

Description

Today there is no standard and attractive 3D displays technology in the market which works "without 3D active/passive glasses". There are mainly three types of 3D glasses anaglyph, polarized, and active shutter which are used today. Due to these cumbersome glasses (bulky, not fit for all face sizes, required to be worn by ALL viewers), 3D displays are losing traction in the market. Each uses different methods to convert "flat" images on the screens. There are a few displays in the market which offer 3D viewing without glass but that's only if you sit exactly in front and center of the TV, and does not quite look 3D. There is no single "standard" that's followed across the industry for 3D displays.

Proposed solution describes how the CCDs and pixels layouts should be changed in imaging devices like camera and TV screen, to produce 3D images without requiring the viewers to wear the glasses from all angles.

Claim

Current market available design shortcomings

Household cheap mirrors produce 3D images without any complex circuitry and "without any special glasses".

Then why can't current high-tech displays produce 3D images with complex circuitry?

Where is the gap? What's missing today in all these technologies?

SVVRON Effect: 3D TV & Camera (without Glasses)

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The actual problem lies in the pixel and CCD (charge coupled device) shapes, and their layouts on TVs and cameras.

Today nearly all cameras have "flat" CCds layout which can't capture angle of light falling from various directions.

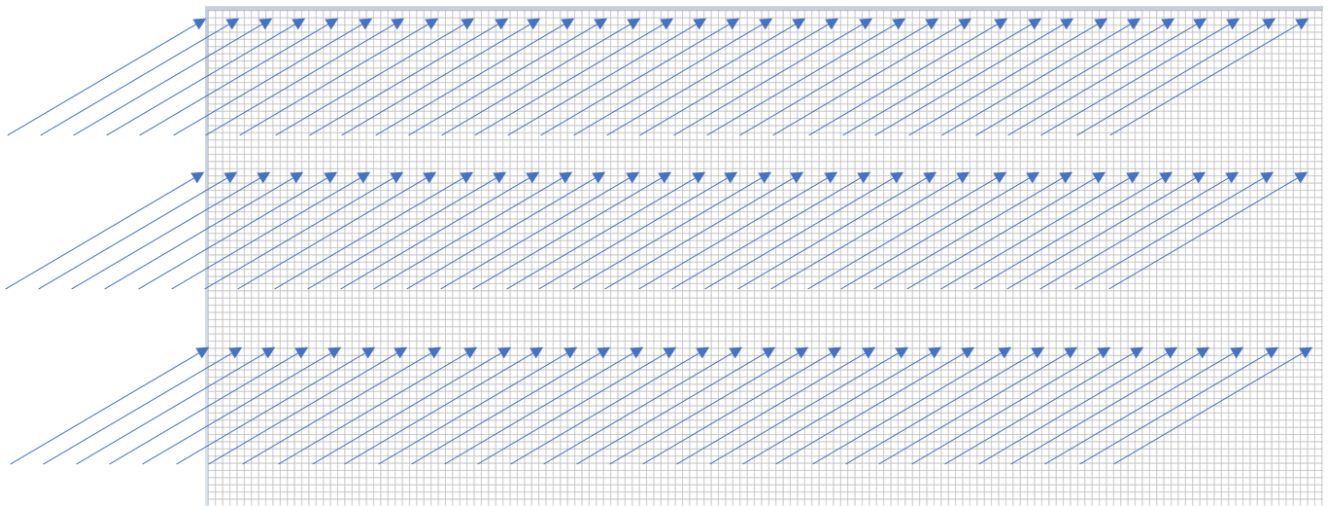


Figure: current way images are captured by imaging devices like camera CCD panel at present (CCD Panel with CCDS placed on rectangular flat mesh)

Today nearly all displays have "flat" pixels layout which send rays in front direction only like a LED torch light. It doesn't reproduce light going at various angles in different directions.

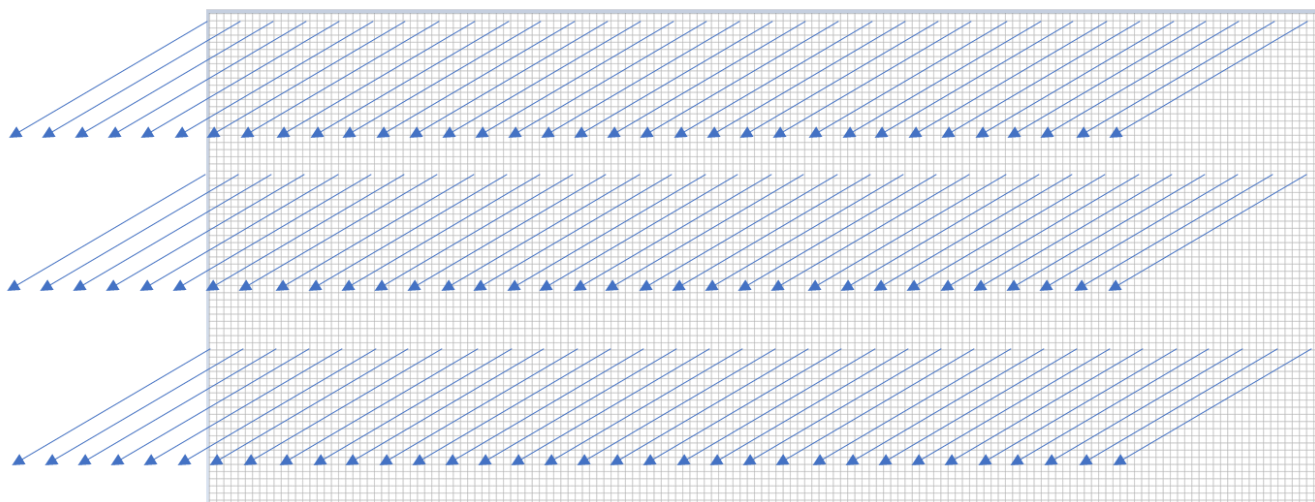


Figure: current way images are produced by imaging devices like TV at present (Flat rectangular mesh Pixels Panel)

Due to this flat layout, these devices are good in capturing and reproducing light falling "straight" on them but not able to capture (and reproduce) the "angles" of the light falling on them from various "directions".

Mirrors reflect rays falling on it from all "directions" (capture) at various "angles", in all directions (produce). Mirrors do not send light in front direction only. When the head (and eyes) are moved around in a mirror, different light rays falling from different angles is seen than seen previously when in different position. This simple phenomenon combined with human binocular vision helps us see things in 3D on simple mirror.

