

CONCEPT OF ILLUMINATION MODEL

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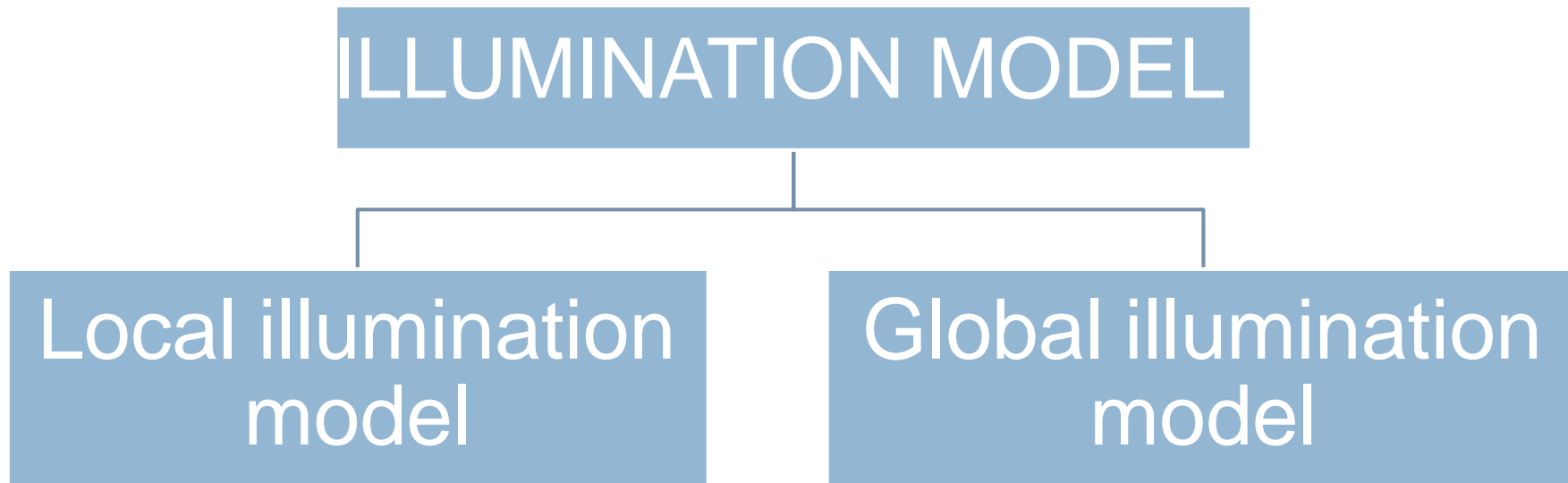
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Outline

- Illumination model
- The important components of illumination model
 - Ambient light
 - Diffuse Illumination
 - Specular reflection
- Object Illumination using following properties:
 - Intensity of Ambient Light
 - Type of Object surface
 - Surface color

DEFINITION

ILLUMINATION MODEL can be defined as a model used in computer graphics to show reflection on objects.



Illumination Model

- A real world image taken by digital camera will only capture a small subset of the light rays passing through a small area.
- Often a approximation view is generated using complex formulation and algorithms.

Hardness of illumination model

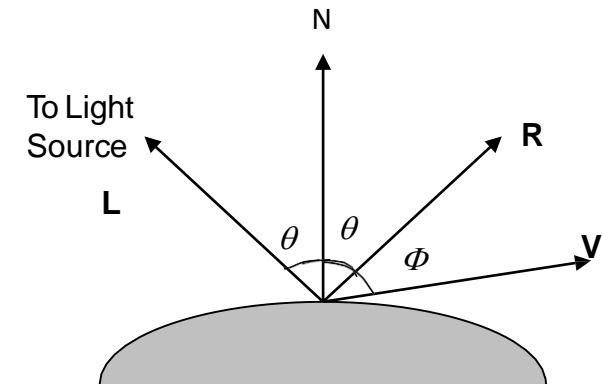
- An object is illuminated not only by a direct light source but also from the light which is inter reflected from near by objects.
- There can be infinite number of light rays coming from the near by objects to illuminate the object.
- In Illumination model it is very hard to find out all the inter reflected lights.
- To make database for these light rays is not possible.
- Hence the image created after considering illumination model is only close approximation of original image.
- In Illumination model we try to capture a set of light rays from the various objects so that a close approximation of original scene can be created.
- Hence to get actual reality of scenes is not possible.

