UTS KOMPUTER GRAFIS

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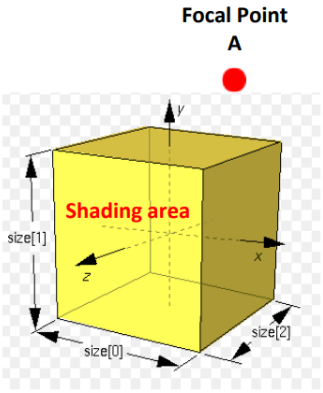
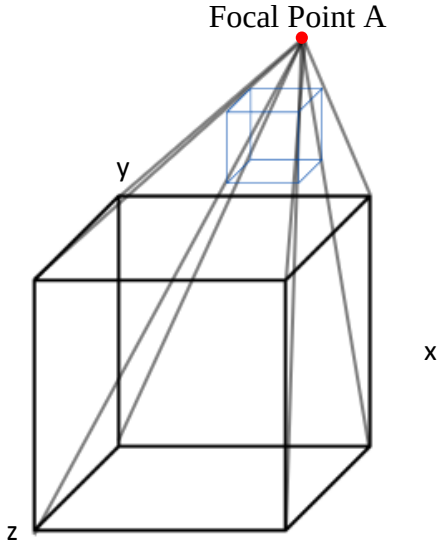


1. Dari gambar di atas, buatlah perspektif gambar dan rumusnya berdasarkan focal point A. (Variabel rumus bebas).



t = x - xfp

u = x - yfp

v = z + |zfp|

$Q = \sqrt{t^2 + u^2 + v^2}$

ux = t/Q

uy = u/Q

uz = v/Q

û = uxî + uyĵ + uzk̂

$Q = \sqrt{t^2 + u^2 + v^2}$

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$Qh = \frac{Q|zfp|}{z+|zfp|}$

xh = uxQh + xfp

yh = uyQh + yfp

zh = 0

|zh = uzQh - |zfp|

$= \frac{v}{Q}$Qh - |zfp|

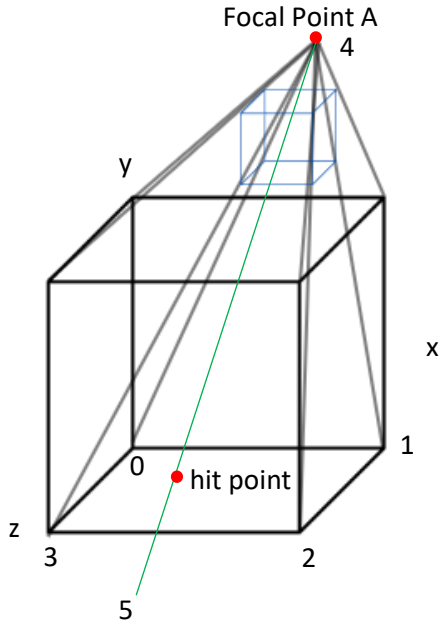
$= (z + |zfp|)\frac{Qh}{Q}$ - |zfp|

$= \frac{(z+|zfp|)}{Q}\frac{Q|zfp|}{(zfp+|zfp|)} - |zfp|$

= |zfp| - |zfp|

= 0

2. Dari gambar di atas, tentukanlah garis yang memotong bidang (digambar) dan buatlah rumusnya.



Distance 4 → 5:
t = x[5] – x[4]
u = y[5] – y[4]
v = z[5] – z[4]
$Q_{45} = \sqrt{t^2 + u^2 + v^2}$

Unit Vector 4 → 5:
$lx = \frac{t}{Q_{45}}$
$ly = \frac{u}{Q_{45}}$
$lz = \frac{v}{Q_{45}}$
$\hat{i} = lx\hat{i} + ly\hat{j} + lz\hat{k}$

Distance 0 → 3:
t = x[3] – x[0]
u = y[3] – y[0]
v = z[3] – z[0]
$Q_{03} = \sqrt{t^2 + u^2 + v^2}$

Unit Vector 0 → 3:
$lx = \frac{t}{Q_{03}}$
$ly = \frac{u}{Q_{03}}$
$lz = \frac{v}{Q_{03}}$
$\hat{u} = ux\hat{i} + uy\hat{j} + uz\hat{k}$

Distance 0 → 1:
t = x[1] – x[0]
u = y[1] – y[0]
v = z[1] – z[0]
$Q_{01} = \sqrt{t^2 + u^2 + v^2}$

Unit Vector 0 → 1:
$lx = \frac{t}{Q_{01}}$
$ly = \frac{u}{Q_{01}}$
$lz = \frac{v}{Q_{01}}$
$\hat{v} = vx\hat{i} + vy\hat{j} + vz\hat{k}$

Unit vector $\hat{n}$
$\hat{n} = \hat{u} \times v$

$$= \begin{bmatrix} \hat{\mathbf{i}} & \hat{\mathbf{j}} & \hat{\mathbf{k}} \\ ux & uy & uz \\ vx & vy & vz \end{bmatrix}$$

