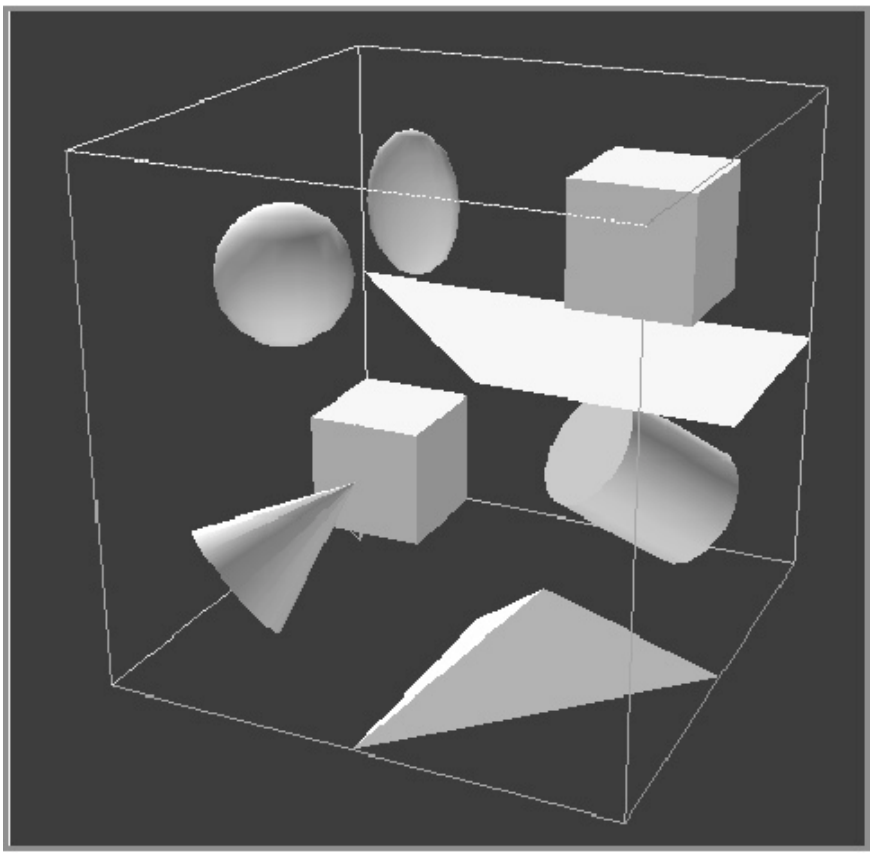
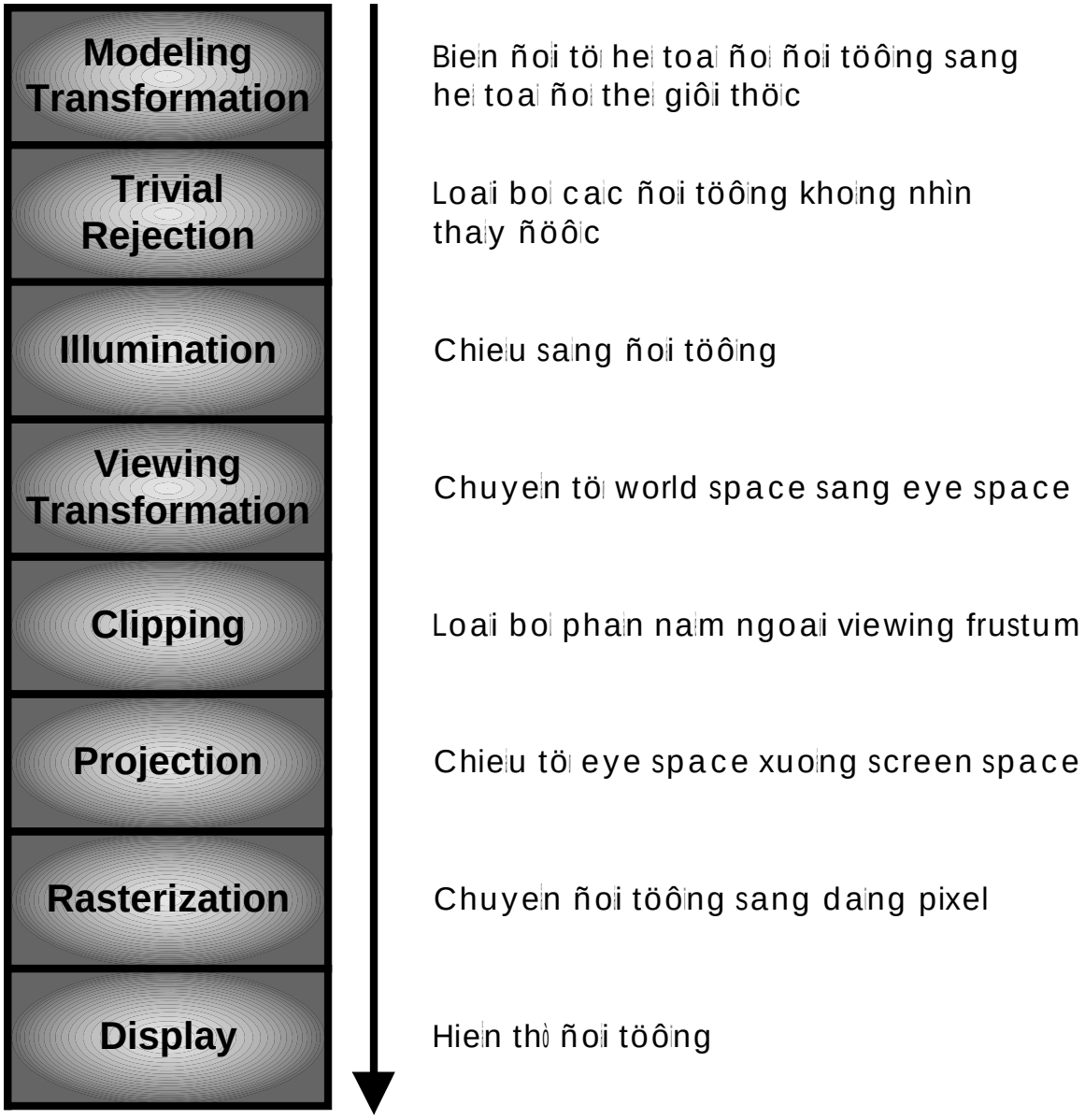
ÑOI HOA 3 CHIEU



