```
#include<GLUT/GLUT.h>
#include<stdio.h>
void *currentfont;
GLfloat tx = 0.0, ty = 0.0, t1x = 0.0, t1y =
0.0,t2x=0.0, t2y=0.0,t3x = 0.0, t3y =
0.0,t4x=0.0,t4y=0.0,t5x=0.0,t5y=0.0,t6x=0.0,t6y=0.0,t
7x=0.0,t7y=0.0,t8x=0.0,t8y=0.0;
GLint c1 = 0, c2 = 0,f1=0,f2=0;
int flag=0, f=0;

void setFont(void *font)
{
    currentfont = font;
}

void drawstring(float x, float y, float z, char
*string) //to display text messages
{
    char *c;
    glRasterPos3f(x, y, z);

    for (c = string; *c != '\0'; c++)
    {
        glColor3f(0.0, 0.0, 0.0);
        glutBitmapCharacter(currentfont, *c);
    }
}
/*void title()
{
    setFont(GLUT_BITMAP_HELVETICA_18);
    glBegin(GL_POLYGON);
    glColor3f(0.0,0.1,0.2);
    glVertex2i(0,500);
    glColor3f(0.0,0.0,0.0);
    glVertex2i(0,0);
    glColor3f(0.0,0.0,0.0);
    glVertex2i(500,0);
    glColor3f(0.0,0.1,0.2);
    glVertex2i(500,500);
    glEnd();
    //    sndPlaySound("CHIMES.wav",SND_ASYNC);

    glColor3f(1.0,0.0,1.0);
    drawstring(20.0,435.0,1.0,"*  * G R A P H I C A L
```

```
I L L U S T R A T I O N   OF   S E L E C T I V E   R
E P E A T   A R Q   P R O T O C O L * *");

    glColor3f(1.0,1.0,1.0);
    drawstring(210.0,365.0,1.0,"SUBMITTED   BY");

    glColor3f(0.0,1.0,1.0);
    drawstring(130.0, 340.0, 1.0, "DHRUV NRUPESH
PATEL              4VV16CS123");

    glColor3f(1.0,1.0,1.0);
    drawstring(190.0,260.0,1.0,"UNDER THE GUIDANCE
OF");

    glColor3f(0.0,1.0,1.0);
    drawstring(70.0,230.0,1.0,"PROF. PAVAN KUMAR S
P");

    setFont(GLUT_BITMAP_HELVETICA_12);

    glColor3f(0.0,1.0,1.0);
    drawstring(70.0,215.0,1.0,"Asst.Prof, Dept of
CSE");

    glColor3f(0.0,1.0,1.0);
    drawstring(70.0, 200.0, 1.0, "VVCE,MYSORE");

    setFont(GLUT_BITMAP_HELVETICA_18);

    glColor3f(0.0,1.0,1.0);
    drawstring(280.0,230.0,1.0,"          PROF.
GURURAJ H L");
    setFont(GLUT_BITMAP_HELVETICA_12);


    glColor3f(0.0,1.0,1.0);
    drawstring(285.0,215.0,1.0,"          Asst. Prof,
Dept of CSE");

    glColor3f(0.0,1.0,1.0);
    drawstring(285.0, 200.0, 1.0, "
VVCE,MYSORE");

    setFont(GLUT_BITMAP_HELVETICA_18);
```

```
    glColor3f(1.0,1.0,1.0);
    drawstring(400.0,100.0,1.0," Press C ->
continue");
}
void mykeyboard(unsigned char key,int x,int y)
{
    if(key=='c' or key=='C')
    {
        f=1;
        glutPostRedisplay();
    }
}*/
void sbox()//sender computer
{
    glColor3f(1.0, 0.0, 1.0);//outer box
    glBegin(GL_LINE_LOOP);
    glVertex2f(230, 395);
    glVertex2f(230, 455);
    glVertex2f(155, 455);
    glVertex2f(155, 395);
    glEnd();
    glColor3f(0.0, 1.0, 0.0);// inner box
    glBegin(GL_LINE_LOOP);
    glVertex2f(225, 402);
    glVertex2f(225, 448);
    glVertex2f(160, 448);
    glVertex2f(160, 402);
    glEnd();
}

void rbox()//receiver computer
{
    glColor3f(1.0, 0.0, 1.0);//outer box
    glBegin(GL_LINE_LOOP);
    glVertex2f(420, 395);
    glVertex2f(420, 455);
    glVertex2f(345, 455);
    glVertex2f(345, 395);
    glEnd();
    glColor3f(0.0, 1.0, 0.0);// inner box
    glBegin(GL_LINE_LOOP);
    glVertex2f(415, 402);
    glVertex2f(415, 448);
    glVertex2f(350, 448);
```

```
