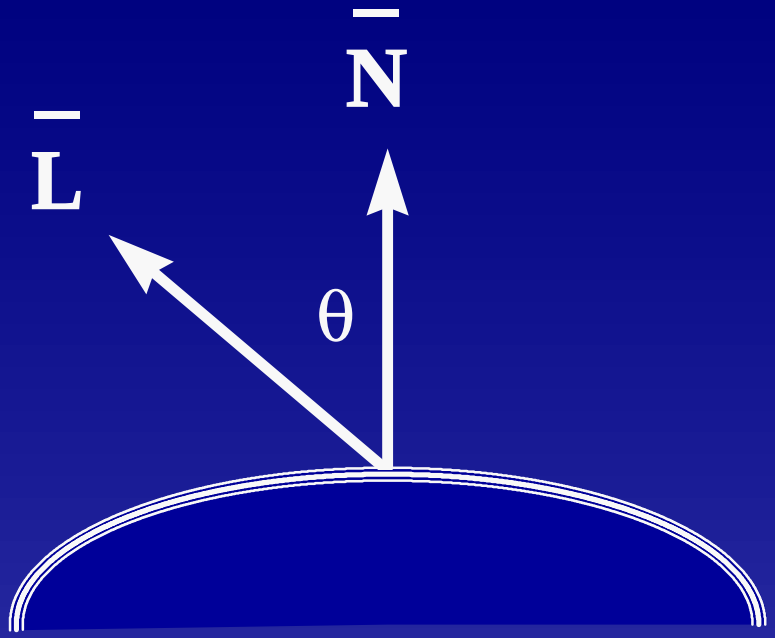
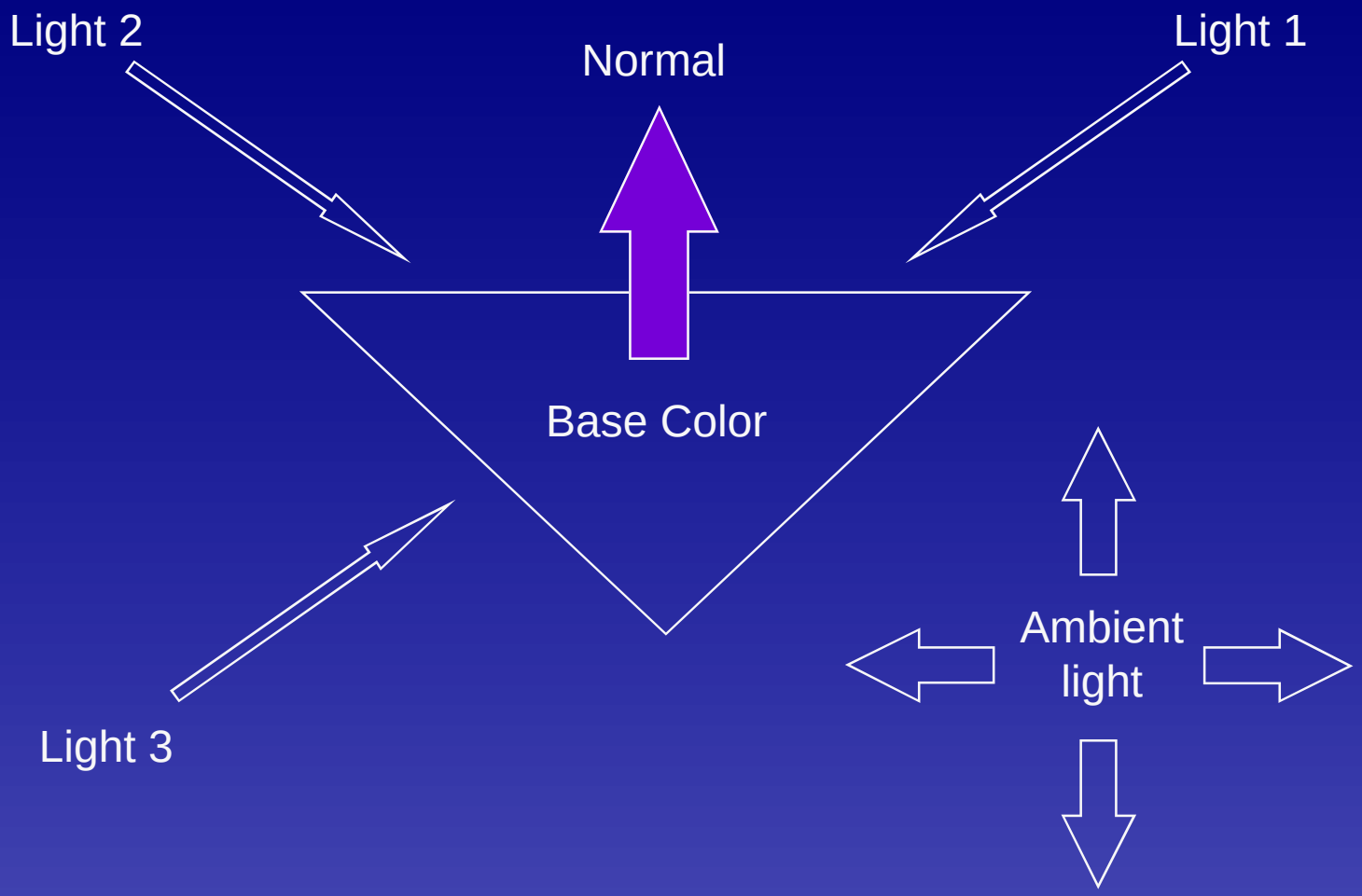
Lighting using GTE

