

MIDlets:

1. Probar en NetBeans todos los ejercicios.
  2. Ejecutar todos los ejercicios en un dispositivo móvil.
- //\*\*\*\*\*

EJEMPLO 1. Hola MIDlet con el API de alto nivel.

```
import javax.microedition.midlet.*;
import javax.microedition.lcdui.*;
public class AltoNivelME extends MIDlet implements CommandListener {
    private Display d;
    private Form f;
    private Command c;
    private Alert a;
    public AltoNivelME( ) {
        d = Display.getDisplay(this);
        f = new Form ("Hola MIDlet");
        f.append("Hola MIDlet!\n");
        c = new Command("Salir", Command.EXIT, 3);
        f.addCommand(c);
        f.setCommandListener(this);
    }
    protected void startApp( ) {
        d.setCurrent(f);
    }
    protected void pauseApp( ) { }
    protected void destroyApp(boolean b) { }
    public void commandAction(Command co, Displayable di) {
        if (co == c) {
            destroyApp(true);
            notifyDestroyed();
        } else d.setCurrent(new Alert("", "Otro comando...", null,
AlertType.ERROR));
    }
}
//*****
```

EJEMPLO 2. Hola MIDlet con el API de bajo nivel.

```
import javax.microedition.midlet.*;
import javax.microedition.lcdui.*;
public class BajoNivelME extends MIDlet implements CommandListener {
    private Display d;
    private Command c;
    private Canvas ca;
    public Maravilloso() {
        d = Display.getDisplay(this);
        ca = new Canvas() {
            private int w;
            private int h;
            public void paint(Graphics g) {
                w = getWidth();
                h = getHeight();
                g.setColor(0, 0, 0);
                g.fillRect(0, 0, w, h);
                g.setColor(255, 255, 255);
                g.setStrokeStyle(Graphics.SOLID);
                g.drawString("Hola MIDlet", w/2, h/2,
(Graphics.BASELINE|Graphics.HCENTER));
            }
        };
        c = new Command("Salir", Command.EXIT, 3);
        ca.addCommand(c);
    }
}
```

```

        ca.setCommandListener(this);
    }
    protected void startApp() {
        d.setCurrent(ca);
    }
    protected void pauseApp() { }
    protected void destroyApp(boolean b) { }
    public void commandAction(Command co, Displayable di) {
        if (co == c) {
            destroyApp(true);
            notifyDestroyed();
        } else d.setCurrent(new Alert("", "Otro comando...", null, AlertType.ERROR));
    }
}
//*****

```

EJEMPLO 3. Ejemplo de Form y Command.

```

import javax.microedition.midlet.*;
import javax.microedition.lcdui.*;
public class FormCommandME extends MIDlet implements CommandListener {
    private Display d;
    private Form f;
    private Command c;
    public FormCommandME( ) {
        d = Display.getDisplay(this);
        f = new Form ("Form y Command");
        f.append("Hola MIDlet\n");
        c = new Command("Salir", Command.EXIT, 3);
        f.addCommand(c);
        f.setCommandListener(this);
    }
    protected void startApp( ) {
        d.setCurrent(f);
    }
    protected void pauseApp( ) { }
    protected void destroyApp(boolean b) { }
    public void commandAction(Command co, Displayable di) {
        if (co == c) {
            destroyApp(true);
            notifyDestroyed();
        } else d.setCurrent(new Alert("", "Otro comando...", null, AlertType.ERROR));
    }
}
//*****

```

EJEMPLO 4. Ejemplo de StringItem.

```

import javax.microedition.midlet.*;
import javax.microedition.lcdui.*;
public class StringItemME extends MIDlet implements CommandListener {
    private Display d;
    private Form f;
    private Alert a;
    private Command cs;
    private Command cc;
    private StringItem si;
    private int n;
    public StringItemME( ) {
        n = 0;
        d = Display.getDisplay(this);
        f = new Form ("StringItem");
    }
}