    glVertex2f(350, 402);
    glEnd();
}
void line()//drop lines
{
    glBegin(GL_LINES);//com1
    glColor3f(1.0, 1.0, 1.0);
    glVertex2f(192.5, 395);
    glVertex2f(192.5, 80);
    glEnd();
    glBegin(GL_LINES);//com2
    glColor3f(1.0, 1.0, 1.0);
    glVertex2f(382.5, 395);
    glVertex2f(382.5, 80);
    glEnd();
    glBegin(GL_LINES);  //arrow com1
    glColor3f(1.0, 1.0, 1.0);
    glVertex2f(189, 85);
    glVertex2f(192.5, 80);
    glVertex2f(195, 85);
    glVertex2f(192.5, 80);

    glColor3f(1.0, 1.0, 1.0);   //arrow com2
    glVertex2f(379, 85);
    glVertex2f(382.5, 80);
    glVertex2f(385, 85);
    glVertex2f(382.5, 80);
    glEnd();

    glBegin(GL_LINES);      //time line
    glColor3f(1.0, 1.0, 1.0);
    glVertex2f(192.5,110);
    glVertex2f(260.5,110);
    glEnd();
    glBegin(GL_LINES);      //time line
    glVertex2f(302.5,110);
    glVertex2f(382.5,110);
    glEnd();
    glColor3f(1.0, 1.0, 1.0);
    drawstring(269, 110, 1.0, "Time");
    glBegin(GL_LINES);
    glColor3f(1.0, 1.0, 1.0);
    glVertex2f(195, 115);
    glVertex2f(192.5, 110);
```

```
    glVertex2f(195, 105);
    glVertex2f(192.5, 110);
    glBegin(GL_LINES);
    glColor3f(1.0, 1.0, 1.0);
    glVertex2f(379.5, 115);
    glVertex2f(382.5, 110);
    glVertex2f(379.5, 105);
    glVertex2f(382.5, 110);
}
void slant_lines()//slant lines for frames
{
    glBegin(GL_LINES);
    glColor3f(0.0, 1.0, 0.0);
    glVertex2f(192.5, 355);
    glVertex2f(382.5, 345);
    glEnd();
    glBegin(GL_LINES);
    glColor3f(0.0, 1.0, 0.0);
    glVertex2f(378, 348);
    glVertex2f(382, 345);
    glVertex2f(378, 341.5);
    glVertex2f(382, 345);

    glBegin(GL_LINES);
    glColor3f(0.0, 1.0, 0.0);
    glVertex2f(192.5, 315);
    glVertex2f(382.5, 305);
    glEnd();
    glBegin(GL_LINES);
    glColor3f(0.0, 1.0, 0.0);
    glVertex2f(378, 308);
    glVertex2f(382, 305);
    glVertex2f(378, 301.5);
    glVertex2f(382, 305);

    glBegin(GL_LINES);
    glColor3f(0.0, 1.0, 0.0);
    glVertex2f(192.5, 269.5);
    glVertex2f(330.5, 259);
    glVertex2f(330.5, 259);
    glVertex2f(290.5, 239);
    glEnd();
    glBegin(GL_LINES);
    glColor3f(0.0, 1.0, 0.0);
```

```
glVertex2f(289.5, 238);
glVertex2f(293.5, 235);
glVertex2f(289.5, 238);
glVertex2f(293.5, 244);
glEnd();

glBegin(GL_LINES);
glColor3f(0.0, 1.0, 0.0);
glVertex2f(192.5, 195);
glVertex2f(382.5, 185);
glEnd();

glBegin(GL_LINES);
glColor3f(0.0, 1.0, 0.0);
glVertex2f(378, 190);
glVertex2f(382.5, 186.5);
glVertex2f(378, 180);
glVertex2f(382.5, 186.5);

glBegin(GL_LINES);
glColor3f(0.0, 1.0, 0.0);
glVertex2f(192.5, 145);
glVertex2f(382.5, 135);
glEnd();
//glFlush();
glBegin(GL_LINES);  //ack
glColor3f(1.0, 0.0, 0.0);
glVertex2f(378, 140);
glVertex2f(382.5, 135.5);
glVertex2f(378, 130);
glVertex2f(382.5, 135.5);
glColor3f(1.0, 0.0, 0.0);
glPushAttrib(GL_ENABLE_BIT);
glLineStipple(1, 0x00FF);
glEnable(GL_LINE_STIPPLE);

glBegin(GL_LINES);
glVertex2f(192.5, 275);
glVertex2f(382.5, 300);
glEnd();
glPopAttrib();
glBegin(GL_LINES);
glColor3f(1.0, 0.0, 0.0);
glVertex2f(192.5, 275);
```

```
    glVertex2f(195.5, 271);
    glVertex2f(192.5, 275);
