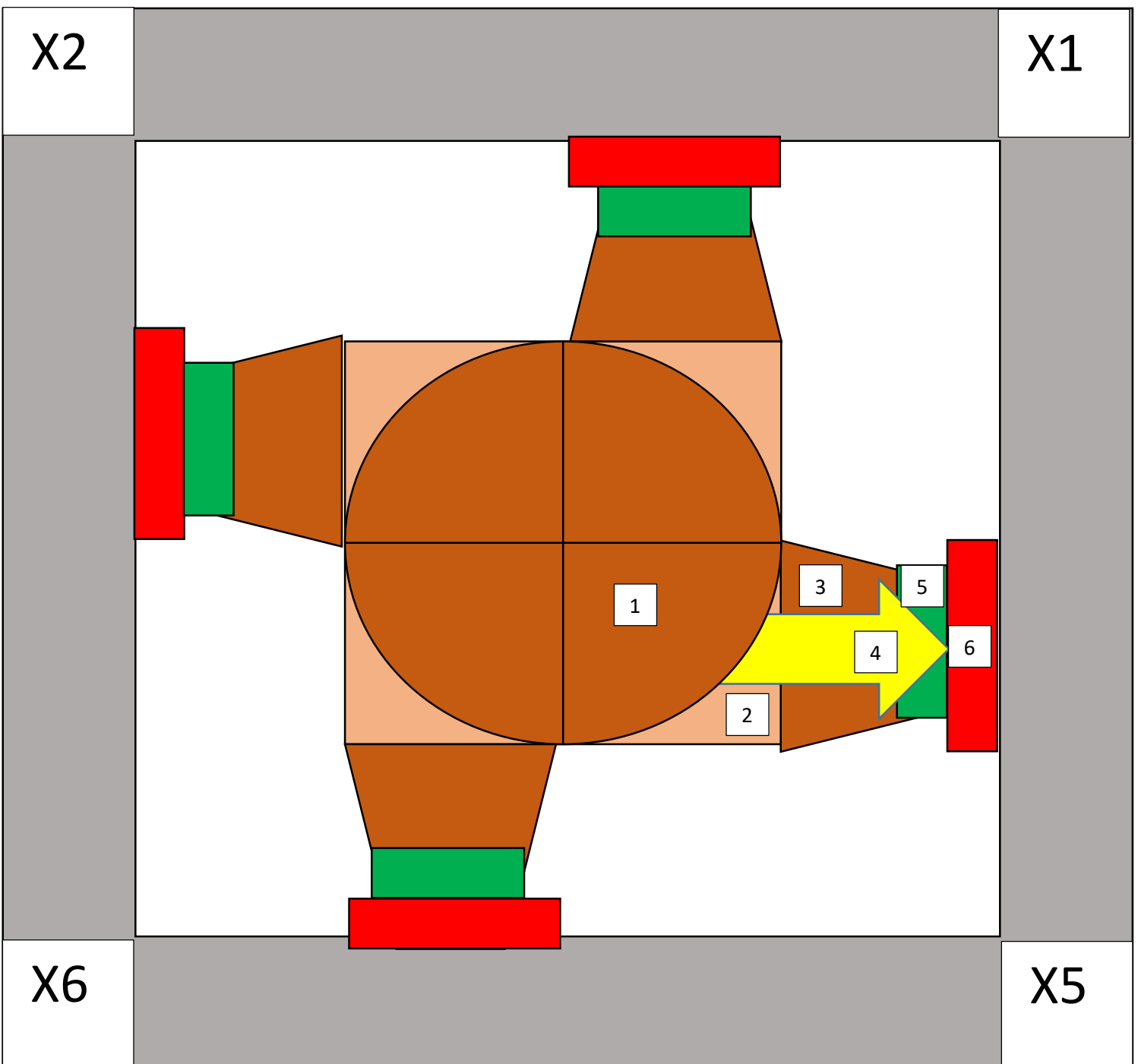
This is the side diagram of the optical system oriented in the perspective described by the perspective reference model as the orientation X6, X5, X8, X7. The entities of this perspective model of the optical system are given below.

Entity one: the structure of part of the primary lens stack (lens stack in the structure of a quadrant), allocated for the optical mechanism of side two.

Entity two: the structure of the part of the transparent material plate (structure of a square shaped part) allocated for the optical mechanism of side two.

Entity three: the secondary lens stack that will used to direct the reflector reflected light beam into the image sensor for the optical mechanism of side two. All the lenses contained in this lens stack are of the shape of the third quadrant (BOC) of the quadrant structure diagram.

- The top diagram of the optical system for side three. (X2, X1, X6,X5 )



Description of the top diagram of the optical system for side three. (X2, X1, X6, and X5)

This is the top diagram of the optical system oriented in the perspective described by the perspective reference model as the orientation X2, X1, X6, X5. The entities of this perspective model of the optical system are given below.