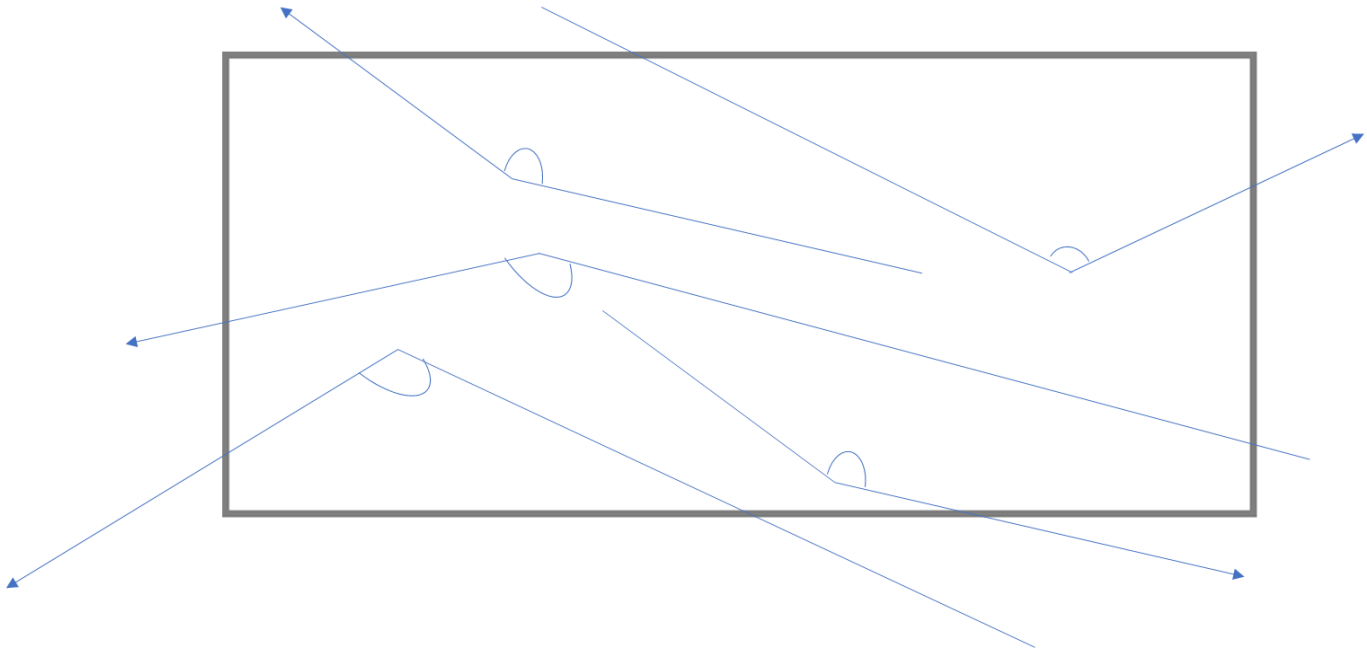


Figure: rays reflected by mirror in all directions at various angles

Proposed solution Comparison with Existing methods

Existing 3D technologies are quite complex, requires active/passive glasses and based on "Tricking the eyes and brains", requires complex image manipulations making it slow. Each viewer has to wear the 3D glasses to view the images and those not wearing the glasses can't see 3D (even 2D) images.

Proposed solution follows basic principles of physics (light optics) to produce the 3D images without any cumbersome gear to wear.

Proposed Solution (SVVRON Effect)

The proposed solution is inspired by ray optics, geometry, mirrors, diamond cuts, eyes, rods & cones and retina design. It doesn't "trick" the eyes, it doesn't manipulate the images to give the 3D effect. It's based on simple ray optics. What

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you capture, that you produce (from all "angles/directions" as seen by the eyes).

The answer to producing 3D images without glasses lies in capturing and emitting the light rays coming from different "directions" at various "angles".

Solution lies in changing the existing pixel (produce) shape/layout design and CCD (capture) shape/layout design to 3D instead of its being flat and rectangular.

The way images are captured and reproduced need to be enhanced. Images need to be captured with "angle" of the rays coming from various "directions", and images need to be reproduced with "angles" of the rays, so that light rays are sent in all "directions" [not just sending it in front like today's display do].

There are two ways to do it:

Case1: Change the layout of CCDs and Pixels (without changing the shapes of CCDs and pixels.

Case 2: Or change the CCD and Pixel shape itself (best case)

CASE 1

CCDs and Pixels layout need to be changed to raised riveted crown head hexagonal mesh layout design for both image capture and image reproducing devices.

Image Capture Design changes

In cameras the image capturing need to be like human eyes. CCDs (image capture) layout need to be enhanced to capture the "angle" of the rays falling on it from all directions at various angles.

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Instead of laying out CCDs on flat surface in flat rectangular mesh, CCDs need to be placed on raised rivets with rounded top and Hexagonal bases (many CCDs on single rivet top to capture light falling on them from all directions) first, and then these rivets need to be arranged in hexagonal mesh structure.

This layout can be compared to blister/bubble pack available today. Imagine placing multiple CCDs on top and sides of each single blister on a big blister sheet (instead of placing CCDs on flat sheet), comparing bubble sheet with CCD panel.

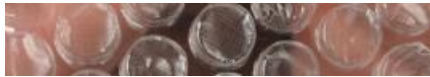


Figure: proposed single raised rivet crown head (side view). C stands for single CCD.

Each CCD will capture light falling on it from a particular direction.

Key to best image capture with this technique is smaller CCD size. Smaller the CCDs, more and better it'd fit on raised riveted layout to capture maximum angle of lights from various directions.



Figure: proposed single raised rivet (top view). C stands for single CCD

Hexagonal rivet base is used so as not to waste space between these rivets. Round base rivets structure would lead to vacant space between the rivets hence the hexagonal bases to be used.

Smaller the size of CCD (and hence the Hexagon), better would be the results. Aim should be to bring the hexagon size to today's existing single CCD size or smaller.