```

```

        f.append("Ejemplo de StringItem\n");
        si = new StringItem("Cadena: ", "Contador = " + n);
        f.append(si);
        cs = new Command("Salir", Command.EXIT, 3);
        cc = new Command("Contar", Command.SCREEN, 1);
        f.addCommand(cs);
        f.addCommand(cc);
        f.setCommandListener(this);
    }
    protected void startApp( ) {
        d.setCurrent(new Alert("", "MIDlet activo...", null, AlertType.ERROR));
        d.setCurrent(f);
    }
    protected void pauseApp( ) {
        d.setCurrent(new Alert("", "MIDlet pausado...", null, AlertType.ERROR));
    }
    protected void destroyApp(boolean b) {
        d.setCurrent(new Alert("", "MIDlet terminado.", null, AlertType.ERROR));
    }
    public void commandAction(Command co, Displayable di) {
        if (co == cs) {
            destroyApp(true);
            notifyDestroyed();
        } else if (co == cc) {
            n++;
            si.setText("Contador = " + n);
        } else d.setCurrent(new Alert("", "MIDlet activo...", null,
AlertType.ERROR));
    }
}
//*****

```

EJEMPLO 5. La imagen java.png se coloca en el directorio res en la carpeta de aplicaciones del dispositivo.

Para probar las imágenes, crear una nueva carpeta llamada resources en miproyecto/Source Packages/resources, y allí guardar las imágenes:

```

import javax.microedition.midlet.*;
import javax.microedition.lcdui.*;
public class Maravilloso extends MIDlet implements CommandListener {
    private Display d;
    private Form f;
    private Image i;
    private ImageItem ii;
    private Command c;
    public Maravilloso( ) {
        d = Display.getDisplay(this);
        f = new Form ("ImageItem");
        try {
            ii = new ImageItem("", Image.createImage("resources/java.png"),
ImageItem.LAYOUT_CENTER, "Logo de Java");
            f.append(ii);
        } catch (java.io.IOException e) {
            f.append(" Error al leer el archivo java.png: " + e);
        }
        c = new Command("Salir", Command.EXIT, 3);
        f.addCommand(c);
        f.setCommandListener(this);
    }
    protected void startApp( ) {
        d.setCurrent(f);
    }
}

```

```

    }
    protected void pauseApp( ) {      }
    protected void destroyApp(boolean b) {      }
    public void commandAction(Command co, Displayable di) {
        if (co == c) {
            destroyApp(true);
            notifyDestroyed();
        } else d.setCurrent(new Alert("", "Otro comando...", null, AlertType.ERROR));
    }
}
//*****

```

EJEMPLO 6. Ejemplo de DateField y TextField.

```

import java.util.Date;
import java.util.Calendar;
import javax.microedition.midlet.*;
import javax.microedition.lcdui.*;
public class DateTextFieldME extends MIDlet implements CommandListener {
    private Display d;
    private Form f;
    private TextField tf;
    private DateField df;
    private StringItem si;
    private Command cc;
    private Command cs;
    public DateTextFieldME ( ) {
        d = Display.getDisplay(this);
        tf = new TextField("Nombre:", "", 10, TextField.ANY);
        df = new DateField("Cumpleaños:", DateField.DATE);
        si = new StringItem("", "");
        f = new Form ("TextField y DateField");
        f.append(tf);
        f.append(df);
        f.append(si);
        cc = new Command("Continuar", Command.OK, 0);
        cs = new Command("Salir", Command.EXIT, 3);
        f.addCommand(cc);
        f.addCommand(cs);
        f.setCommandListener(this);
    }
    protected void startApp( ) {
        d.setCurrent(f);
    }
    protected void pauseApp( ) {      }
    protected void destroyApp(boolean b) {      }
    public void commandAction(Command co, Displayable di) {
        if (co == cs) {
            destroyApp(true);
            notifyDestroyed();
        } else if (co == cc) {
            Calendar c1 = Calendar.getInstance();
            Calendar c2 = Calendar.getInstance();
            Date date = df.getDate();
            if ((date == null) || (tf.getString().equals("")) ) {
                si.setText("Favor de ingresar su nombre...");
                return;
            }
            c2.setTime(date);
            int edad = c1.get(Calendar.YEAR)-c2.get(Calendar.YEAR);
            f.delete(0);

```

```

        f.delete(0);
        f.removeCommand(cc);
        si.setText("Hola " + tf.getString() + "\nTu edad es = " + edad + "
años");
    } else d.setCurrent(new Alert("", "Otro comando...", null,
AlertType.ERROR));
    }
}
//*****

