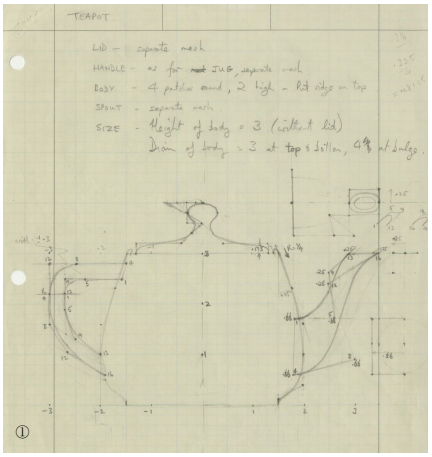
Computer Graphics



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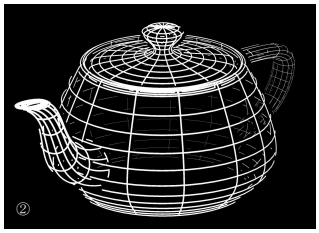
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CSE 4303 / CSE 5365
Backface Culling, 2020 Spring

① http://www.computerhistory.org/revolution/computer-graphics-music-and-art/15/206/556
② http://www.cs.technion.ac.il/~gershon/site/img/gallery/gallery-pic-cat3-depth-cueing-2-big.jpg
③ http://www.omnigraphica.com/gallery/maingallery/original/Utah_teapot_1.png
④ http://unfold.be/assets/images/000/113/719/large-utanalog3.jpg

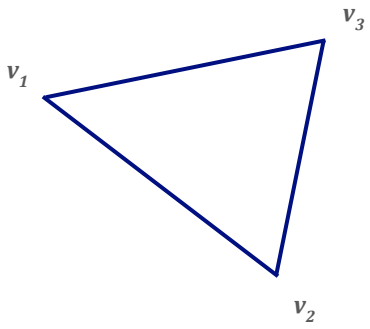
Backface Culling

Backface Culling …

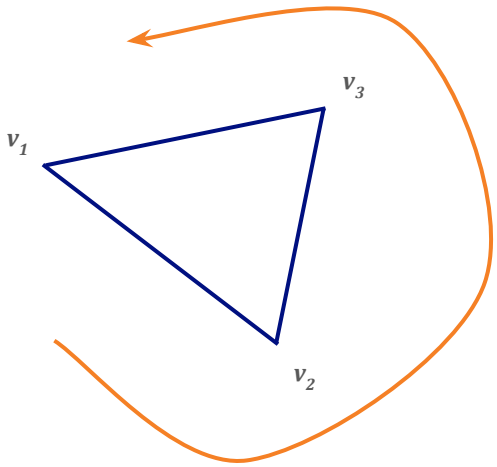
- A triangle $\boldsymbol{v}_1, \boldsymbol{v}_2, \boldsymbol{v}_3$ is visible iff the *front* of the triangle is *facing* the camera position.
- The *front* of a triangle is defined by its *surface normal*.
  - Equal to the cross product of a vector from $\boldsymbol{v}_1$ to $\boldsymbol{v}_2$ with a vector from $\boldsymbol{v}_1$ to $\boldsymbol{v}_3$.
- Let θ be the angle between the *surface normal* and a vector from the camera position to $\boldsymbol{v}_1$ of the triangle.
- The *front* of the triangle is *facing* the camera position iff $\pi/2 < \theta < 3\pi/2$.