Entity one: the structure of part of the primary lens stack (lens stack in the structure of a quadrant), allocated for the optical mechanism of side three.

Entity two: the structure of the part of the transparent material plate (structure of a square shaped part) allocated for the optical mechanism of side three.

Entity three: the secondary lens stack that will used to direct the reflector reflected light beam into the image sensor for the optical mechanism of side three.

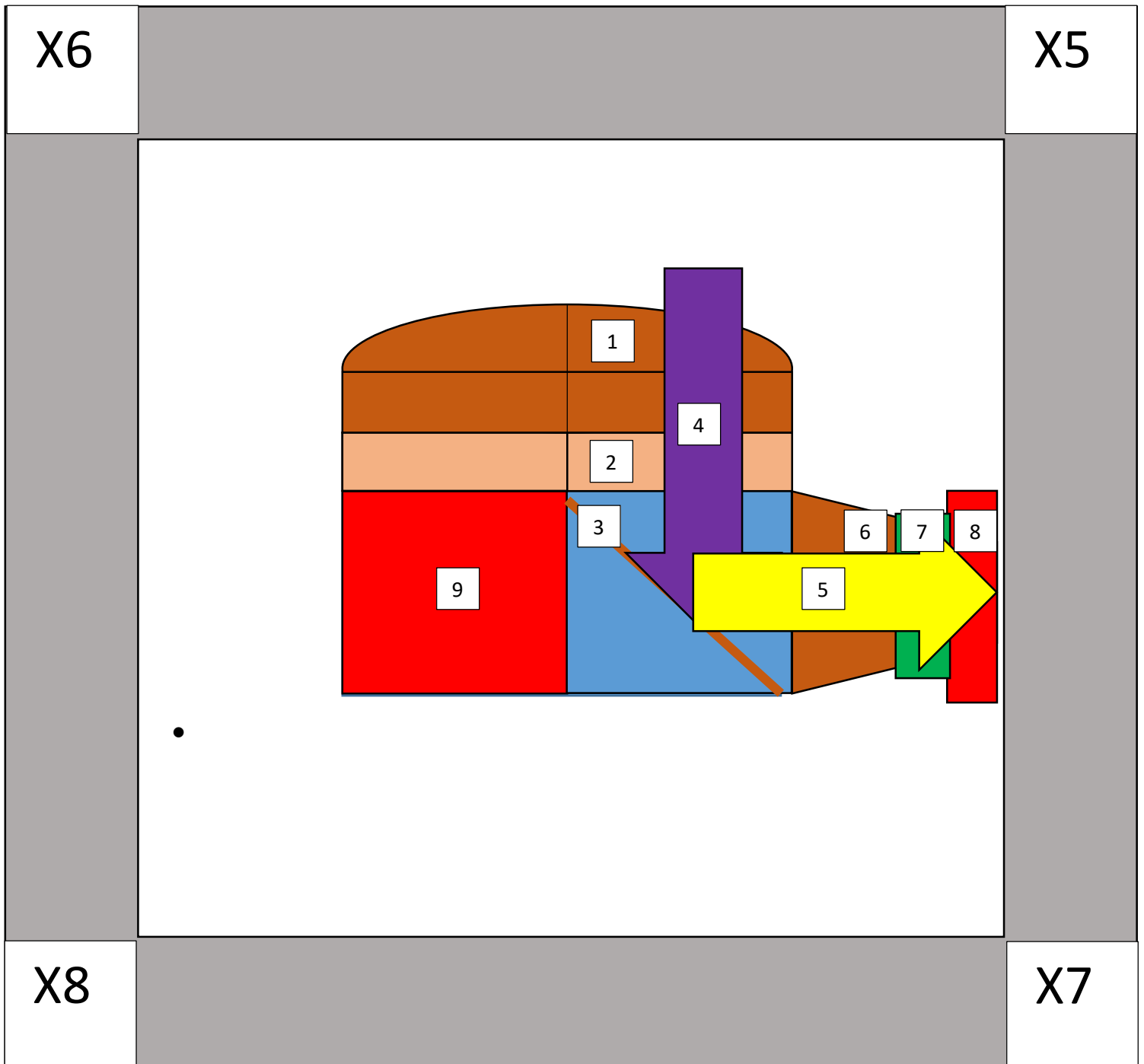
Entity four: the reflector reflected light beam of the optical mechanism of side three.

.

Entity five: the gap between the secondary lens stack and the image sensor for the optical mechanism of side three.

Entity six: the image sensor for the optical mechanism of side three.

- The side diagram of the optical system for side three. (X6, X5,X8,X7)



- Description of the diagram of the optical system for side three. (X6, X5, X8, X7)

This is the side diagram of the optical system oriented in the perspective described by the perspective reference model as the orientation X1, X2, X3, X4. The entities of this perspective model of the optical system are given below.