Dan nhap

- Cac ñoi töông trong the giôi thöc phan lôn la cac ñoi töông 3 chieu con thiet bò hien thò chæ 2 chieu.
- Muon co cac hình anh 3 chieu ta can gia lap.
- Chien löôc cô ban la chuyen ñoi töng böôc. Hình anh se ñöôc hình thanh tö tö, ngay cang chi tiet hôn.
- Qui trình hien thò:



Cac vat the 3D ñöôc bieu dien nhö the nao ?

- Point
- Vector
- Line
- Ray
- Triangle
- Polygon
- Quadric curve
- Spline
- Quadric solid
- Curved surface
- v.v...

Ñiem trong khong gian 3 chieu

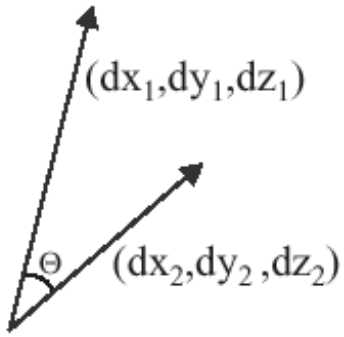
- Mo ta mot vò trí trong khong gian

```
typedef struct{
   Coordinate x ;
   Coordinate y ;
   Coordinate z ;
}Point3D ;
```

● (x,y,z)

3D vector

- Mo ta mot höôùng va bien ño (magnitude)
  - Xac ñònh bôi 3 toa ño dx, dy, dz
  - Magnitude $\|V\| = \sqrt{dx^2 + dy^2 + dz^2}$
  - Khong co vò trí trong khong gian



- Tích voâ höôùng cua 2 vector
  - $V_1 \bullet V_2 = dx_1dx_2 + dy_1dy_2 + dz_1dz_2$
  - $V_1 \bullet V_2 = \|V_1\|\|V_1\|\cos(\Theta)$

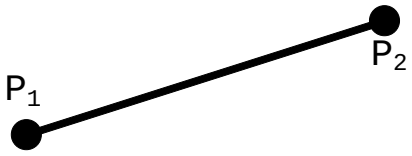
```
typedef struct {
   Coordinate dx;
   Coordinate dy;
   Coordinate dz;
}Vector;
```

Ñoan thang trong khong gian 3 chieu

- Bieu dien to hôp tuyen tính cua 2 ñiem.
  - Bieu dien dang tham so cua ñoan thang

$$P = P_1 + t\,(P_2 - P_1),\ (0 \le t \le 1)$$

```
typedef struct {
   Point P1;
   Point P2;
}Segment;
```



Tia (Ray)

- La mot ñoan thang vôi mot ñau nam ô vo cöc.
  - Bieu dien dang tham so cua tia

$$P = P_1 + t\,V,\ (0 \le t < \infty)$$

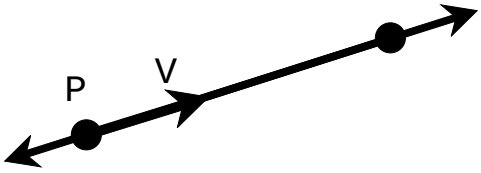
```
typedef struct {
   Point P1;
   Vector V;
}Ray;
```