```

EJEMPLO 7. Ejemplo de ChoiceGroup.

```

import javax.microedition.midlet.*;
import javax.microedition.lcdui.*;
public class ChoiceGroupME extends MIDlet implements CommandListener {
    private Display      d;
    private Form          f;
    private TextField     tf;
    private ChoiceGroup   cg;
    private ChoiceGroup   ch;
    private Command       cs;
    public ChoiceGroupME( ) {
        d = Display.getDisplay(this);
        tf = new TextField("Nombre:", "", 10, TextField.ANY);
        cg = new ChoiceGroup("Sexo:", ChoiceGroup.EXCLUSIVE);
        cg.append("Masculino", null);
        cg.append("Femenino", null);
        ch = new ChoiceGroup("Lenguajes:", ChoiceGroup.MULTIPLE);
        ch.append("Java", null);
        ch.append("C++", null);
        ch.append("Prolog", null);
        ch.append("Otros", null);
        f = new Form ("ChoiceGroup");
        f.append(tf);
        f.append(cg);
        f.append(ch);
        cs = new Command("Salir", Command.EXIT, 3);
        f.addCommand(cs);
        f.setCommandListener(this);
    }
    protected void startApp( ) {
        d.setCurrent(f);
    }
    protected void pauseApp( ) { }
    protected void destroyApp(boolean b) { }
    public void commandAction(Command co, Displayable di) {
        if (co == cs) {
            destroyApp(true);
            notifyDestroyed();
        } else d.setCurrent(new Alert("", "Otro comando...", null,
AlertType.ERROR));
    }
}
//*****

```

EJEMPLO 8. Ejemplo de Gauge.

```

import javax.microedition.midlet.*;
import javax.microedition.lcdui.*;
public class GaugeME extends MIDlet implements CommandListener {
    private Display d;
    private Form    f;

```

```

private Gauge    g;
private Command c;
public GaugeME( ) {
    d = Display.getDisplay(this);
    g = new Gauge("Amplitud", true, 10, 5);
    f = new Form ("Gauge");
    f.append(g);
    c = new Command("Salir", Command.EXIT, 3);
    f.addCommand(c);
    f.setCommandListener(this);
}
protected void startApp( ) {
    d.setCurrent(f);
}
protected void pauseApp( ) { }
protected void destroyApp(boolean b) { }
public void commandAction(Command co, Displayable di) {
    if (co == c) {
        destroyApp(true);
        notifyDestroyed();
    } else d.setCurrent(new Alert("", "Otro comando...", null,
AlertType.ERROR));
}
}
//*****

```

EJEMPLO 9. Ejemplo de Alert.

```

import javax.microedition.midlet.*;
import javax.microedition.lcdui.*;
public class AlertME extends MIDlet implements CommandListener, ItemStateListener {
    private Display    d;
    private Alert      a;
    private Form       f;
    private TextField  tt;
    private TextField  tx;
    private ChoiceGroup ct;
    private ChoiceGroup cg;
    private Gauge      g;
    private Command    cc;
    private Command    cs;
    private int        s=2;
    public AlertME( ) {
        d = Display.getDisplay(this);
        tt = new TextField("Titulo:", "Un título", 10, TextField.ANY);
        tx = new TextField("", "...texto del Alert...", 50, TextField.ANY);
        ct =new ChoiceGroup("Seleccionar tipo:", ChoiceGroup.EXCLUSIVE);
        ct.append("ALARM", null);
        ct.append("CONFIRMATION", null);
        ct.append("ERROR", null);
        ct.append("INFO", null);
        ct.append("WARNING", null);
        ct.setSelectedIndex(0, true);
        cg=new ChoiceGroup("Tiempo:", ChoiceGroup.EXCLUSIVE);
        cg.append("Forever", null);
        cg.append("Temporal", null);
        cg.setSelectedIndex(0, true);
        g = new Gauge("Gauge (min=0 max=20)", true, 20, s);
        f = new Form ("Ejemplo Alert");
        f.append(tt);
        f.append(tx);
    }
}