Figure: hexagon size comparison to existing CCD size



Figure: current flat layout in which CCDs are arranged on image capturing devices like digital cameras (Side view)



Figure: proposed raised rivet layout for CCDs to be arranged on image capture devices like digital camera panels (Side view)



Figure: current flat rectangular mesh layout in which CCDs are arranged on image capturing devices like digital cameras (Top view)

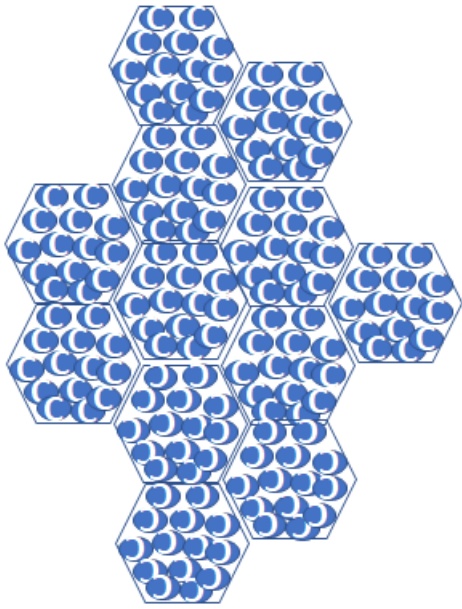


Figure: proposed layout in which hexagonal raised rivets (with CCDs on them) to be arranged on image capture devices like digital camera panels (Top view of small section)

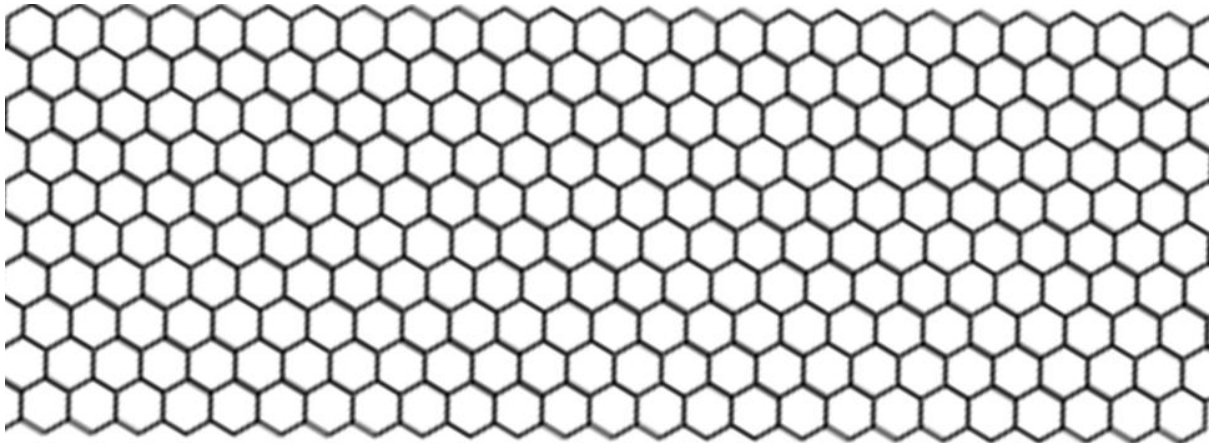


Figure: CCD panel closeup

Image Producer Design changes

Similarly the image emitters on the Displays (e.g. TV/Mobile screens) need to be of raised rivet shape with pixels placed on it in all directions.

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Imagine placing multiple pixels on top and sides of each single blister on a big blister sheet (instead of placing pixels on flat sheet), comparing bubble sheet with TV screen.

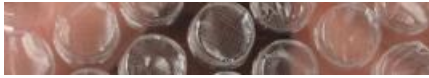


Figure: proposed single raised rivet (side view). P stands for single Pixel. Although pixels are composed of multiple RGB components and may not be circular, here it's shown as single circular P for simplicity of the figure.

Each Pixel will emit light in a particular direction (as was captured by CCD).

Key to best display with this technique is smaller pixels. Smaller the pixels, better it'd fit on raised rivet head structure.



Figure: proposed single raised rivet (top view). P stands for single Pixel.

Smaller the size of Pixel (and hence the Hexagon), better would be the results. Aim should be to bring the hexagon size to today's existing single pixel size or smaller.



Figure: hexagon size comparison to existing pixel size

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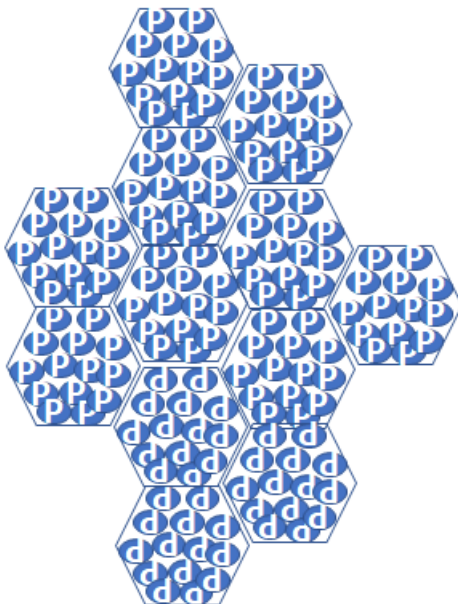
Figure: current flat layout in which pixels are arranged on image producing devices like TV screens (Side view)



Figure: proposed raised rivet layout in which pixels to be arranged on image producing devices like TV screens (Side view)



Figure: current flat way pixels are arranged on image producing devices like TV screens (Top view)



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Figure: proposed layout in which hexagonal raised rivets (with pixels on them) to be arranged on image producing devices like TV screens (Top view of small section)

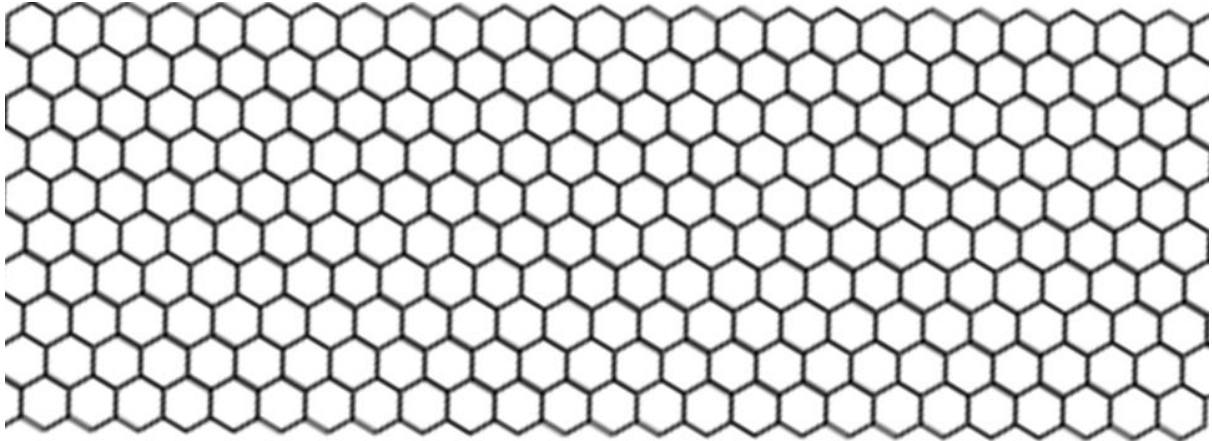


Figure: display panel closeup

Final outcome

After changing the consumer and producer designs as mentioned above, desired results can be achieved in following way.