Illumination model

Figure shows the specular reflection direction at a point on the illuminated surface.

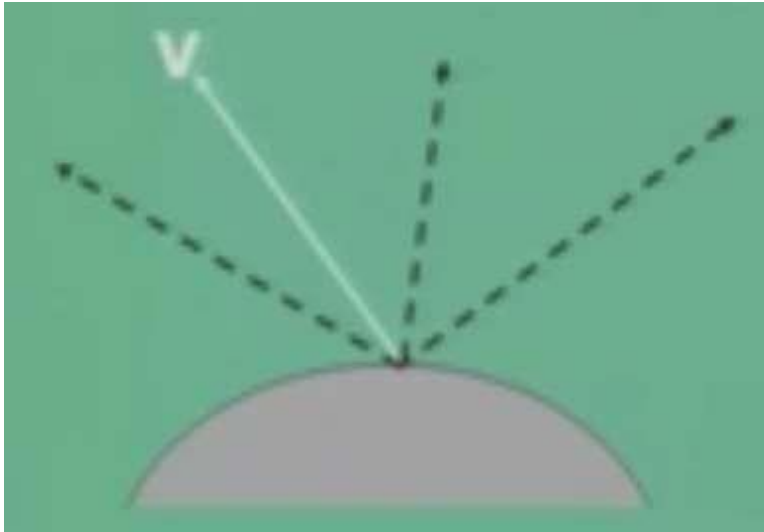
In this figure,

- **R** represents the unit vector in the direction of specular reflection;
- **L** – unit vector directed toward the point light source;
- **V** – unit vector pointing to the viewer from the surface position.
- Angle θ is the viewing angle relative to the specular- reflection direction **R**.
- Viewing direction can be any where in 3D plane.

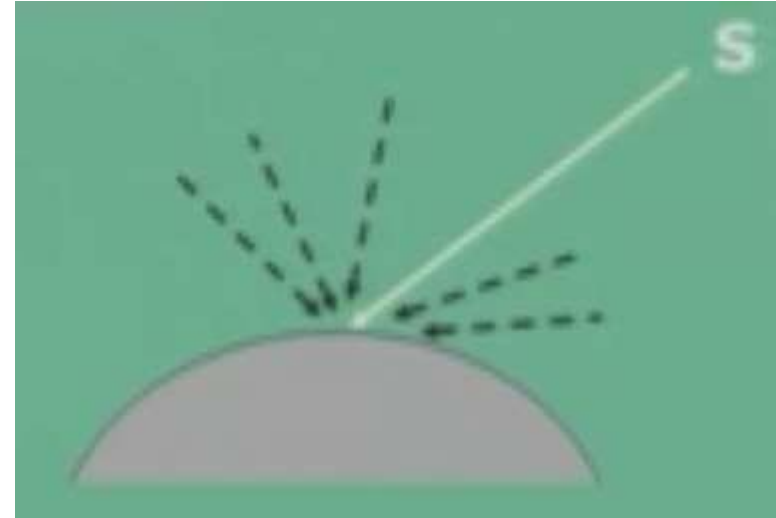


Modeling specular reflection.

Illumination Model



Multiple viewing direction in 3D scene.