Method Summary

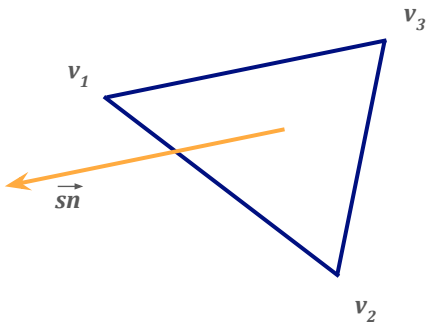
A Triangle …



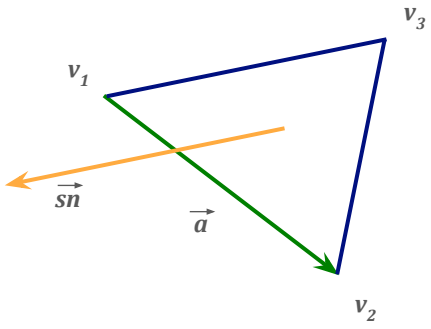
… Drawn “Right-Handed” …



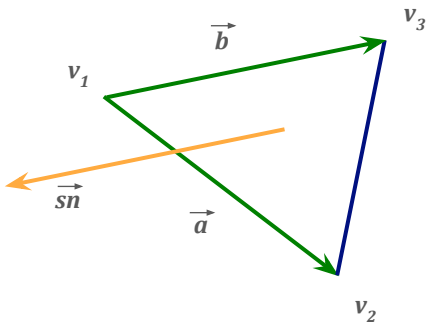
… Has this Surface Normal …



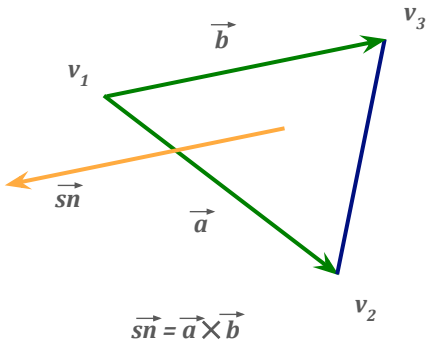
Compute the Vector $\vec{a}$ from v_1 to v_2 …



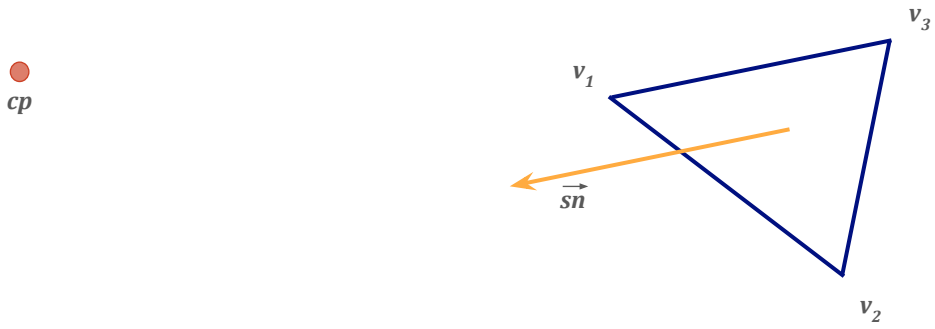
And the Vector $\vec{b}$ from v_1 to v_3 …



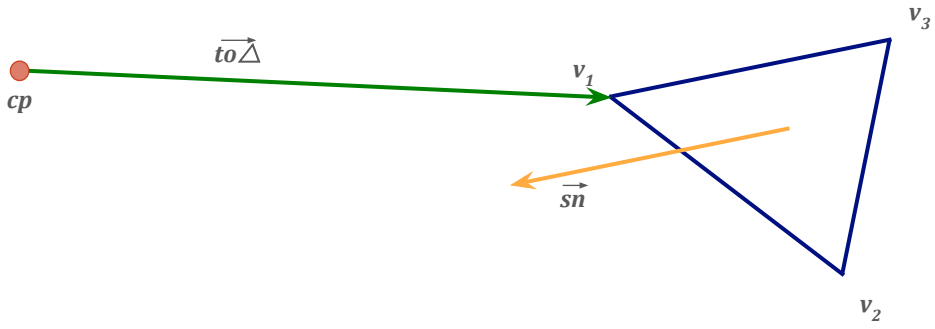
To get the Surface Normal.



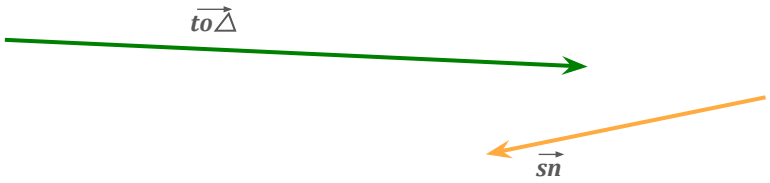
Given a Camera Position …



… Compute the Vector from the CP to v_1.