    glVertex2f(195.5, 280);
    glEnd();

    glColor3f(1.0, 0.0,0.0); //nak
    glBegin(GL_LINES);
    glVertex2f(192.5, 152);
    glVertex2f(382.5, 180);
    glEnd();
    glPopAttrib();
    glBegin(GL_LINES);
    glColor3f(1.0, 0.0, 0.0);
    glVertex2f(192.5, 152);
    glVertex2f(195.5, 150);
    glVertex2f(192.5, 152);
    glVertex2f(195.5, 156);
    glEnd();
}

void text()//sender, receiver text display
{

    glColor3f(1.0f, 1.0f, 1.0f);
    setFont(GLUT_BITMAP_TIMES_ROMAN_24);
    drawstring(352.0, 420.0, 1.0, "RECEIVER");

    glColor3f(1.0f, 1.0f, 1.0f);
    setFont(GLUT_BITMAP_TIMES_ROMAN_24);
    drawstring(168.0, 420.0, 1.0, "SENDER");

    glColor3f(1.0f, 1.0f, 0.0f);              //
senders numbering frames
    setFont(GLUT_BITMAP_TIMES_ROMAN_24);
    drawstring(102, 349.5, 1.0, "0");

    glColor3f(1.0f, 1.0f, 0.0f);
    setFont(GLUT_BITMAP_TIMES_ROMAN_24);
    drawstring(112, 349.5, 1.0, "1");

    glColor3f(1.0f, 1.0f, 0.0f);
    setFont(GLUT_BITMAP_TIMES_ROMAN_24);
    drawstring(122, 349.5, 1.0, "2");
```

```
        glColor3f(1.0f, 1.0f, 0.0f);
        setFont(GLUT_BITMAP_TIMES_ROMAN_24);
        drawstring(132, 349.5, 1.0, "3");

        glColor3f(1.0f, 1.0f, 0.0f);
        setFont(GLUT_BITMAP_TIMES_ROMAN_24);
        drawstring(142, 349.5, 1.0, "0");

        glColor3f(1.0f, 1.0f, 0.0f);
        setFont(GLUT_BITMAP_TIMES_ROMAN_24);
        drawstring(152, 349.5, 1.0, "1");

        glColor3f(1.0f, 1.0f, 0.0f);
        setFont(GLUT_BITMAP_TIMES_ROMAN_24);
        drawstring(162, 349.5, 1.0, "2");


        glColor3f(1.0f, 1.0f, 0.0f);                //
    receiversnumbering frames
        setFont(GLUT_BITMAP_TIMES_ROMAN_24);
        drawstring(412, 349.5, 1.0, "0");

        glColor3f(1.0f, 1.0f, 0.0f);
        setFont(GLUT_BITMAP_TIMES_ROMAN_24);
        drawstring(422, 349.5, 1.0, "1");

        glColor3f(1.0f, 1.0f, 0.0f);
        setFont(GLUT_BITMAP_TIMES_ROMAN_24);
        drawstring(432, 349.5, 1.0, "2");

        glColor3f(1.0f, 1.0f, 0.0f);
        setFont(GLUT_BITMAP_TIMES_ROMAN_24);
        drawstring(442, 349.5, 1.0, "3");

        glColor3f(1.0f, 1.0f, 0.0f);
        setFont(GLUT_BITMAP_TIMES_ROMAN_24);
        drawstring(452, 349.5, 1.0, "0");

        glColor3f(1.0f, 1.0f, 0.0f);
        setFont(GLUT_BITMAP_TIMES_ROMAN_24);
        drawstring(462, 349.5, 1.0, "1");

        glColor3f(1.0f, 1.0f, 0.0f);
        setFont(GLUT_BITMAP_TIMES_ROMAN_24);
```

```
    drawstring(472, 349.5, 1.0, "2");

    glColor3f(1.0f, 1.0f, 0.0f);
    setFont(GLUT_BITMAP_TIMES_ROMAN_24);
    drawstring(300, 230, 1.0, "LOST");

    glColor3f(1.0f, 1.0f, 0.0f);
    setFont(GLUT_BITMAP_TIMES_ROMAN_24);
    drawstring(280, 125, 1.0, "FRAME 2 RESENT");
}
void frame()
{
    glColor3f(1.0, 1.0, 1.0);//sender's frames
    glBegin(GL_LINE_LOOP);
    glVertex2f(170, 345);
    glVertex2f(170, 365);
    glVertex2f(100, 365);
    glVertex2f(100, 345);
    glEnd();

    glBegin(GL_LINE_LOOP);
    glVertex2f(480, 345);
    glVertex2f(480, 365);
    glVertex2f(410, 365);
    glVertex2f(410, 345);
    glEnd();

    glBegin(GL_LINES);