The final panel should work like as shown below.

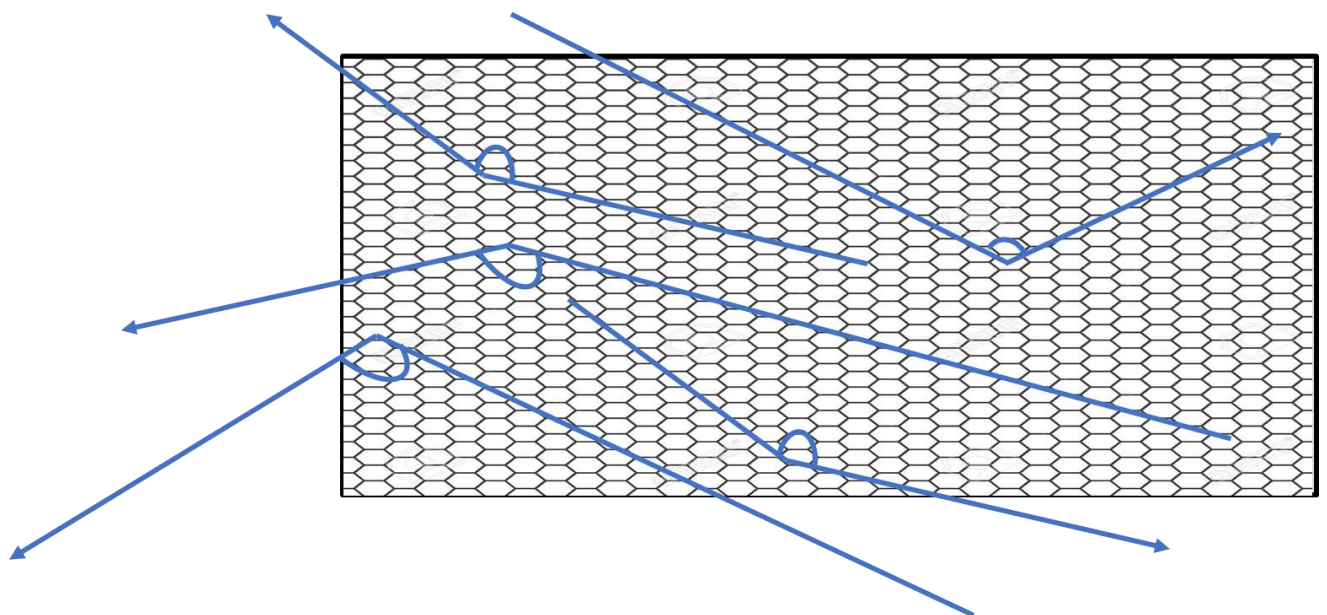


Figure: proposed way images to be produced by imaging devices like TV (with raised riveted hexagonal mesh pixel layout)

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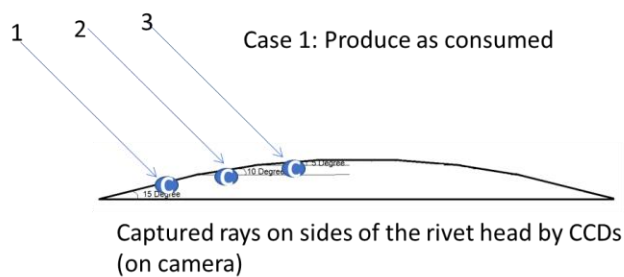
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Panel. Size of the mesh is shown bigger for illustration purpose only. Actual size would be small and indiscernible to the naked eyes)

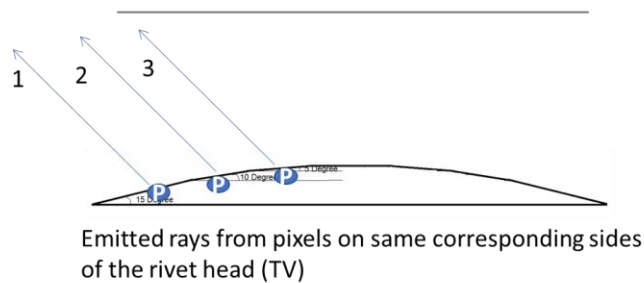
There are 2 ways in which this design can be used:

Case1: Produce as consumed

Case2: Produce reflected as consumed



Minimum and max rivet crown head angle based on the distance of lens from the CCD panel.



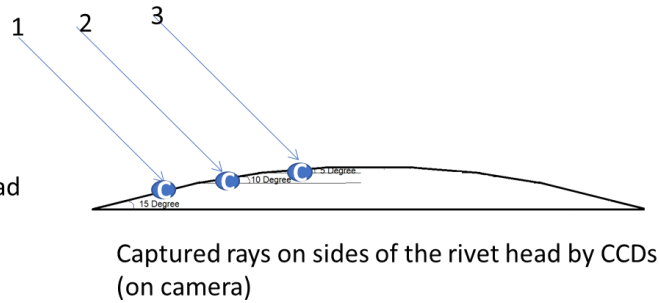
Minimum and max angle of the rivet crown head based on the viewers distance from the screen.

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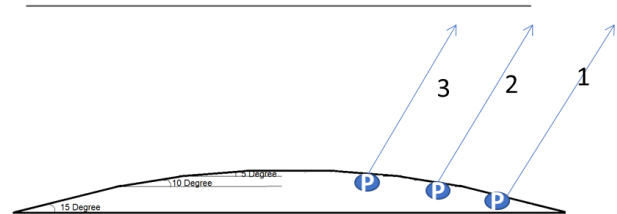
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Case 2: Produce reflected as consumed

Minimum and max angle of the rivet crown head based on the distance of CCD panel from the camera lens.



Minimum and max angle of the rivet crown head based on the viewers distance from the screen.



Emitted rays from pixels on the corresponding opposite side of the rivet head (TV)

Light captured by one facet of the camera can be emitted by corresponding opposite facet from the screen as if the light has got reflected.

Shape of the rivet head crown: Shape is such as to capture maximum light with minimum or no loss of light. Least light reflected. And when 1 crown is surrounded by other crowns on all sides, no 2 crowns should block light from each other (in camera) and no 2 crowns should emit light so as to be blocked by another crown.