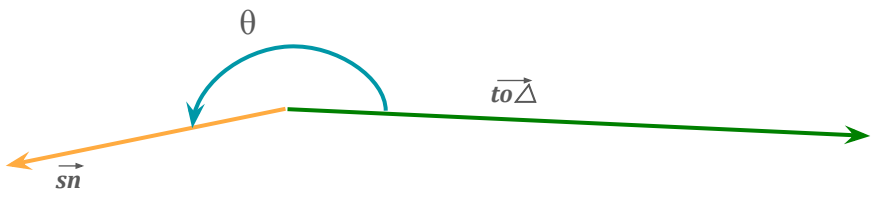


Now consider just the vectors $\overrightarrow{to\triangle}$ and $\overrightarrow{sn}$ …

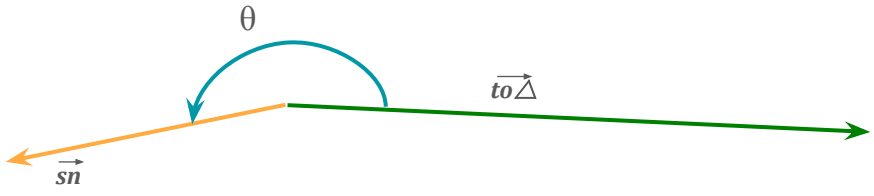


… Which, as Vectors, can be moved around …

… To make the Angle θ more obvious.



If $\pi/2 < \theta < 3\pi/2$, then the Triangle is Visible.



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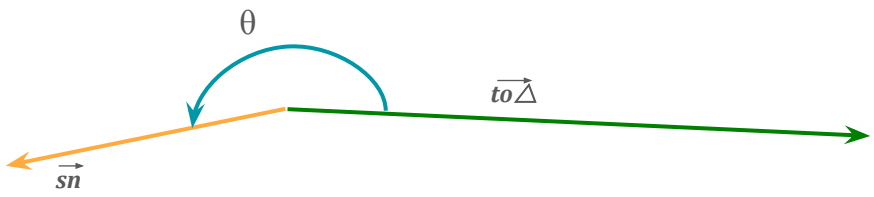
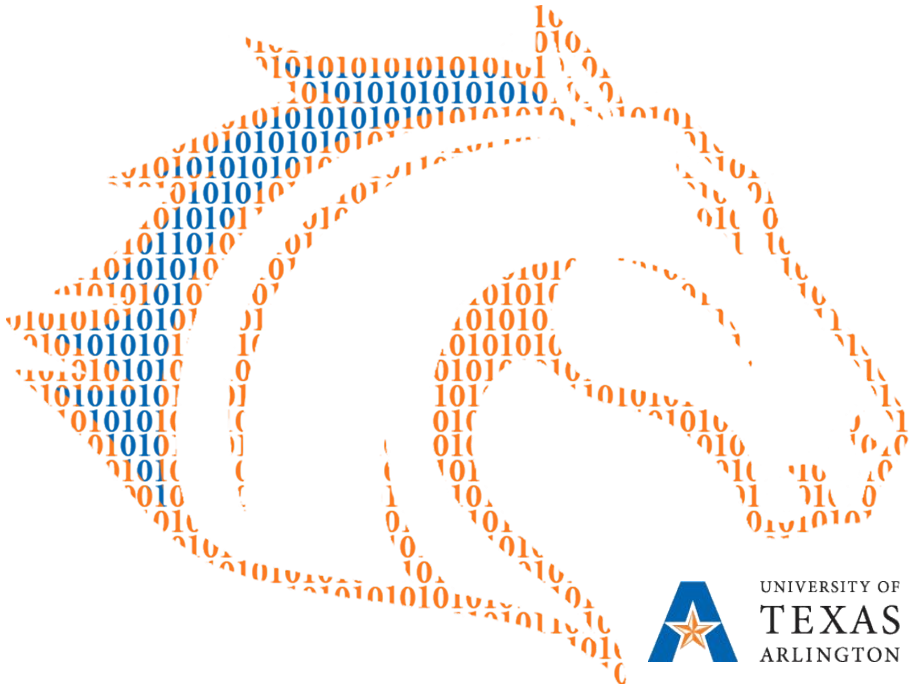


In this case, the triangle is visible as the angle θ is clearly greater than $\pi/2$ (90°) but less than $3\pi/2$ (270°).



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