    glVertex2f(160, 365.5);
    glVertex2f(160, 345);
    glVertex2f(160, 345);
    glVertex2f(160, 365.5);
    glEnd();

    glBegin(GL_LINES);
    glVertex2f(150, 365.5);
    glVertex2f(150, 345);
    glVertex2f(150, 345);
    glVertex2f(150, 365.5);
    glEnd();

    glBegin(GL_LINES);
    glVertex2f(140, 365.5);
    glVertex2f(140, 345);
```

```
glVertex2f(140, 345);
glVertex2f(140, 365.5);
glEnd();

glBegin(GL_LINES);
glVertex2f(130, 365.5);
glVertex2f(130, 345);
glVertex2f(130, 345);
glVertex2f(130, 365.5);
glEnd();

glBegin(GL_LINES);
glVertex2f(120, 365.5);
glVertex2f(120, 345);
glVertex2f(120, 345);
glVertex2f(120, 365.5);
glEnd();

glBegin(GL_LINES);
glVertex2f(110, 365.5);
glVertex2f(110, 345);
glVertex2f(110, 345);
glVertex2f(110, 365.5);
glEnd();

glBegin(GL_LINES);
glVertex2f(100, 365.5);
glVertex2f(100, 345);
glVertex2f(100, 345);
glVertex2f(100, 365.5);
glEnd();

glBegin(GL_LINES);
glVertex2f(420, 365.5);
glVertex2f(420, 345);
glVertex2f(420, 345);
glVertex2f(420, 365.5);
glEnd();

glBegin(GL_LINES);
glVertex2f(430, 365.5);
glVertex2f(430, 345);
glVertex2f(430, 345);
glVertex2f(430, 365.5);
```

```
    glEnd();

    glBegin(GL_LINES);
    glVertex2f(440, 365.5);
    glVertex2f(440, 345);
    glVertex2f(440, 345);
    glVertex2f(440, 365.5);
    glEnd();

    glBegin(GL_LINES);
    glVertex2f(450, 365.5);
    glVertex2f(450, 345);
    glVertex2f(450, 345);
    glVertex2f(450, 365.5);
    glEnd();

    glBegin(GL_LINES);
    glVertex2f(460, 365.5);
    glVertex2f(460, 345);
    glVertex2f(460, 345);
    glVertex2f(460, 365.5);
    glEnd();

    glBegin(GL_LINES);
    glVertex2f(470, 365.5);
    glVertex2f(470, 345);
    glVertex2f(470, 345);
    glVertex2f(470, 365.5);
    glEnd();

    glBegin(GL_LINES);
    glVertex2f(480, 365.5);
    glVertex2f(480, 345);
    glVertex2f(480, 345);
    glVertex2f(480, 365.5);
    glEnd();

}
void animate()
{
    if (tx<=200)                            //frame 0
    {
        tx += 2.0;
        ty -= 0.1052;
```

```
    }
    if ((int)tx>=200 && t1x<=200)          //frame 1
    {
        if(t8x<=9.0)
            t8x+=2.0;
        t1x += 2.0;
        t1y -= 0.1052;
    }

    if ((int)t1x>=200 && t2x>=-220)         //ack
    {
        if(t8x<=19.0)
            t8x+=2.0;
        t2x -= 2.0;
        t2y -= 0.1052;

    }
    if ((int)t2x<=-220)                  //frame 2
lost
    {
        if(t7x<=19)
            t7x+=2.0;
        t3x += 2.0;
        t3y -= 0.1052;
        if((int)t3x==150)
        {
            f1=0;
        }
    }
    if ((int)t3x>=190 && t4x<=200)         //frame 3
    {
        t4x += 2.0;
        t4y -= 0.1052;
    }
    if ((int)t4x>=190 && t5x>=-225)         //nak
    {
        if(t8x<=39.0)
            t8x+=2.0;
        t5x -= 2.0;
        t5y -= 0.2052;
    }
    if ((int)t5x<=-225 && t6x<=200)          //frame
2 resend
    {
```

```
            t6x += 2.0;
            t6y -= 0.1052;
        }
        if((int)t6x>=200&&t8x>=31.0)
        {
            t8x-=2.0;
        }
        /*if((int)t1x==-150)
        {
            ack1=0;
        }*/