Entity one: the structure of part of the primary lens stack (lens stack in the structure of a quadrant), allocated for the optical mechanism of side three.

Entity two: the structure of the part of the transparent material plate (structure of a square shaped part) allocated for the optical mechanism of side three.

Entity three: the reflector which will reflect the entity one (lens stack in the structure of a quadrant) collected light beam allocated for the optical mechanism of side three.

Entity four: the light beam collected by the primary lens stack (entity one).

Entity five: the reflector (entity three) reflected light beam.

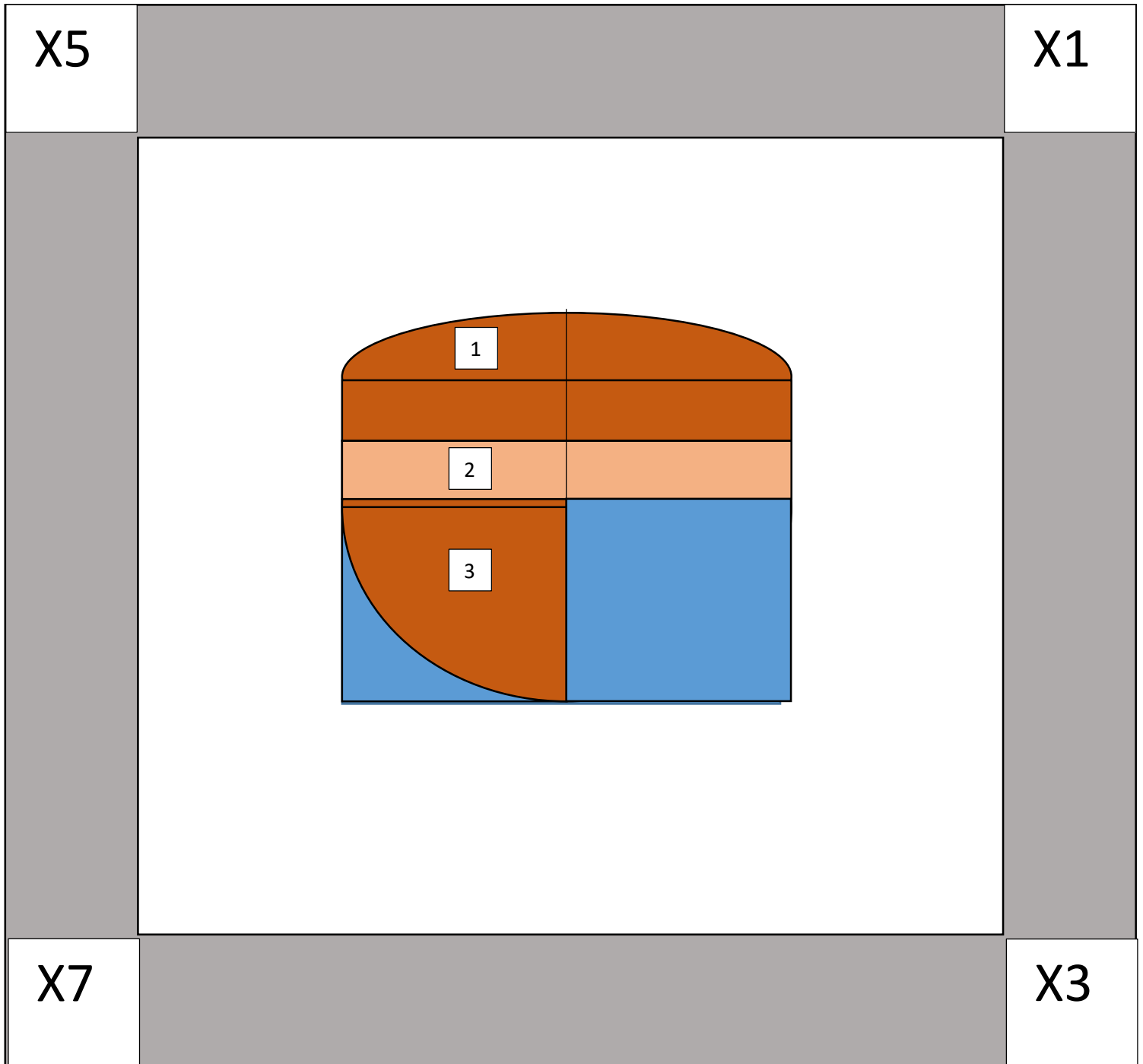
Entity six: the secondary lens stack that will used to direct the reflector reflected light beam into the image sensor for the optical mechanism of side three.

Entity seven: the gap between the secondary lens stack and the image sensor for the optical mechanism of side three.

Entity eight: the image sensor for the optical mechanism of side three.

Entity nine: the image sensor allocated for the optical mechanism of the side with the perspective relative to the perspective model as (X5, X1, X7, and X3).