```

```

        f.append(ct);
        f.append(cg);
        f.append(g);
        cc=new Command("Continuar", Command.OK, 0);
        cs=new Command("Salir", Command.EXIT, 3);
        f.addCommand(cc);
        f.addCommand(cs);
        f.setCommandListener(this);
        f.setItemStateListener(this);
    }
    protected void startApp( ) {
        d.setCurrent(new Alert("", "En estado Activo", null, AlertType.ERROR));
        d.setCurrent(f);
    }
    protected void pauseApp( ) {
        d.setCurrent(new Alert("", "En estado pausado...", null,
AlertType.ERROR));
    }
    protected void destroyApp(boolean b) {
        d.setCurrent(new Alert("", "En estado terminado.", null,
AlertType.ERROR));
    }
    public void commandAction(Command co, Displayable di) {
        if (co == cs) {
            destroyApp(true);
            notifyDestroyed();
        } else if (co == cc) {
            switch (ct.getSelectedIndex()) {
                case 0: a = new Alert(tt.getString(), tx.getString(), null,
AlertType.ALARM); break;
                case 1: a = new Alert(tt.getString(), tx.getString(), null,
AlertType.CONFIRMATION); break;
                case 2: a = new Alert(tt.getString(), tx.getString(), null,
AlertType.ERROR); break;
                case 3: a = new Alert(tt.getString(), tx.getString(), null,
AlertType.INFO); break;
                case 4: a = new Alert(tt.getString(), tx.getString(), null,
AlertType.WARNING); break;
                default:a = new Alert(tt.getString(), tx.getString(), null,
AlertType.INFO);
            }
            if ((cg.getSelectedIndex() == 0) || (g.getValue()==0) )
                a.setTimeout(Alert.FOREVER);
            else
                a.setTimeout(g.getValue()*1000);
            d.setCurrent(a);
        } else d.setCurrent(new Alert("", "Otro comando digitado...", null,
AlertType.ERROR));
    }
    public void itemStateChanged(Item item) {
        if (item == cg) {
            if (cg.getSelectedIndex() == 0) {
                s=g.getValue();
                g.setValue(0);
            } else
                g.setValue(s);
        } else if (item == g) {
            if (g.getValue() == 0)
                cg.setSelectedIndex(0,true);
            else

```

```

        cg.setSelectedIndex(1,true);
    } else d.setCurrent(new Alert("", "Otro item seleccionado...", null,
AlertType.ERROR));
    }
}
//*****

```

EJEMPLO 10. Ejemplo de List.

```

import javax.microedition.midlet.*;
import javax.microedition.lcdui.*;
public class Maravilloso extends MIDlet implements CommandListener {
    public static final int CONECTAR = 0;
    public static final int ESTADO = 1;
    public static final int INSERTAR = 2;
    public static final int DESCONECTAR = 3;
    public static final int MENU = 4;
    private Display    d;
    private List       l;
    private TextBox    tb;
    private Form       f;
    private TextField  ts;
    private TextField  tf;
    private ChoiceGroup cr;
    private Command    cs;
    private Command    cc;
    private int        n;
    public Maravilloso( ) {
        n = MENU;
        d = Display.getDisplay(this);
        ts = new TextField("Servidor:", "", 10, TextField.URL);
        tb = new TextBox("Estado", "Sin Conexion", 400, TextField.ANY);
        tf = new TextField("Area ID", "0", 10, TextField.NUMERIC);
        cr= new ChoiceGroup("Riesgo:", ChoiceGroup.EXCLUSIVE);
        cr.append("Bajo", null);
        cr.append("Normal", null);
        cr.append("Alto", null);
        l = new List ("Seleccionar opción:", List.EXCLUSIVE);
        l.append("Conectar", null);
        l.append("Solicitar Datos", null);
        l.append("Ingresar Datos", null);
        l.append("Desconectar", null);
        f = new Form ("Menu Conectar");
        cs = new Command("Salir", Command.EXIT, 3);
        cc = new Command("Continuar", Command.OK, 1);
        l.addCommand(cc);
        l.addCommand(cs);
        l.setCommandListener(this);
        f.addCommand(cc);
        f.addCommand(cs);
        f.setCommandListener(this);
        tb.addCommand(cs);
        tb.setCommandListener(this);
    }
    protected void startApp( ) {
        d.setCurrent(l);
    }
    protected void pauseApp( ) {
    }
    protected void destroyApp(boolean b) {
    }
    public void commandAction(Command co, Displayable di) {
        if (n == MENU ) {