Ñöông thang (Line)

- La mot ñoan thang vôi ca hai ñau nam ô vo cöc.
  - Bieu dien dang tham so cua ñöông thang

$$P = P_1 + t\,V,\ (-\infty < t < \infty)$$

```
typedef struct {
   Point P1;
   Vector V;
}Line;
```

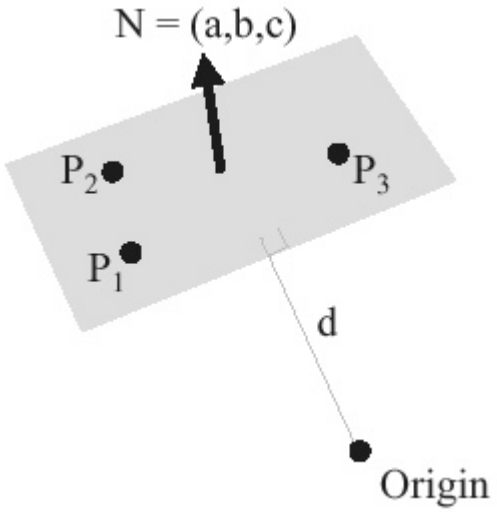


Mat phang (Plane)

- La mot ñoan thang vôi ca hai ñau nam ô vo cöc.
  - Bieu dien cua mat phang

    P.N + d = 0 hoac

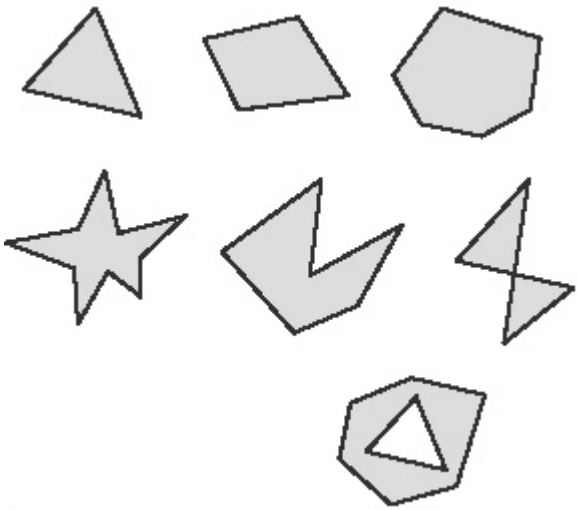
    ax + by + cz + d = 0




```
typedef struct {
   Vector   N;
   Distance d;
}Plane;
```

Ña giac (Polygon)

- La mot vung giôi han bôi day cac ñiem ñong phang.
  - Tam giac,
  - Tö giac,
  - Ña giac loi,
  - Ña giac lom,
  - Ña giac tö cat,
  - Ña giac co lo

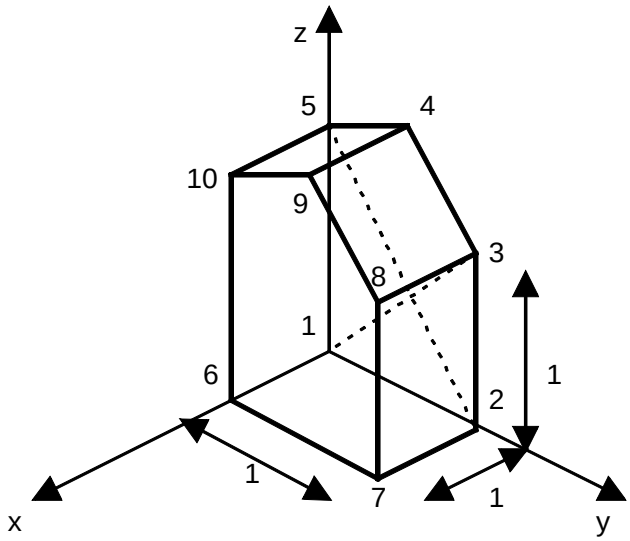


```
typedef struct {
   Point *Points;
   int   nPoints;
}Polygon;
```

  - Cac ñiem ñöôc cho theo thö tö ngöôc chieu kim ñong ho

Modeling transformation

- Bien ñoi tö He toa ño ñoi töông sang He toa ño the giôi thöc.
- Moi ñoi töông ñöôc mo ta trong mot he toa ño rieng ñöôc goi la ***He toa ño ñoi töông***.