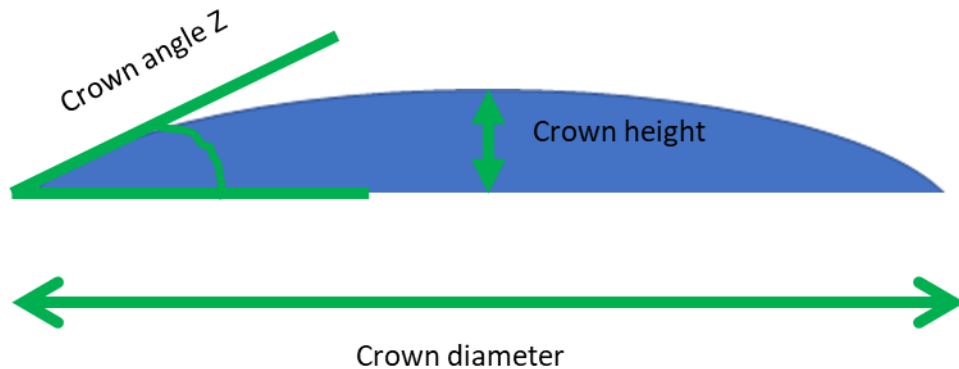
Height of the rivet head crown: is dependent on the angle of the rivet head crown and its diameter.

Base shape of the rivet head: Top view of the crown has to be hexagonal like honeycomb structure to fit maximum crowns (On capturing and emitting devices).

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Finding the rivet head angle

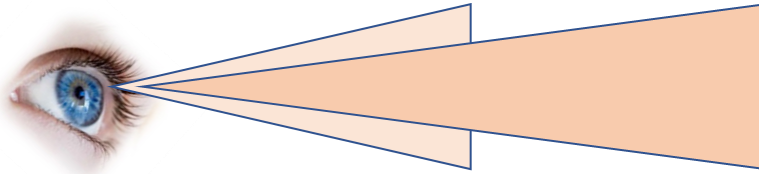
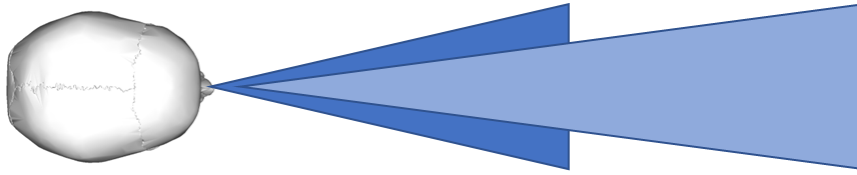


Angles of the rivet head can't be sharp, as Field Of View (FOV) need to be considered while coming up with angles. Angles of the rivet should be small so that one rivet doesn't block the light falling on another rivet.

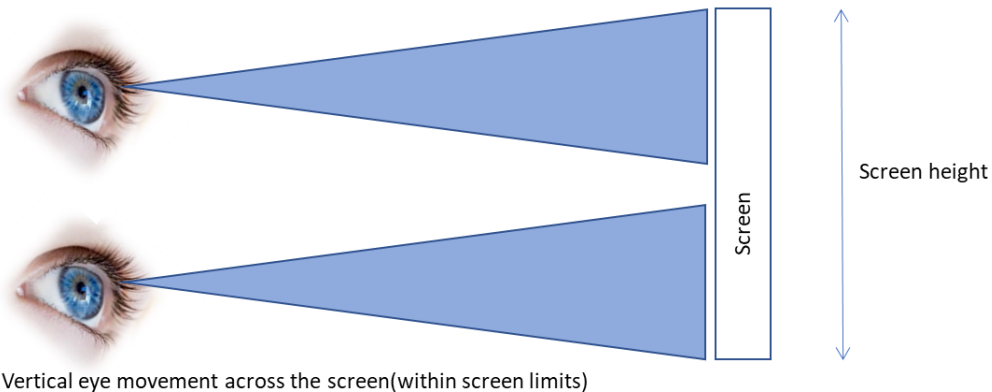
Rivet head angles of image capture devices should match the angles of rivet heads of image producing devices for better reproduction of the image captured.

High and sharp angles will cause light to go beyond visual field of view. And light from one rivet will be blocked by another rivet.

Angle selected should be such that a person viewing from front center gets maximum light and similarly person at front last corner of the screen also get the max light.