        glutPostRedisplay();
}

void packet0()
{
    glColor3f(1.0, 1.0, 0.0);
    drawstring(183.0, 356.0, 0.0, "0");
    glColor3f(1.0, 1.0, 1.0);
}
void packet1()
{
    glColor3f(1.0, 1.0, 0.0);
    drawstring(183.0, 316.0, 0.0, "1");
    glColor3f(1.0, 1.0, 1.0);
}
void packet2()
{
    if(f1==1)
    {
        glColor3f(1.0, 1.0, 0.0);
        drawstring(183, 270, 0.0, "2");
        //glPopMatrix();
    }
}
void packet3()
{
    glColor3f(1.0, 1.0, 0.0);
    drawstring(183.0, 196.0, 0.0, "3");
    glColor3f(1.0, 1.0, 1.0);
}

void ack()
{
```

```
   // if(ack1==1)
    //{
    glPushMatrix();
    glColor3f(1.0, 0.0, 0.0);
    drawstring(384.5, 287, 0.0, "ACK");
    glPopMatrix();
    //}

}
void nak()
{
    glPushMatrix();
    glColor3f(1.0, 0.0, 0.0);
    drawstring(384.5, 185, 0.0, "NAK2");
    glPopMatrix();
}
void packet2resend()
{
    glPushMatrix();
    glColor3f(1.0, 1.0, 0.0);
    drawstring(183, 147, 0.0, "2");
    glPopMatrix();
}

void window()
{
    glColor3f(0.0, 0.0, 1.0);   //senders window
    glBegin(GL_LINE_LOOP);
    glVertex2f(100, 335);
    glVertex2f(100, 375);
    glVertex2f(120, 375);
    glVertex2f(120, 335);
    glEnd();
}
void window1()
{
    glColor3f(0.0, 0.0, 1.0);   //receivers window
    glBegin(GL_LINE_LOOP);
    glVertex2f(400, 335);
    glVertex2f(400, 375);
    glVertex2f(410, 375);
    glVertex2f(410, 335);
    glEnd();
}
```

```
void display()
{
    glClear(GL_COLOR_BUFFER_BIT);
    glClearColor(0.0, 0.0, 0.0, 1.0);
    glColor3f(0.0, 1.0, 1.0);
    setFont(GLUT_BITMAP_TIMES_ROMAN_24);
    drawstring(155, 40, 1.0, "**** SELECTIVE REPEAT
ARQ PROTOCOL ****");
    glColor3f(1.0, 1.0, 1.0);
    sbox();
    rbox();
    line();
    slant_lines();
    frame();
    //title();
    text();
    //window();
    glPushMatrix();
    glTranslatef(tx, ty, 0.0);
    packet0();
    glPopMatrix();
    glPushMatrix();
    glTranslatef(t1x, t1y, 0.0);
    packet1();
    glPopMatrix();
    glPushMatrix();
    glTranslatef(t2x, t2y, 0.0);
    ack();
    glPopMatrix();
    glPushMatrix();
    glTranslatef(t3x, t3y, 0.0);
    packet2();
    glPopMatrix();
    glPushMatrix();
    glTranslatef(t4x, t4y, 0.0);
    packet3();
    glPopMatrix();
    glPushMatrix();
    glTranslatef(t5x, t5y, 0.0);
    nak();
    glPopMatrix();
    glPushMatrix();
    glTranslatef(t6x, t6y, 0.0);
    packet2resend();
```

```
    glPopMatrix();
    glPushMatrix();
    glTranslatef(t7x, t7y, 0.0);
    window();
    glPopMatrix();
    glPushMatrix();
    glTranslatef(t8x, t8y, 0.0);
    window1();
    glPopMatrix();
    glFlush();
    glutSwapBuffers();
}
void init()
{
    glMatrixMode(GL_PROJECTION);
    glLoadIdentity();
    gluOrtho2D(0.0, 500.0, 0.0, 500.0);
    glMatrixMode(GL_MODELVIEW);
}

int main(int argc, char**argv)
{
    f1=1,f2=1;
    glutInit(&argc, argv);
    glutInitDisplayMode(GLUT_SINGLE | GLUT_RGB);
    glutInitWindowSize(1000, 1000);
    glutInitWindowPosition(0, 0);
    glutCreateWindow("Selective Repeat ARQ");
    //glutKeyboardFunc(mykeyboard);
    init();
    glutDisplayFunc(display);
    glutIdleFunc(animate);
    glutMainLoop();

}
```