- The secondary lens stack diagram of the optical system for side three.  
(X5, X1,X7, X3)



- Description of the diagram of the optical system for side three. (X5, X1, X7, X3)

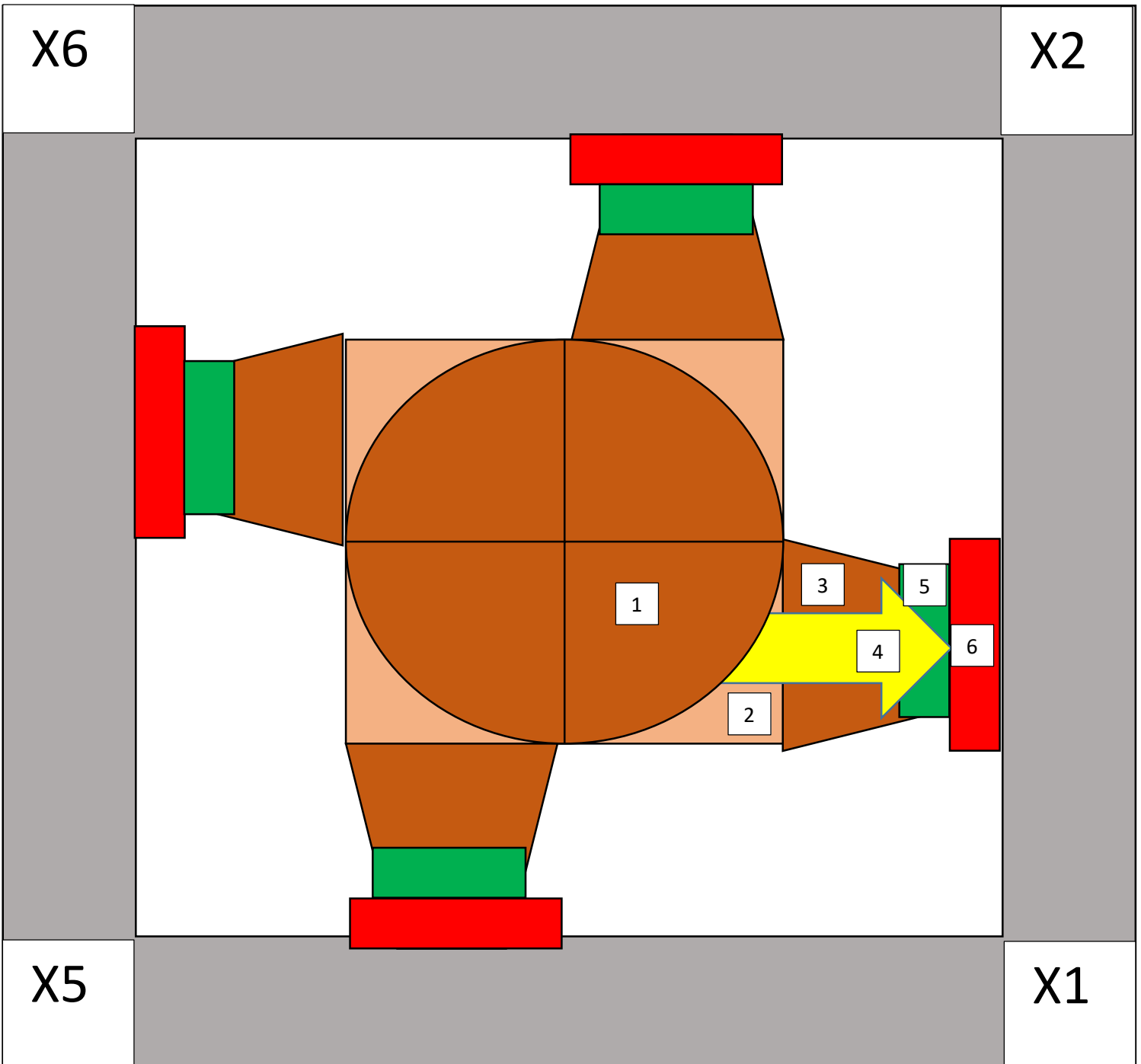
This is the side diagram of the optical system oriented in the perspective described by the perspective reference model as the orientation X2, X6, X4, X8. The entities of this perspective model of the optical system are given below.

Entity one: the structure of part of the primary lens stack (lens stack in the structure of a quadrant), allocated for the optical mechanism of side three.

Entity two: the structure of the part of the transparent material plate (structure of a square shaped part) allocated for the optical mechanism of side three.

Entity three: the secondary lens stack that will used to direct the reflector reflected light beam into the image sensor for the optical mechanism of side three. All the lenses contained in this lens stack are of the shape of the third quadrant (BOC) of the quadrant structure diagram.

- The top diagram of the optical system for side four. (X6, X2, X5,X1 )





- Description of the top diagram of the optical system for side four. (X6, X2, X5, and X1)

This is the top diagram of the optical system oriented in the perspective described by the perspective reference model as the orientation X6, X2, X5, X1. The entities of this perspective model of the optical system are given below.