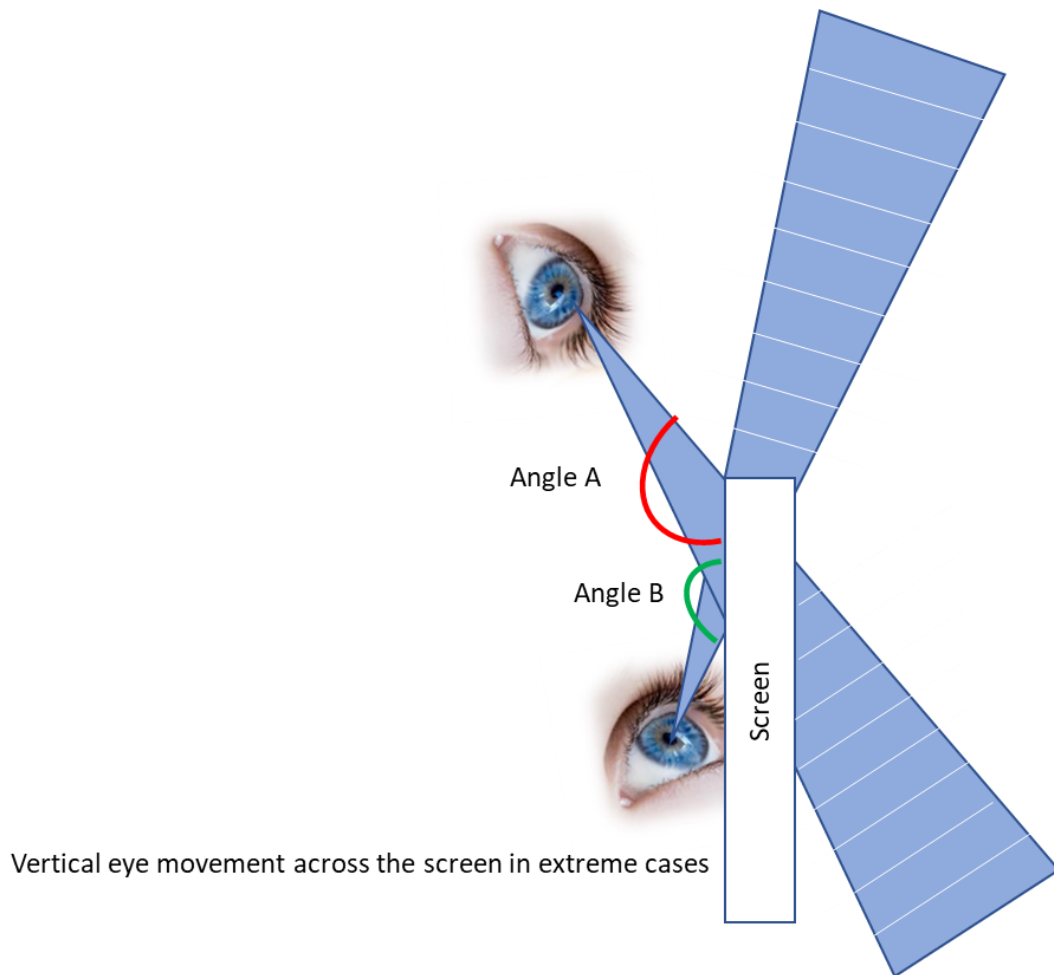


Minimum and maximum rivet crown head angle and diameter can be adjusted based on the distance from the screen as per horizontal and vertical field of view. Mobile devices for close viewing and big TVs for far viewing

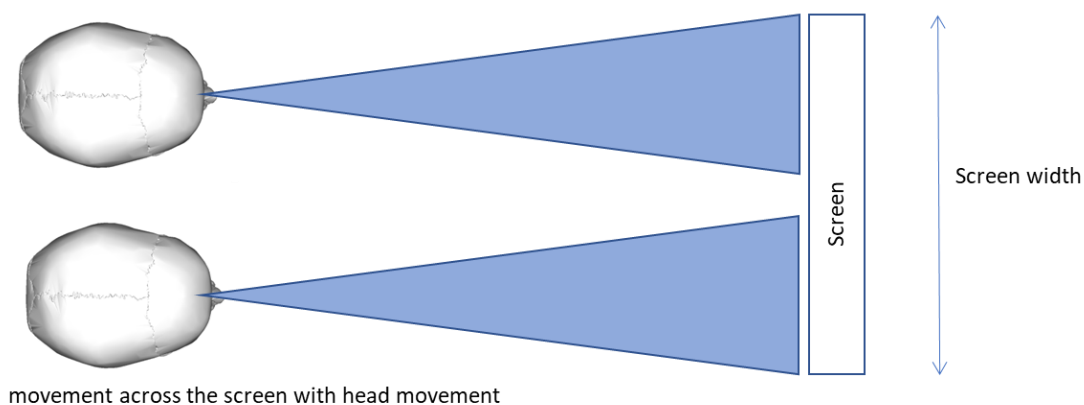


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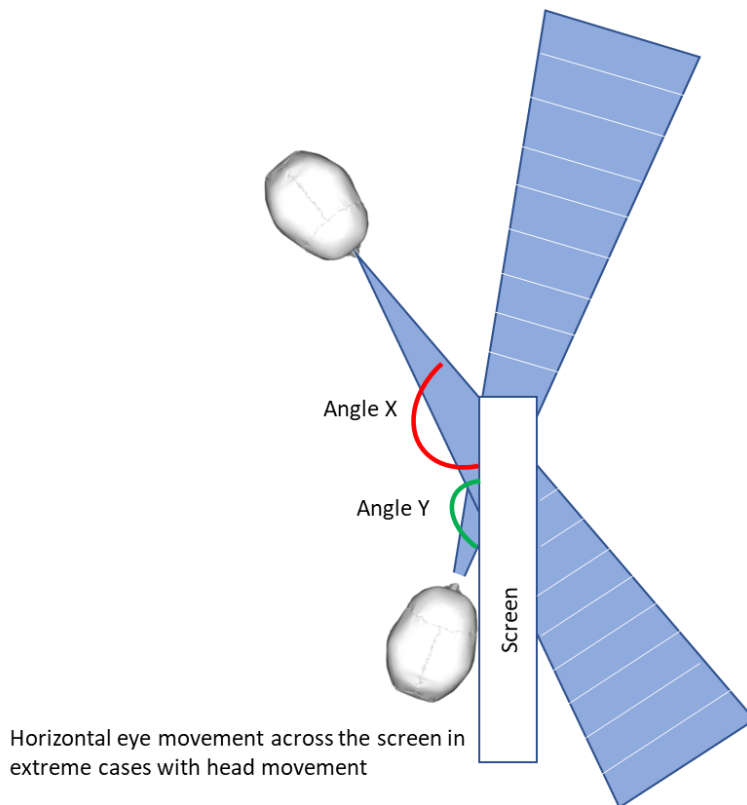


Angle A & B can be kept same for symmetric design. Light going beyond these angles will not be visible to the eyes. Hence emitting light beyond these angles will not be useful. This helps in finding the optimal angle of the rivet crown head.



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Angle X & Y can be kept same for symmetric design. Light going beyond these angles will not be visible to the eyes. Hence emitting light beyond these angles will not be useful. This helps in finding the optimal angle of the rivet crown head.

Since the rivet head shape is symmetrical, all angles A, B, X, & Y are to be kept same (rivet head crown angle Z) as viewer can view from any direction. And directions are not to be differentiated.

Angle Z (rivet head crown angle) should be such that it can send rays at all angle X(Y, A, B) in all directions, without being obstructed by another rivet. It should not send rays beyond angle A, B, X, Y.

Maximum angle at which rays can be viewed by the viewer A, B, X, Y are also dependent on angle Z.

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If binocular vision horizontal field of view angle is taken as 60 degree and vertical field of view angle as 50 degree. Keeping the minimum of these two (50degree) and considering max horizontal and vertical head movement as same, and considering the edge cases where eyes are close to max viewing angle of the screen. Crown angle can be 15 degree.

Total number of CCDs/pixels on the rivet head: Even number of total CCDs/pixels on the rivet crown head sides, and few pixels (even or odd based on how many can fit) on top of the crown to send light in straight front direction. Even number of CCDs/pixels on sides, so that each CCD/Pixel has corresponding diagonally opposite side CCD/Pixel. More pixels should send light in front direction.

Case 2

If the shape of CCDs and Pixels itself can be changed as per the above design then best effects will come when single CCD itself is of the rivet crown head shape capturing the light falling on it from various directions. And single Pixel also having the same rivet crown head shape and emitting light in various directions (the way it was captured by CCD).