```



```

        if (co == cs) {
            destroyApp(true);
            notifyDestroyed();
        } else if (co == cc) {
            switch ( l.getSelectedIndex() ){
                case CONECTAR:      conectar(); break;
                case ESTADO:       listar();break;
                case INSERTAR:      insertar();break;
                case DESCONECTAR:   desconectar();break;
            }
        } d.setCurrent(new Alert("", "Otro comando digitado...", null,
AlertType.ERROR));
    } else {
        if (co == cs) {
            muestraMenu();
        } else if (co ==cc) {
            switch ( n ){
                case CONECTAR:      listar();break;
                case ESTADO:       muestraMenu();break;
                case INSERTAR:      listar();break;
                case DESCONECTAR:   muestraMenu();break;
            }
        } d.setCurrent(new Alert("", "Otro comando digitado...", null,
AlertType.ERROR));
    }
}

public void conectar(){
    n = CONECTAR;
    f.setTitle("Menu Conectar");
    while (f.size()>0) f.delete(0);
    f.append(ts);
    d.setCurrent(f);
}

public void insertar(){
    n = INSERTAR;
    f.setTitle("Menu Insertar");
    while (f.size()>0) f.delete(0);
    f.append(tf);
    f.append(cr);
    d.setCurrent(f);
}

public void desconectar(){
    d.setCurrent(new Alert("Desconectar","No está conectado a un servidor.",
null, AlertType.ERROR));
    n = DESCONECTAR;
    n = MENU;
}

public void listar(){
    n = ESTADO;
    d.setCurrent(tb);
}

public void muestraMenu(){
    n = MENU;
    d.setCurrent(l);
}
}
//*****

```

EJEMPLO 11. Ejemplo de Canvas.

```
import javax.microedition.midlet.*;
```

```

import javax.microedition.lcdui.*;
public class CanvasME extends MIDlet implements CommandListener {
    private Display d;
    private Command cs;
    private Canvas ca;
    public CanvasME( ) {
        d = Display.getDisplay(this);
        ca = new Canvas() {
            private int w;
            private int h;
            public void paint (Graphics g){
                w = getWidth();
                h = getHeight();
                g.setColor(255, 0, 0); g.fillRect(0, 0, w, h);
                g.setColor(0, 0, 0); g.drawLine(0, 0, 50, 50);
            }
        };
        cs = new Command("Salir", Command.EXIT, 3);
        ca.addCommand(cs);
        ca.setCommandListener(this);
    }
    protected void startApp( ) {
        d.setCurrent(ca);
    }
    protected void pauseApp( ) { }
    protected void destroyApp(boolean b) { }
    public void commandAction(Command co, Displayable di) {
        if (co == cs) {
            destroyApp(true);
            notifyDestroyed();
        } else d.setCurrent(new Alert("", "Otro comando digitado...", null,
AlertType.ERROR));
    }
}
//*****

```

EJEMPLO 12. Ejemplo de primitivas gráficas.

```

import javax.microedition.midlet.*;
import javax.microedition.lcdui.*;
public class Maravilloso extends MIDlet implements CommandListener {
    private Display d;
    private Command cs;
    private Canvas ca;
    public Maravilloso( ) {
        d = Display.getDisplay(this);
        ca = new Canvas() {
            private int w;
            private int h;
            public void paint (Graphics g){
                w=getWidth();
                h=getHeight();
                g.setColor(0, 0, 0);
                g.fillRect(0, 0, w, h);
                g.setColor(255, 255, 255);
                g.setStrokeStyle(Graphics.SOLID);
                g.drawLine(0, h/2, w-1, h/2);
                g.setColor(0, 255, 0);
                g.setStrokeStyle(Graphics.DOTTED);
                g.drawLine(0, 0, w-1, h-1);
                g.setColor(255, 0, 0);
            }
        };
    }
}

```

```

        g.setStrokeStyle(Graphics.DOTTED);
        g.drawRect(w/4, 0, w/2, h/4);
        g.setColor(0, 0, 255);
        g.setStrokeStyle(Graphics.SOLID);
        g.drawRoundRect(w/4 + 4, 4, w/2 -8, h/4 -8, 8,8);
    }

    };
    cs=new Command("Salir",Command.EXIT, 3);
    ca.addCommand(cs);
    ca.setCommandListener(this);
}
protected void startApp( ) {
    d.setCurrent(ca);
}
protected void pauseApp( ) { }
protected void destroyApp(boolean b) { }
public void commandAction(Command co, Displayable di) {
    if (co ==cs) {
        destroyApp(true);
        notifyDestroyed();
    } else d.setCurrent(new Alert("", "Otro comando digitado...", null,
AlertType.ERROR));
}
}
//*****