Entity one: the structure of part of the primary lens stack (lens stack in the structure of a quadrant), allocated for the optical mechanism of side four.

Entity two: the structure of the part of the transparent material plate (structure of a square shaped part) allocated for the optical mechanism of side four.

Entity three: the secondary lens stack that will used to direct the reflector reflected light beam into the image sensor for the optical mechanism of side four.

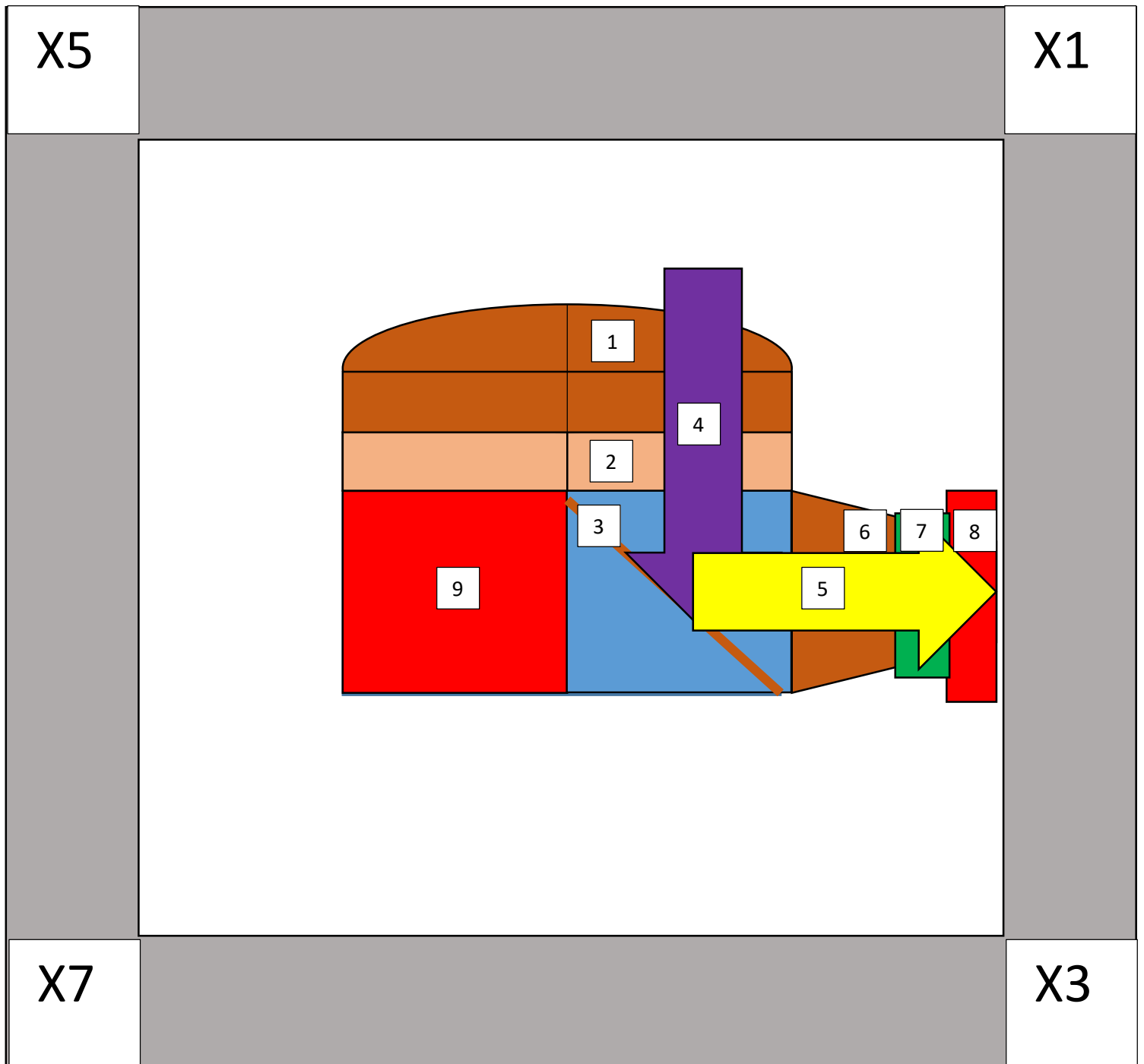
Entity four: the reflector reflected light beam of the optical mechanism of side four.

.

Entity five: the gap between the secondary lens stack and the image sensor for the optical mechanism of side four.

Entity six: the image sensor for the optical mechanism of side four.

- The side diagram of the optical system for side four. (X5, X1,X7,X3)



- Description of the diagram of the optical system for side four. (X5, X1, X7, X3)

This is the side diagram of the optical system oriented in the perspective described by the perspective reference model as the orientation X5, X1, X7, X3. The entities of this perspective model of the optical system are given below.