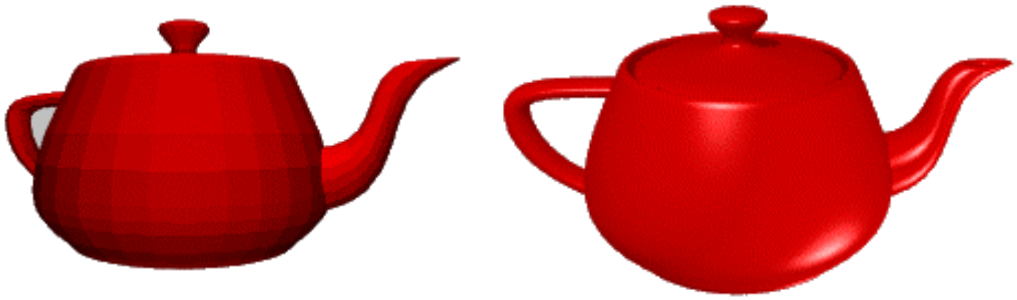
- Co hai cach mo hình hoa ñoi töông :
  - Solid modeling: mo ta cac vat the (ke ca ben trong)
  - Boudary representation: chæ quan tam ñen be mat ñ/tg
- Cac ñoi töông co the ñöôc bieu dien bang mo hình Wire-Frame
- Nhan xet
  - Khi bieu dien ñoi töông, ta co the chon goc toa ño va ñôn vò ño löông sao cho viec bieu dien thuan lôi nhat. Thöông thì ngöôi ta chuan hoa kích thöôc cua ñoi töông khi bieu dien.
  - Boudary representation cho phep xö ly nhanh con silid modeling cho hình anh ñay ñu va xac thöc hôn.

Trivial Rejection

- Loai bo cac ñoi töông hoan toan khong the nhìn thay trong canh.
- Thao tac nay giup ta löôc bo bôt cac ñoi töông khong can thiet hien thò giam chi phí xö ly.

Illumination

- Gan cho cac ñoi töông mau sac döa tren cac ñac tính cua cac chat tao nen chung va cac nguon sang ton tai trong canh.
- Co nhieu mo hình chieu sang va tao bong : constant-intensity, interpolate (Gouraud), phong, ….

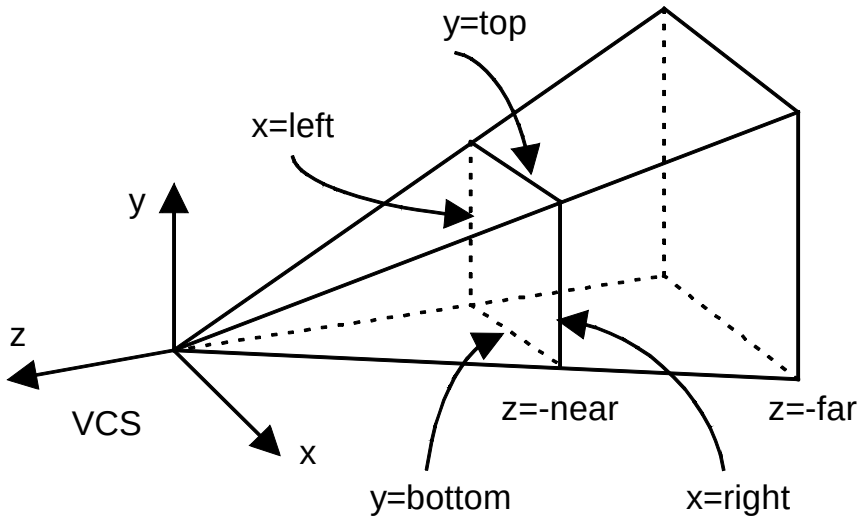


Viewing transformation

- Thöc hien mot phep bien ñoi he toa ño ñe ñat vò trí quan sat (viewing position) ve goc toa ño va mat phang quan sat (viewing plane) ve mot vò trí mong öôc.
- Hình anh hien thò phu thuoc vao vò trí quan sat va goc nhìn.
- He qui chieu co goc ñat tai vò trí quan sat va phu hôp vôi höông nhìn se thuan lôi cho cac xö ly nhat.

Clipping

- Thöc hien viec xen (clip) cac ñoi töông trong canh ñe canh nam goin trong mot phan khong gian hình chop cut giôi han vung quan sat ma ta goi la **viewing frustum**.
- Viewing frustum co truc trung vôi tia nhìn, kích thöôc



giôi han bôi vung ta muon quan sat.

Projection

- Thöc hien viec chieu canh 3 chieu tö khong gian quan sat xuong khong gian man hình.
- Co hai phöông phap chieu:
  - Chieu song song
  - Chieu phoi canh
- Khi chieu ta phai tien hanh viec khö mat khuat ñe co the nhan ñöôc hình anh trung thöc.
- Khö mat khuat cho phep xac ñònh vò trí (x,y) tren man hình thuoc ve ñoi töông nao trong canh.