In that case instead of placing the CCDs and Pixels on rivet crown head, CCDs & Pixels will have the rivet crown head shape and can directly be layed out in hexagonal grid structure on the camera and screen panels.

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3D Contents for viewers

There are 2 types of contents that's being used in industry today:

1. Captured via camera
2. Produced via software

Above the 1st method was discussed (Captured via camera).

For point 2 (Produced via software): Software support to produce contents (which are not captured via camera) can also be made available fast, 3D gaming technologies already have software for ray tracing and they can fast adapt and enhance their games to this technology, to produce 3D contents without glasses.

Limitations and remediation

This technique will work to display images which will look 3D "inside" the device, not outside i.e. it will not produce protruding 3D images. 3D images would be like the way we see in mirrors (images don't seem to come out of the mirrors).

Since this technique is based on light **emitting** pixels, this technique can't be used in projectors which throw light on dumb screens.

To produce images protruding out of display, this technique can be combined with existing 3D technologies to produce stunning effects beyond imagination, and it'd lead to better 3D Holograms Technologies.

Future Enhancements

1. The CCD panel of cameras is flat today, it can be curved like human eyes (retina wall) to capture the light better.

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2. CCD & Pixel shape itself can also be hexagonal rivet head, for better coverage in advance stages.
3. Projector companies using DLP technology can augment this technology
4. Fighter jet companies working on stealth technologies have labs to understand the rays at various directions and they can augment this technology
5. Futuristic 3D hologram projector companies can leverage from this design.
6. 3D Scanner technology can be used to further augment the camera design.

Business Opportunities

Today the TV and mobile market has saturated, stagnated, and sales of these devices is not picking up. People who already have mobiles and TVs currently have no reason to buy new devices.

With this new SVVRON technology, camera, mobile, medical imaging devices, and TV makers can push the sales of new devices with this attractive feature to new as well as old customers.

Existing CCDs and Pixels technologies can be reused as per above design, hence no big bang change is required by these manufacturing companies to their existing capabilities and infrastructure to launch this new feature.

Software support for contents is readily available with minor changes.

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Applications and Usages

- Screens of Mobile Phones
- Screens of Tablets
- Screens of Laptops
- Screens of Desktops
- Digital Cameras
- Screens of Cameras
- TV Screens
- Digital watch screens
- Screens of medical imaging devices
- Invisibility/camouflage cloaks
- 3D holographic projectors
- Invisible walls (described below)
- Aeroplane without glass windshields and windows (described below)
- Camouflage technologies
- Video games
- Augmented reality
- 3D holographic projectors

Invisible wall

Currently the way images are reproduced is, by camera having lens capturing the light on CCDs and later reproducing via screen Pixels (LEDs). Size of the CCD panels is much smaller.

If instead of following this approach and removing the lenses, we map the CCDs to Pixels in 1:1 ratio, by placing CCDs on one side of the wall and Pixels on other side of the wall, invisible wall effect can be achieved.

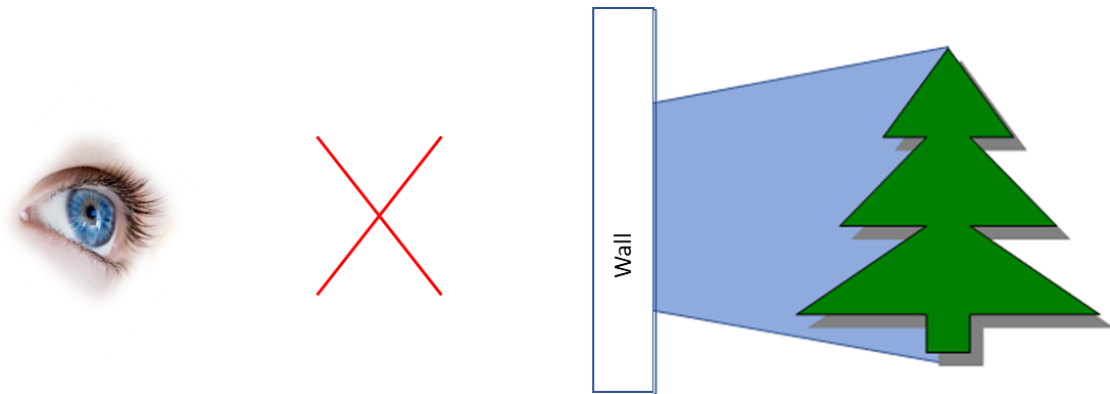
Blocking rays

Objects on other side of the wall can't be seen because the light emitted (reflected) by that object is blocked by the

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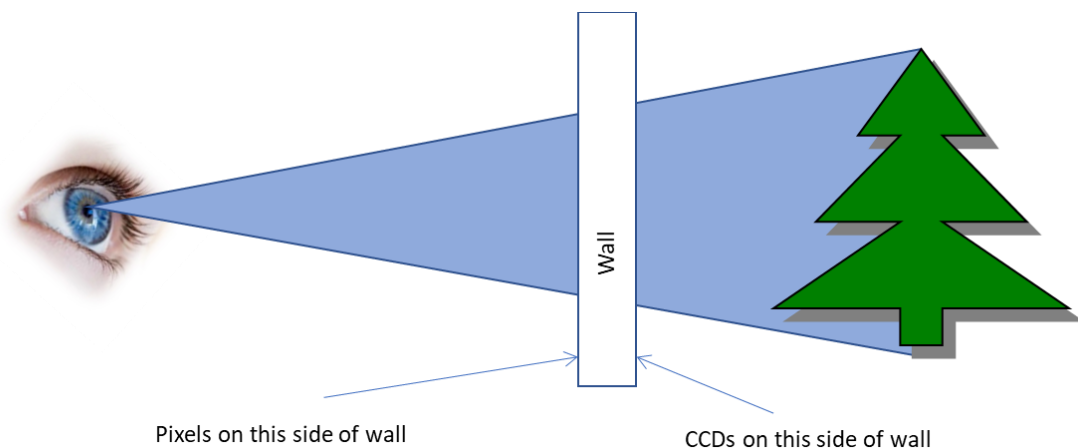
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intermediary objects (wall in this case), and since the light doesn't reach our eyes, the object can't be seen.



Pass through rays

If raised rivet hexagonal CCD panel is placed on one side of the wall and raised rivet hexagonal pixel panel is placed on other side of the wall with 1:1 mapping between these rivets, then the light emitted (reflected) by that object will fall on CCDs panel and same light can be reproduced on other side of the wall by the raised rivet pixels placed on it. That way eyes can see the objects (in 3D) on other side of the wall as if the wall was never there.