Entity one: the structure of part of the primary lens stack (lens stack in the structure of a quadrant), allocated for the optical mechanism of side four.

Entity two: the structure of the part of the transparent material plate (structure of a square shaped part) allocated for the optical mechanism of side four.

Entity three: the reflector which will reflect the entity one (lens stack in the structure of a quadrant) collected light beam allocated for the optical mechanism of side four.

Entity four: the light beam collected by the primary lens stack (entity one).

Entity five: the reflector (entity three) reflected light beam.

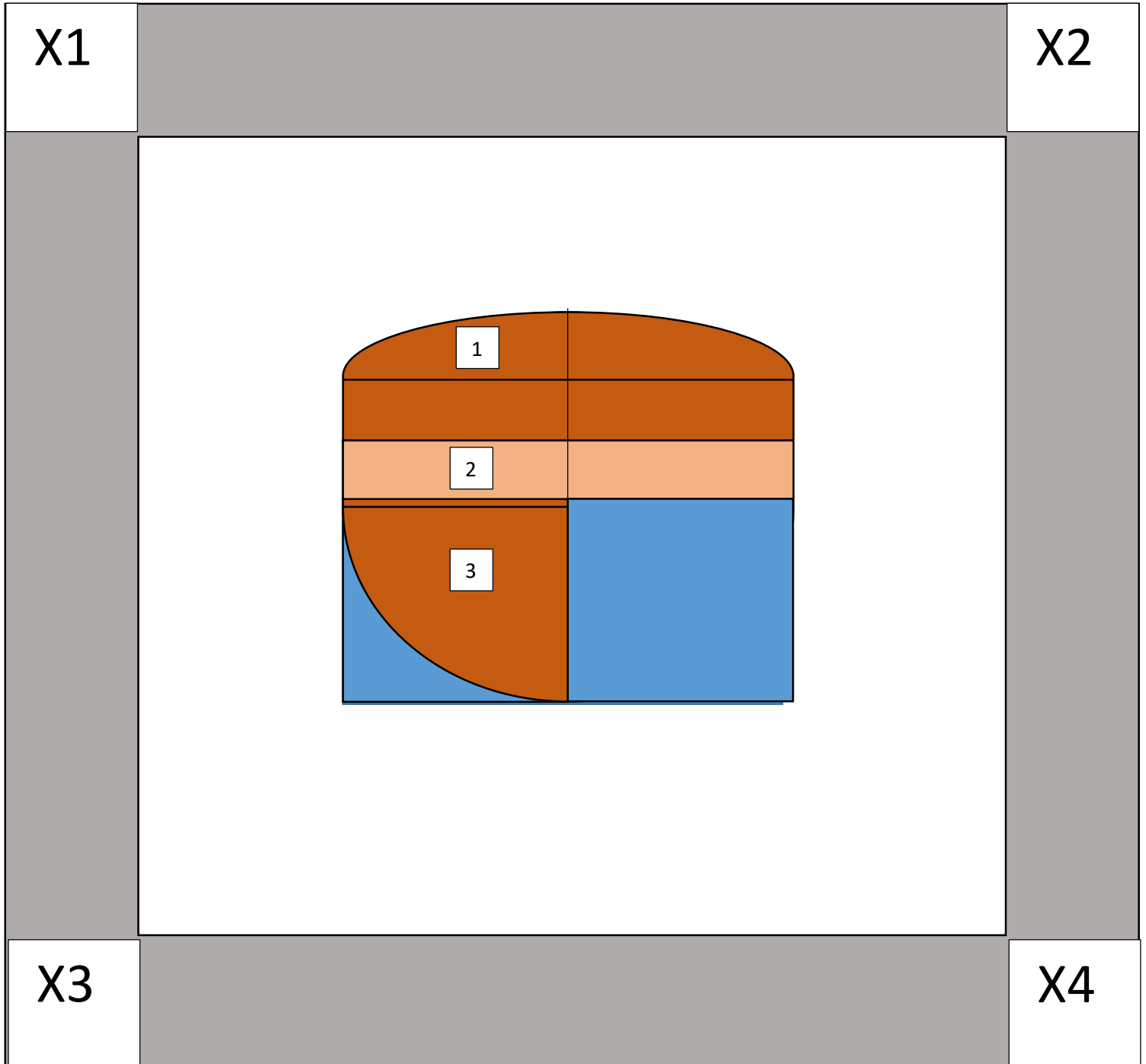
Entity six: the secondary lens stack that will used to direct the reflector reflected light beam into the image sensor for the optical mechanism of side four.

Entity seven: the gap between the secondary lens stack and the image sensor for the optical mechanism of side four.

Entity eight: the image sensor for the optical mechanism of side four.

Entity nine: the image sensor allocated for the optical mechanism of the side with the perspective relative to the perspective model as (X5, X1, X7, and X3).