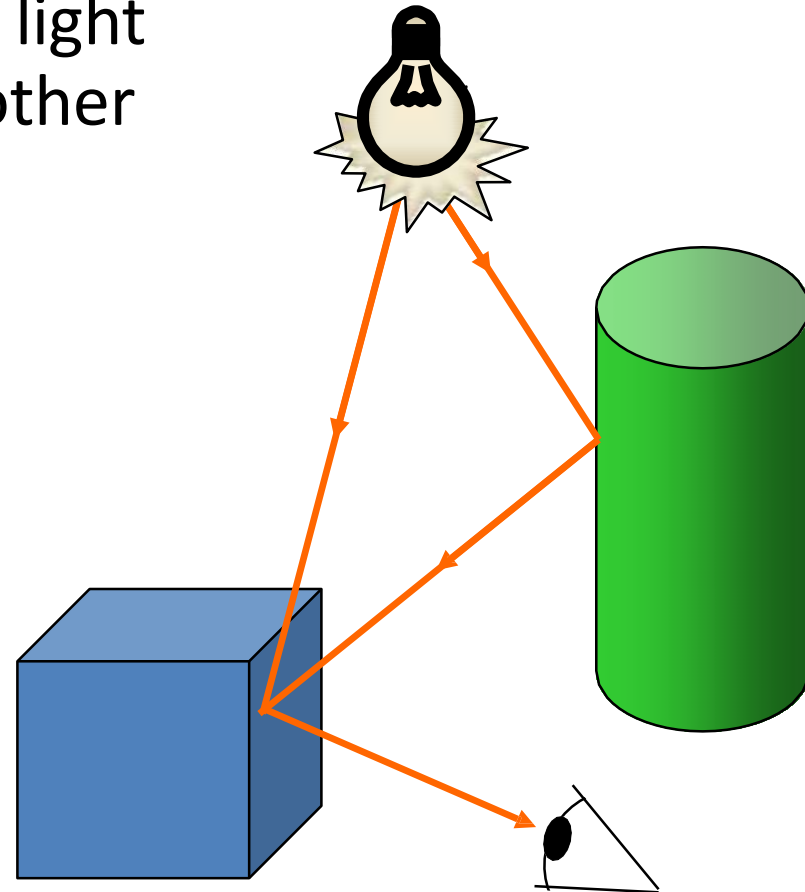


A light source may come from various direction

1. Due to more than one light source
2. Due to inter reflection of light from various objects present in the scene.

Ambient Light

- A surface that is not exposed to direct light may still be lit up by reflections from other nearby objects – **ambient light**.

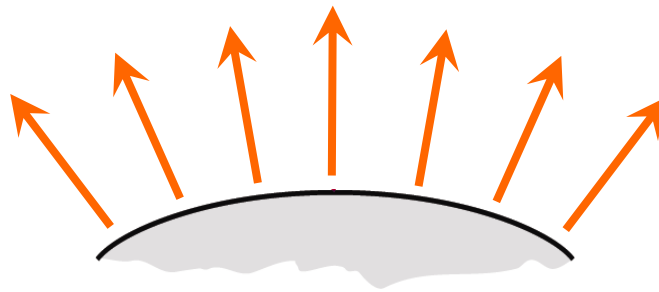


Surface Lighting Effects

- The amount of incident light reflected by a surface depends on the type of material.
- Shiny materials reflect more of the incident light and dull surfaces absorb more of the incident light.
- For transparent surfaces some of the light is also transmitted through the material.