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Aeroplane without glass windshields and windows

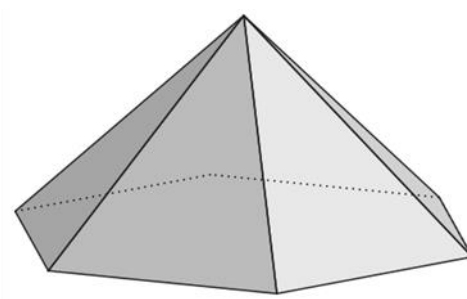
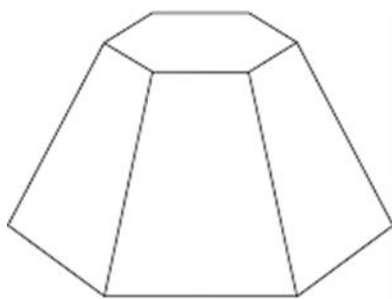
Glass currently poses the size/shape restriction on the aeroplane windshield. Due to glass, windshields and windows of a plane are flat and small. With this concept, metal windshields can be used of any size and shape.

Similar to above invisible wall, same concept can be used to replace the "glass" windshield of the Aeroplane with bigger "metal" windshield, with raised rivet hexagonal CCD panel on front side, and raised rivet hexagonal pixel panel on the inside (cockpit) of the "metal" windshield.

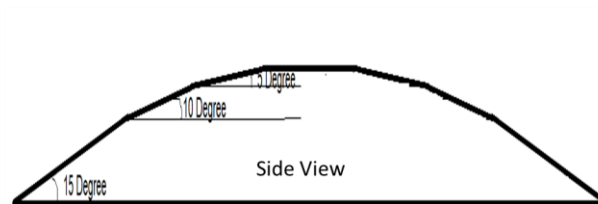
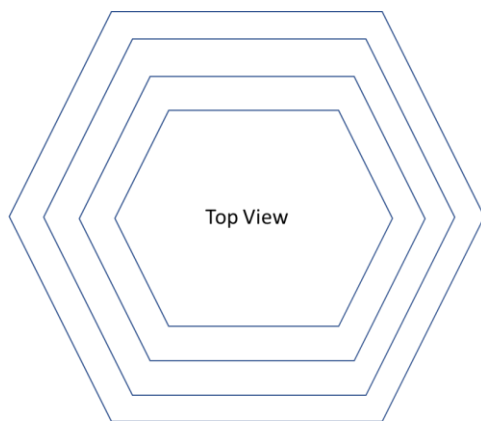
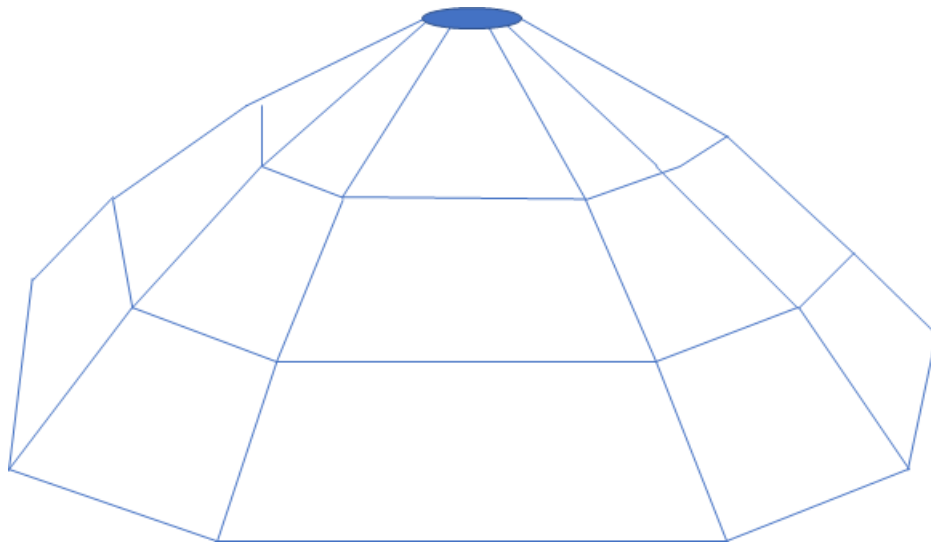
In similar way Aeroplane windows can also be made of any shape/size.

Alternate Rivet head designs

Alternate for round rivet crown head is faceted design of the crown head. Facet Structures can be: Trapezoidal, Triangular and Lozenge



In addition, there can be multiple layers at slight angle difference starting from 15 degree and difference of 5 degree each.



Size of each facets: Same as size of the pixel. Smaller the size of the pixel, small is the size of the facet.

Total number of facets: Even number of total facets on each side strip of the crown, and one flat facet on top of the crown. Even number of facets, so that each facet has corresponding opposite side facet. If CCDs capture light on one facet (in camera), it will be coming out of corresponding opposite facet on the display (TV) where the image will be reproduced. It will produce light reflection effect. One flat facet on top of the crown to capture and produce the light falling directly perpendicular to it (the way existing camera and TVs do it today).

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Number of facets from top to bottom in one side from front view: As many as cover the 15 to 90 degree.

Number of pixels on each facet: One pixel on each facet. Smaller the pixel, more facets can be supported. Instead of putting more pixels on a single facet, prefer to have more facets on the side of the crown.

Other alternate shapes can be inspired by:

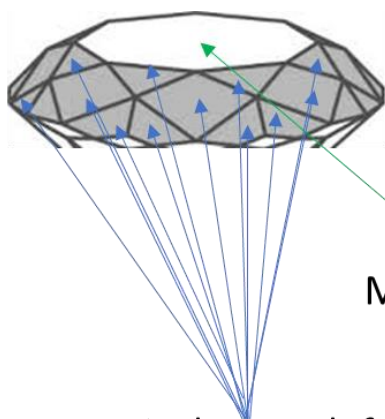
Geodesic domes of classes V1, V2, V3

Dodecahedron and icosahedron shapes

Cues can be taken from Diamond cuts also.

Head structure can be inspired by diamond cuts like:

- Step cut
- Point Cut
- Table cut
- Old European cut
- Rose cut
- Round brilliant cut
- Mirror cut
- Burgundian Point (dodecahedron)



Multiple Pixels can be there on top flat surface

1 Pixel on each facet

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Shape chosen is very much dependent on the size of the facet, smaller the facet the better as it fits more CCDs/Pixels and will have smooth edges.