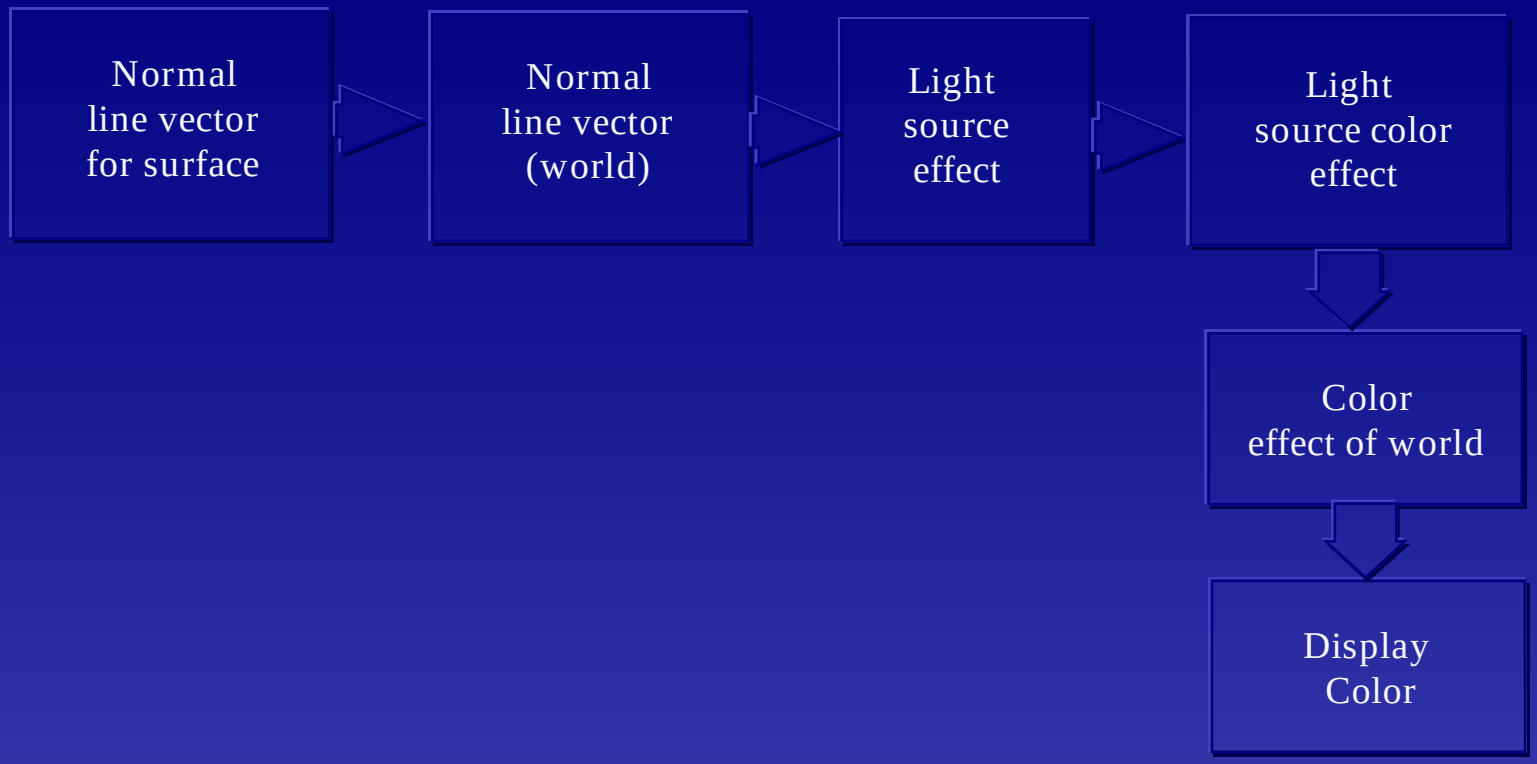
GTE illumination model



Light source calculations...



GTE Light Source Calculation



GTE light source calculations...

Object Level

Local Lights

Light vectors

Transformation
Matrix R1
Local -to- World

GTE light source calculations...

Polygon Level

$$\begin{bmatrix} L1 \\ L2 \\ L3 \end{bmatrix} = \begin{bmatrix} L11 & L12 & L13 \\ L21 & L22 & L23 \\ L31 & L32 & L33 \end{bmatrix} \begin{bmatrix} NX \\ NY \\ NZ \end{bmatrix}$$

Local Lights

Local Normal Vector

GTE light source calculations...