Diffuse Reflection/Perfect diffuse Reflection

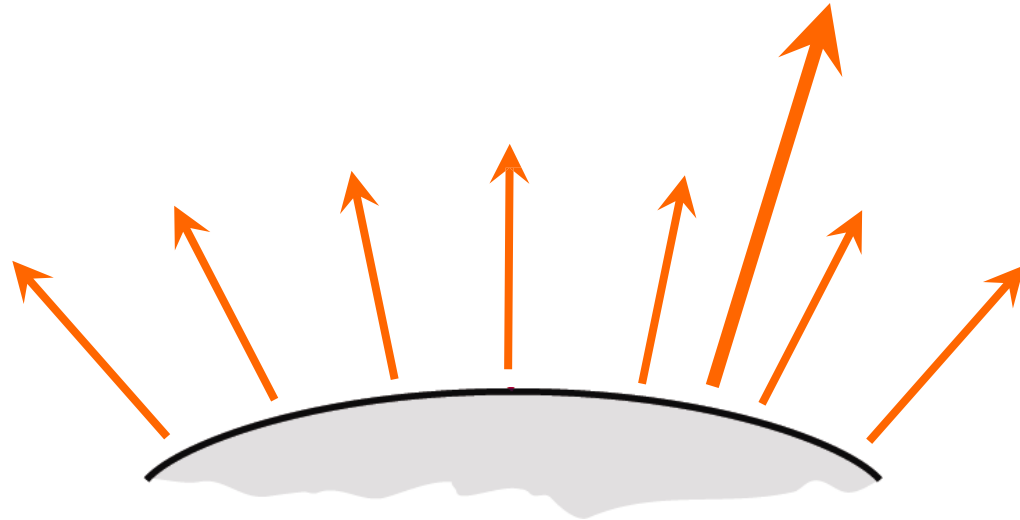
- Surfaces that are rough or grainy tend to reflect light in all directions.
- This scattered light is called **diffuse reflection**.
- Surfaces that reflect incident light with equal intensity in all directions. It is a case of perfect diffuse reflection.
- Such surfaces are referred to as **ideal diffuse reflectors**.
- **Example- snow, movie screen.**
- **Lambertian surface** appears equally bright from all the viewing directions. Because they reflect light with equal intensity in all direction.



Specular Reflection

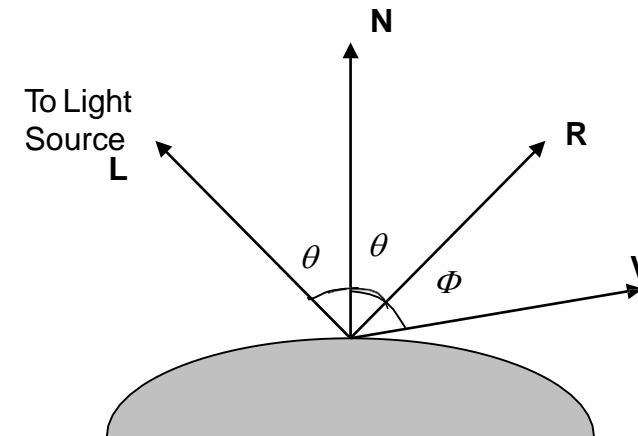
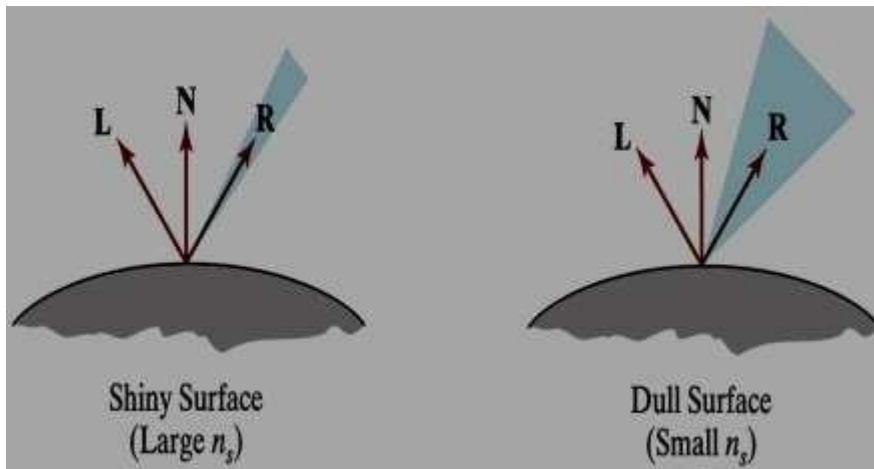
In Specular reflection it may possible that some portion of surface generated more light or may produce bright spot.