$\hat{n} = \hat{i}\underbrace{(uy.vz - uz.vy)}_{nx} + \hat{j}\underbrace{(uz.vz - ux.vz)}_{ny} + \hat{k}\underbrace{(ux.vy - uy.v}_{nz}$
$\hat{n} = vx\hat{i} + vy\hat{j} + vz\hat{k}$
nx = uy.vz – uz.uy
nz = ux.vy – uy.vx

Vector 0 → 4:
$V_{04} = vx_{04}\hat{i} + vy_{04}\hat{j} + vz_{04}$

$vx_{04} = x[4] - x[0]$
$vy_{04} = y[4] - y[0]$
$vz_{04} = z[4] - z[0]$

$Q_n = |V_{04.n}|$

Hit point:

$Q_n = Q_h \cos(p)$

$Q_n = \frac{Q_n}{\cos(p)}$

$\cos(p) = \hat{i}.n$

$= lx.nx + ly.ny + lz.nz$

$xh = x[4] + Q_h lx$

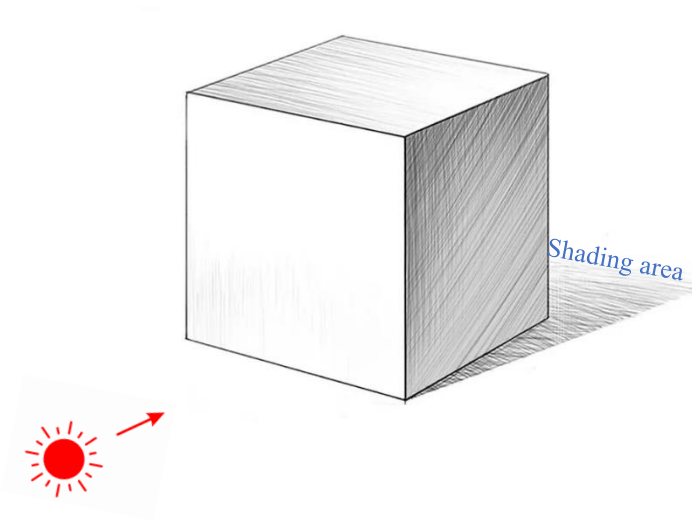
$yh = y[4] + Q_h ly$

$zh = z[4] + Q_h lz$

$t = xh - x[0]$
$u = yh - y[0]$
$v = zh - z[0]$

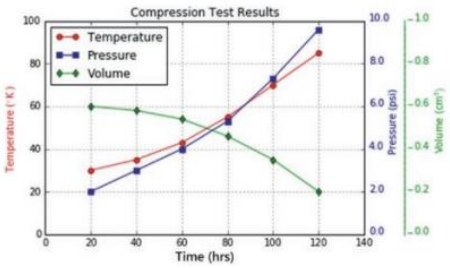
$t = xh - x[4]$
$u = yh - y[4]$
$v = zh - z[4]$

3. Dari gambar di atas, tentukanlah arah sinar dari shading area dan buatlah rumusnya.



$$\sqrt{lx^2 + ly^2 + lz^2} = 1$$

4. Buatlah algoritma untuk membuat plotting data 2D seperti pada gambar di bawah ini



Import pustaka Matplotlib dan numpy

```
import matplotlib.pyplot as plt
import numpy as np
```

Menentukan batas nilai setiap sumbunya

```
plt.axis([0,140,0,100])
plt.axis('on')
plt.grid(True)
```

Membuat data yang akan diplot

```
t=[20,40,60,80,100, 120]
T=[30,35,43,55,70,85]
p=[2,3,4,5.3,7.3,9.6]
v=[.6,.58,.54,.46,.35,.2]
```

Membuat list untuk mempermudah visualisasi data

```
pp=[]
for i in np.arange(0,len(p),1):
  pp.append(p[i]*10)

vv=[]
for i in np.arange(0,len(v), 1):
  vv.append(v[i]*100)
```

Menentukan warna garis yang digunakan

```
plt.plot(t,T,color='r',label='Tesperature',marker='o')
plt.plot(t,pp,color='b',label='Pressure',marker='s')
plt.plot(t,vv,color='g',label='Volume',marker='d')
plt.legend(loc='upper left')
```

Melakukan looping dan mengubah tipe data a menjadi string

```
for y in np.arange(0,100+1,20):
  a=y/10
  a=str(a)
  plt.text(142,y,a,color='b')
```

Buat label pada datanya agar mudah dipahami

```
plt.xlabel('Time (hrs)')
plt.ylabel('Temperature °K',color='r')
plt.text(151,65,'Pressure(psi)',rotation=90,color='b')
```

Buat perulangan for yang digunakan untuk mengiterasi nilai-nilai pada array np.arange(100,-1,-20), yaitu array yang berisi nilai dari 100 hingga 0 dengan jarak antara nilai adalah 20

```
for y in np.arange(100,-1,-20
  a=y/100
  a=str(a)
  plt.text(162,y,a,color='g')
  plt.text(159,y+2,'_',color='g')
```

Buat perulangan y dan menggambar garis hijau

```
for y in np.arange(1,99,3):
  plt.text(157,y,'-',color='g')
```

Membuat tampilan data

```
plt.text(170,65,r'Volume (cm3)',rotation=90,color='g')
plt.title('Compression Test Results')
plt.show()
```