Polygon Level

$$\begin{bmatrix} RLT \\ GLT \\ BLT \end{bmatrix} = \begin{bmatrix} LR1 & LR2 & LR3 \\ LG1 & LG2 & LG3 \\ LB1 & LB2 & LB3 \end{bmatrix} \begin{bmatrix} L1 \\ L2 \\ L3 \end{bmatrix} \text{ or } \begin{bmatrix} L1^n \\ L2^n \\ L3^n \end{bmatrix} + \begin{bmatrix} RBK \\ GBK \\ BBK \end{bmatrix}$$

Local Light color

Light Color Matrix

Light Source Effect

Ambient Light color

GTE light source calculations

Polygon Level

$$\begin{bmatrix} R0 \\ G0 \\ B0 \end{bmatrix} = (1-p) \begin{bmatrix} R \times RLT \\ G \times GLT \\ B \times BLT \end{bmatrix} + p \begin{bmatrix} RFC \\ GFC \\ BFC \end{bmatrix}$$

Screen Color

Polygon Color

Far Color

$$p = DQA * h / SZn + DQB$$

How to apply all this info..

- setting up the light vector matrix correctly
- please refer to the sample odeng.c light.c object.c rtp1.h
- runtime implementation of material attenuation

Existing GTE command set…

- lighting calculations

Normal Color + Depth Cue	**F14,15 (x3)** NCDS (NCDT)

```
L1 = L11*NXn+L12*NYn+L13*NZn;
L2 = L21*NXn+L22*NYn+L23*NZn;
L3 = L31*NXn+L32*NYn+L33*NZn;
RLT = RBK+LR1*L1+LR2*L2+LR3*L3;
GLT = GBK+LG1*L1+LG2*L2+LG3*L3;
BLT = BBK+LB1*L1+LB2*L2+LB3*L3;
R0 = R*RLT+IR0*(RFC - R*RLT);
G0 = G*GLT+IR0*(GFC-G*GLT);
B0 = B*BLT+IR0*(BFC-B*BLT);
```

Existing GTE command set…

- lighting calculations cont..

Normal ColorCol (no depth cue)

F16,17 (x3)
NCCS (NCCT)

```
L1 = L11*NXn+L12*NYn+L13*NZn;
L2 = L21*NXn+L22*NYn+L23*NZn;
L3 = L31*NXn+L32*NYn+L33*NZn;
RLT = RBK+LR1*L1+LR2*L2+LR3*L3;
GLT = GBK+LG1*L1+LG2*L2+LG3*L3;
BLT = BBK+LB1*L1+LB2*L2+LB3*L3;
R0 = R*RLT
G0 = G*GLT;;
B0 = B*BLT;;
```

Existing GTE command set...

- lighting calculations cont..

Material Screen Color + Depth Cueuing (textured poly screen color)

F18
CDP

```
RLT = RBK+LR1*L1^n+LR2*L2^n+LR3*L3^n;
GLT = GBK+LG1*L1^n+LG2*L2^n+LG3*L3^n;
BLT = BBK+LB1*L1^n+LB2*L2^n+LB3*L3^n;
R0 = R*RLT+IR0*(RFC - R*RLT);
G0 = G*GLT+IR0*(GFC-G*GLT);
B0 = B*BLT+IR0*(BFC-B*BLT);
```

Existing GTE command set…

- lighting calculations cont...

Screen Color Material without Depth Cue **F19** CC

```
RLT = RBK+LR1*L1^n+LR2*L2^n+LR3*L3^n;
GLT = GBK+LG1*L1^n+LG2*L2^n+LG3*L3^n;
BLT = BBK+LB1*L1^n+LB2*L2^n+LB3*L3^n;
R0 = R*RLT;
G0 = G*GLT;
B0 = B*BLT;
```

Existing GTE command set…

- lighting subset utils

Light Source Effect

F4
MVMVA

```
L1 = L11*NXn+L12*NYn+L13*NZn;
L2 = L21*NXn+L22*NYn+L23*NZn;
L3 = L31*NXn+L32*NYn+L33*NZn;
```

Light Source Color Effect (without material)

F5
MVMVA

```
RLT = RBK+LR1*L1+LR2*L2+LR3*L3;
GLT = GBK+LG1*L1+LG2*L2+LG3*L3;
BLT = BBK+LB1*L1+LB2*L2+LB3*L3;
```

Screen Color with Depth Cue

F6
DCPL

```
R0 = R*IR1+IR0*(RFC - R*IR1);
G0 = G*IR2+IR0*(GFC-G*IR2);
B0 = B*IR3+IR0*(BFC-B*IR3);
```

Existing GTE command set…

- lighting subset utils

Screen Color with Depth Cue	**F7,8 (x3)** DPCS (DPCT)	R0 = R+IR0*(**RFC**-R); G0 = G+IR0*(**GFC**-G); B0 = B+IR0*(**BFC**-B);
Screen Color with Interpolation	**F9** INTPL	R0 = IR1+IR0*(**RFC**-IR1); G0 = IR2+IR0*(**GFC**-IR2); B0 = IR3+IR0*(**BFC**-IR3);