This is called **specular reflection**.



Specular Reflection (contd...)

- A perfect mirror reflects light only in the specular-reflection direction.
- Other objects exhibit specular reflections over a finite range of viewing positions around vector R .

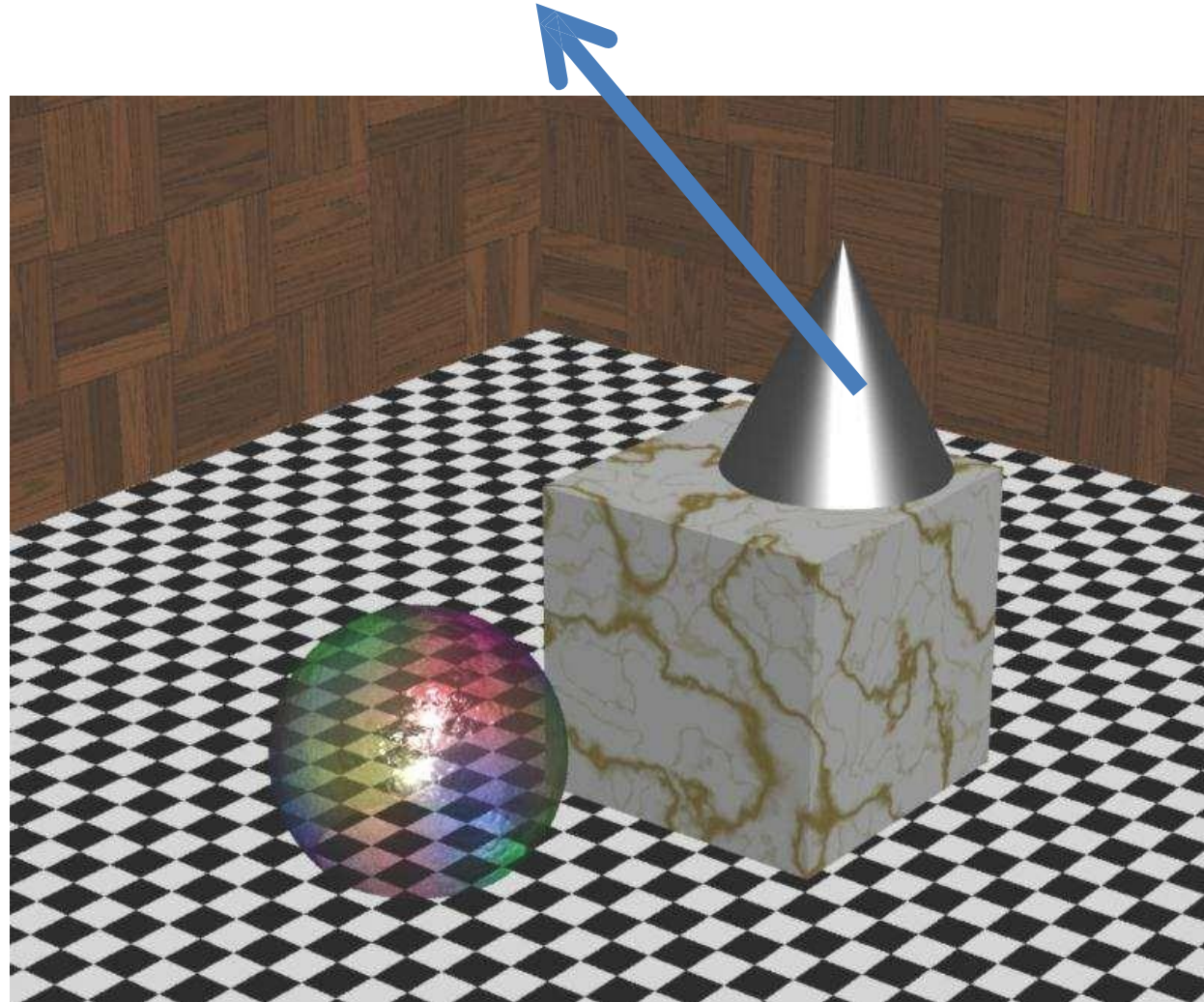


Modeling specular reflection.