- The secondary lens stack diagram of the optical system for side four. (X1, X2, X3, X4)



- Description of the diagram of the optical system for side four. (X1, X2, X3, X4)

This is the side diagram of the optical system oriented in the perspective described by the perspective reference model as the orientation X1, X2, X3, X4. The entities of this perspective model of the optical system are given below.

Entity one: the structure of part of the primary lens stack (lens stack in the structure of a quadrant), allocated for the optical mechanism of side four.

Entity two: the structure of the part of the transparent material plate (structure of a square shaped part) allocated for the optical mechanism of side four.

Entity three: the secondary lens stack that will used to direct the reflector reflected light beam into the image sensor for the optical mechanism of side four. All the lenses contained in this lens stack are of the shape of the third quadrant (BOC) of the quadrant structure diagram.

## DESCRIPTION

This paper describes a method to structure the light collected by a primary lens stack and to reflect them towards a set of image sensors. A primary lens stack collects light and projects the light towards four cyclically arranged reflectors. These four cyclically arranged reflectors direct the reflected light beams into four cyclically arranged image sensors through four cyclically arranged secondary lens stacks. The four images that are generated at the four image sensors will be combined through the utilization of computing resources to form into a one single image.

This optical system contains a primary lens stack to collect light from the outside world. This lens stack contains a collection of lenses. The primary function of this collection of lenses is to collect light and to assist in focusing that collected light beam. Other than this primary functionality, the lenses also perform the task of correcting the aberration issues that arises when the light travels through the lens stack. This lens stack is structured into four equally sized and equally shaped parts. Each lens stack part takes the form of a quadrant from a circle. The four structures collectively forms a full circle shape by combining all four quadrants of a circle. (First quadrant, second quadrant, third quadrant and the fourth quadrant). The full circle shaped collective quadrant combination of the primary lens stack will be visible in all the top diagrams of each side from their corresponding observed perspective (relative to the perspective reference frame). This full circle shaped lens stack will be visible as a brown colored circle shape when viewed from the top in each of these top view diagrams (oriented relative to the perspective reference model)of each corresponding side. In all these diagrams viewed from the top, the quadrant shaped structured lens stack will be visible as the entity one and will also be visible as entity one in the side diagrams of the optical system.

When the light from the outside world is collected by the primary lens stack it will be structured into four separate beams of light by the four quadrant shaped lens structures(quadrant shaped lens structure of side one, quadrant shaped lens structure of side two, quadrant shaped lens structure of side three and quadrant shaped lens structure of side four).

These four separate light beams will pass through the transparent material plate which is structured into four equally sized and shaped (square shaped) parts. These transparent material plate structural parts will be visible in pink color as the entity two in the top view diagrams of the optical system and also as entity two in the side view diagrams of the optical system.

Each of the four separate light beams structured by the four separate quadrant shaped primary lens stacks which then passed through the four square shaped transparent material plates will travel directly downwards in the optical system. This downward light travelling direction will be visualized by the purple shaped downwards arrow or the entity four in all the side diagrams of the optical system.

This four separate light beams which travelled in downwards direction which travelled through the structured primary lens stack and the structured transparent material plate will then be reflected by the four reflectors that is arranged in cyclic manner in the optical system. These reflectors are visualized as entity three in all the side diagrams (observed from each perspective relative to the perspective reference model) of the optical system. After being reflected by the reflectors, the four light beams will travel in the perpendicular directions to the initially light beams travelled direction. (Perpendicular to the downward direction) These perpendicular directions are visualized in yellow color and are marked as the entity four in the top view diagrams and as entity five in the side diagrams of the optical system.

The four light beams which are reflected by the four cyclically arranged reflectors will then travel through a set of four cyclically arranged secondary lens stacks. These four cyclically arranged secondary lens stacks are visualized in brown color and are marked as entity three in all the top view diagrams and marked as entity six in the side view diagrams of the optical system.

Like in the primary lens stack structure, the task of this cyclically arranged set of secondary lens stack structure will be also to mainly assist in the focusing of the structured light beam that was collected from the outside world. Also like in the primary lens stack, the secondary functionality of this cyclically arranged set of lens stacks is to correct the aberration issues that arises when the light travels through these lens stacks.