```

EJEMPLO 13. Ejemplo de Arcos.

```

import javax.microedition.midlet.*;
import javax.microedition.lcdui.*;
public class ArcoME extends MIDlet implements CommandListener {
    private Display d;
    private Command cs;
    private Canvas ca;
    public ArcoME( ) {
        d = Display.getDisplay(this);
        ca = new Canvas() {
            private int w;
            private int h;
            public void paint (Graphics g){
                w = getWidth();
                h = getHeight();
                g.setColor(0, 0, 0);
                g.fillRect(0, 0, w, h);
                g.setColor(255, 255, 255);
                g.setStrokeStyle(Graphics.SOLID);
                g.fillArc(0, 0, h-100, w-100, 0, 360);
                g.setColor(255, 0, 0);
                g.drawArc(60, 20, 97, 97, -90, 180);
                g.setColor(0, 255, 0);
                g.drawArc(60, 20, 97, 97, 90, 180);
                g.drawString("w:"+w+" h:"+h, 50, 50, 0);
            }
        };
        cs = new Command("Salir",Command.EXIT, 3);
        ca.addCommand(cs);
        ca.setCommandListener(this);
    }
    protected void startApp( ) {
        d.setCurrent(ca);
    }
}

```

```

protected void pauseApp( ) {      }
protected void destroyApp(boolean b) {      }
public void commandAction(Command co, Displayable di) {
    if (co == cs) {
        destroyApp(true);
        notifyDestroyed();
    } else d.setCurrent(new Alert("", "Otro comando digitado...", null,
AlertType.ERROR));
    }
}
//*****

```

EJEMPLO 14. Ejemplo de textos.

```

import javax.microedition.midlet.*;
import javax.microedition.lcdui.*;
public class Maravilloso extends MIDlet implements CommandListener {
    private Display d;
    private Command cs;
    private Canvas ca;
    public Maravilloso( ) {
        d = Display.getDisplay(this);
        ca = new Canvas() {
            private int w, h;
            public void paint (Graphics g){
                w = getWidth();
                h = getHeight();
                g.setColor(0, 0, 0);
                g.fillRect(0, 0, w, h);
                g.setColor(255, 255, 255);
                g.setStrokeStyle(Graphics.SOLID);
                g.drawString("...Una carta...", w/2, h/2, (Graphics.BASELINE|
Graphics.HCENTER));
            }
        };
        cs = new Command("Salir", Command.EXIT, 3);
        ca.addCommand(cs);
        ca.setCommandListener(this);
    }
    protected void startApp( ) {
        d.setCurrent(ca);
    }
    protected void pauseApp( ) {      }
    protected void destroyApp(boolean b) {      }
    public void commandAction(Command co, Displayable di) {
        if (co == cs) {
            destroyApp(true);
            notifyDestroyed();
        } else d.setCurrent(new Alert("", "Otro comando digitado...", null,
AlertType.ERROR));
    }
}
//*****

```

EJEMPLO 15. Ejemplo de mostrar una imagen en un Canvas.

```

import javax.microedition.midlet.*;
import javax.microedition.lcdui.*;
public class Maravilloso extends MIDlet implements CommandListener {
    private Display d;
    private Command c;
    private Canvas ca;

```

```

public Maravilloso ( ) {
    d = Display.getDisplay(this);
    ca = new Canvas() {
        private int w, h;
        public void paint (Graphics g){
            w = getWidth();
            h = getHeight();
            g.setColor(0, 0, 0);
            g.fillRect(0, 0, w, h);
            try {
                Image i= Image.createImage("/java.png");
                g.drawImage(i, w/2, h/2, (Graphics.VCENTER|
Graphics.HCENTER));
            } catch (java.io.IOException e) {
                g.setColor(255, 255, 255);
                g.setStrokeStyle(Graphics.SOLID);
                g.drawString("Error al leer java.png", 0, h/2,
(Graphics.BASELINE|Graphics.LEFT));
            }
        }
    };
    c = new Command("Salir", Command.EXIT, 3);
    ca.addCommand(c);
    ca.setCommandListener(this);
}
protected void startApp( ) {
    d.setCurrent(ca);
}
protected void pauseApp( ) { }
protected void destroyApp(boolean b) { }
public void commandAction(Command co, Displayable di) {
    if (co == c) {
        destroyApp(true);
        notifyDestroyed();
    } else d.setCurrent(new Alert("", "Otro comando digitado...", null,
AlertType.ERROR));
}
}
//*****