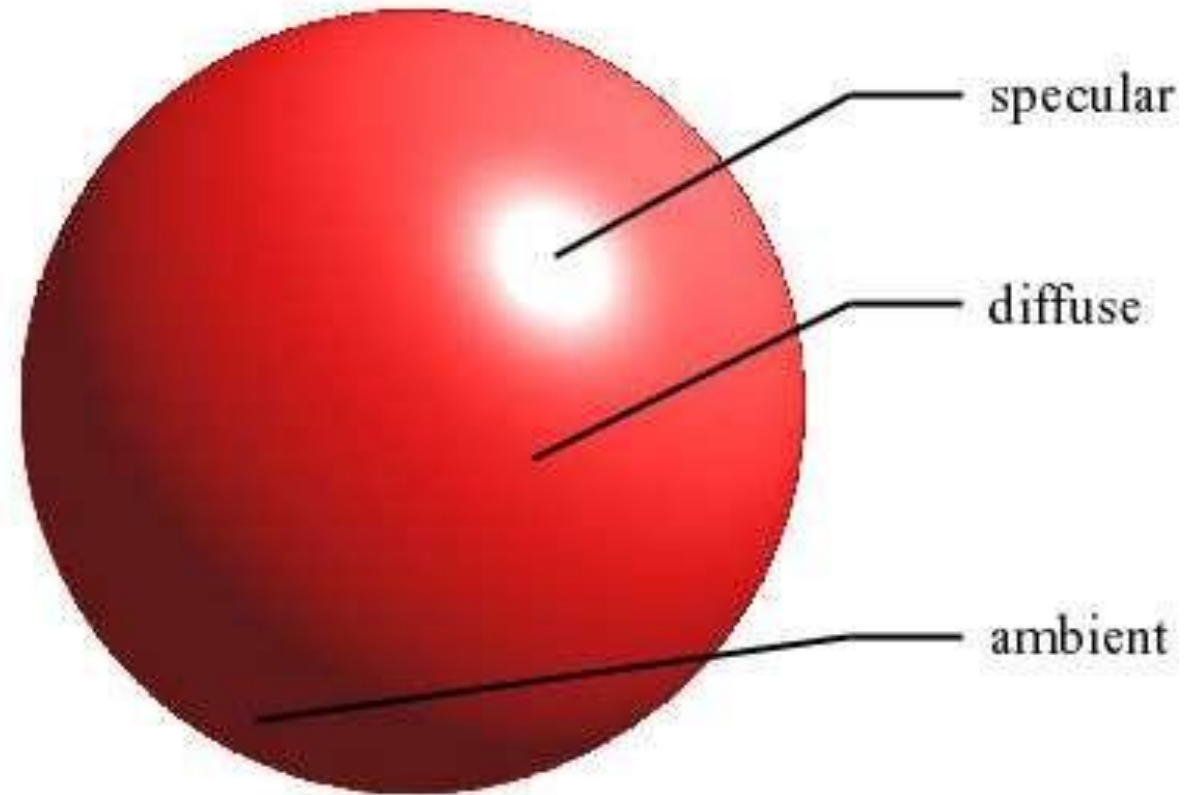
Example of Specular Reflection

- Metal surfaces
- Mirror
- Shiny plastic
- Gold and silver coated surfaces
- Shiny apple surface

Specular Reflection



Example



THANKING YOU