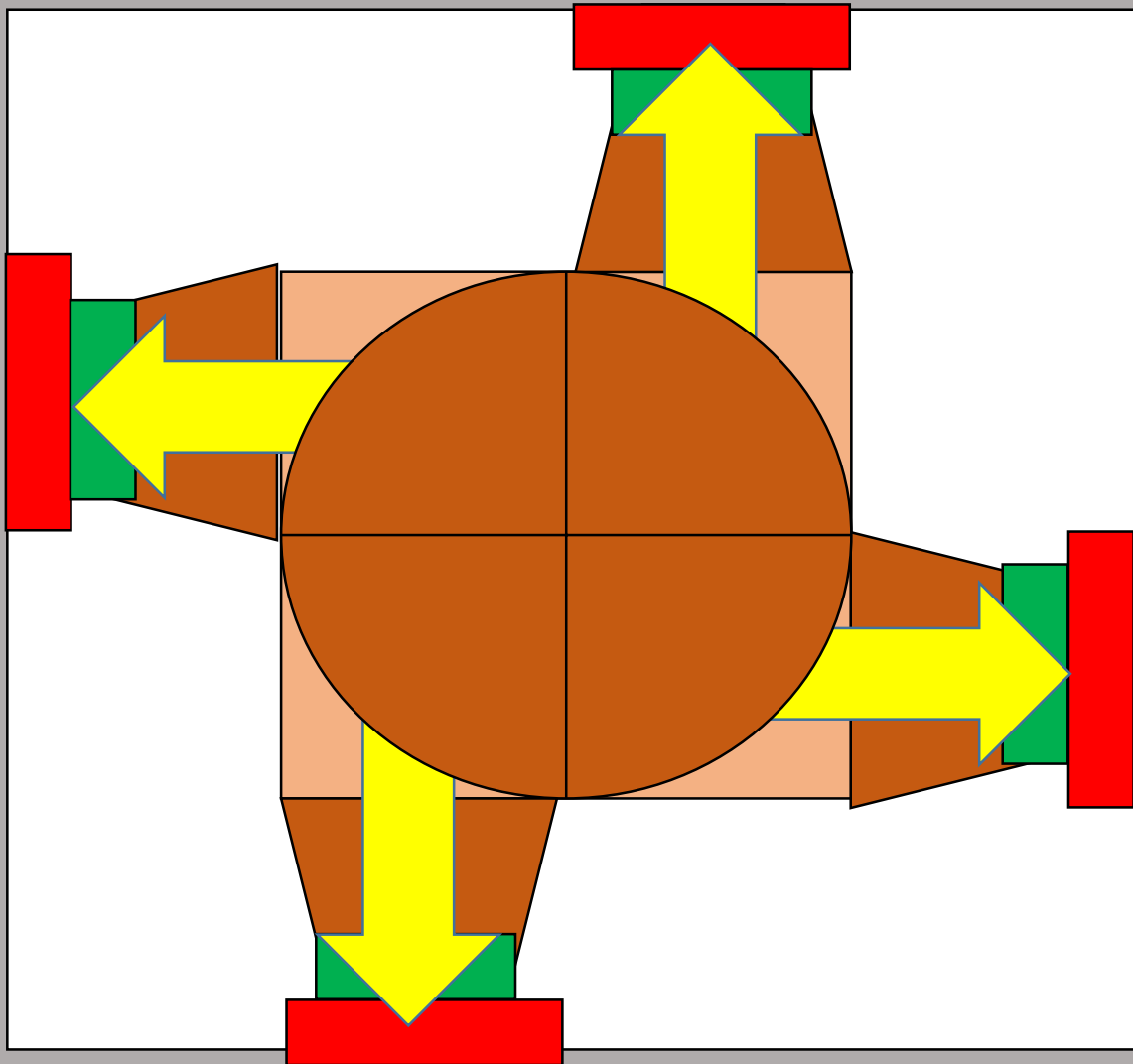
Also like the primary lens stack which is structured into four separate quadrant shapes, each of these secondary lens stack will take the shape of a quadrant. However, unlike in the case of the primary lens stack where each structured part takes a different quadrant shape, these secondary cyclically arranged lens stacks does not take different quadrant shapes. Instead, all of these secondary lens stacks will take the shape of the third quadrant of the circle structure or as the light green colored quadrant marked as BOC in the quadrant structure. This BOC quadrant shaped structures of the secondary lens stacks are visualized in brown color and are marked as entity three in the secondary lens stack observing diagrams of the optical system.

Upon travelling though this secondary cyclically arranged lens stacks, the light beams will then travel through the physical gaps which are also cyclically arranged and will finally meet the four cyclically arranged image sensors. These four cyclically arranged physical gaps are visualized in dark green color and are marked as entity five in the top view diagrams and are marked as entity seven in the side view diagrams of the optical system.

The four light beams that was initially got structured by the single light beam collected and that was reflected by the four cyclically arranged reflectors will finally meet the four cyclically arranged image sensors. These cyclically arranged image sensors are visualized in red color and are marked as entity six in the top view diagrams and are marked as entity eight in the side view diagrams of the optical system.

The general diagram visualizing the four light beams that are reflected by the four cyclically arranged reflectors travelling towards the corresponding four cyclically arranged image sensors is given below.





The four cyclically arranged image sensors upon receiving the four light beams with the assistance of computing resources, will generate the four corresponding images that are formed and will combine those four images into one to produce the original image of the light beam that was initially collected by the primary lens stack.