```

EJEMPLO 16. Ejemplo para mover un cuadro.

```

import javax.microedition.midlet.*;
import javax.microedition.lcdui.*;
public class MueveTeclaME extends MIDlet implements CommandListener {
    private Display d;
    private Command cs;
    private Canvas ca;
    public MueveTeclaME( ) {
        d = Display.getDisplay(this);
        ca = new Canvas() {
            private int x=0, y=0;
            public void paint (Graphics g){
                g.setColor(255, 255, 255);
                g.fillRect(0, 0, getWidth(), getHeight());
                g.setColor(255, 0, 0);
                g.setStrokeStyle(Graphics.SOLID);
                g.fillArc(x, y, 50, 50, 0, 360);
                g.drawString("x="+x+", y="+y, getWidth()/2,
getHeight()/2, 0);
            }
        }
    }
}

```

```

        protected void keyPressed(int k) {
            int up = getKeyDownCode(UP);
            int dn = getKeyDownCode(DOWN);
            int lf = getKeyDownCode(LEFT);
            int rt = getKeyDownCode(RIGHT);
            if (k == up) { if(y>0) y-=1; repaint(); }
            else if (k == dn) { if(y<getWidth()) y+=1; repaint(); }
            else if (k == lf) { if(x>0) x-=1; repaint(); }
            else if (k == rt) { if(x<getHeight()) x+=1; repaint(); }
        }
    };
    cs = new Command("Salir",Command.EXIT, 3);
    ca.addCommand(cs);
    ca.setCommandListener(this);
}
protected void startApp( ) {
    d.setCurrent(ca);
}
protected void pauseApp( ) { }
protected void destroyApp(boolean b) { }
public void commandAction(Command co, Displayable di) {
    if (co == cs) {
        destroyApp(true);
        notifyDestroyed();
    } else d.setCurrent(new Alert("", "Otro comando digitado...", null,
AlertType.ERROR));
}
}
//*****

```

EJEMPLO 17. Una animación de una pelota con un objeto fillArc().

```

import javax.microedition.lcdui.*;
import javax.microedition.midlet.*;
import javax.microedition.lcdui.game.GameCanvas;
public class Rebota extends MIDlet {
    Display d;
    Pantalla p;
    public Rebota() {
        d = Display.getDisplay(this);
        p = new Pantalla();
    }
    protected void destroyApp(boolean b) throws MIDletStateChangeException{ }
    protected void pauseApp() { }
    protected void startApp() throws MIDletStateChangeException {
        d.setCurrent(p);
    }
}
class Pantalla extends GameCanvas implements Runnable{
    int x = 0, y = 0;
    int velx = 6, vely = 4;
    public Pantalla(){
        super(true);
        Thread t=new Thread(this);
        t.start();
    }
    public void paint(Graphics g) {
        g.setColor(255, 255, 210);
        g.fillRect(0, 0, getWidth(), getHeight());
        g.setColor(0, 255, 2);
        g.fillArc(x, y, 30, 30, 0, 360);
    }
}

```

```

    }
    public void run() {
        while(true){
            x = x + velx;
            y = y + vely;
            repaint();
            if( x+30 > getWidth() || x < 0 ) velx = -velx;
            if( y+30 > getHeight() || y < 0 ) vely = -vely;
            try {
                Thread.sleep(50);
                flushGraphics();
            } catch (InterruptedException e) {
                e.printStackTrace();
            }
        }
    }
}
//*****

```

EJEMPLO 18. Cargar música midi.

Investigar, el uso de MMAPAPI (Mobile Media API):

```

import java.io.*;
import javax.microedition.media.*;
:
:
try {
    InputStream ins = getClass().getResourceStream("jazz.mid");
    Player p = Manager.createPlayer(ins,"audio/midi");
    p.setLoopCount(5);
    p.start();
} catch (Exception e) { ... }
:
:

```