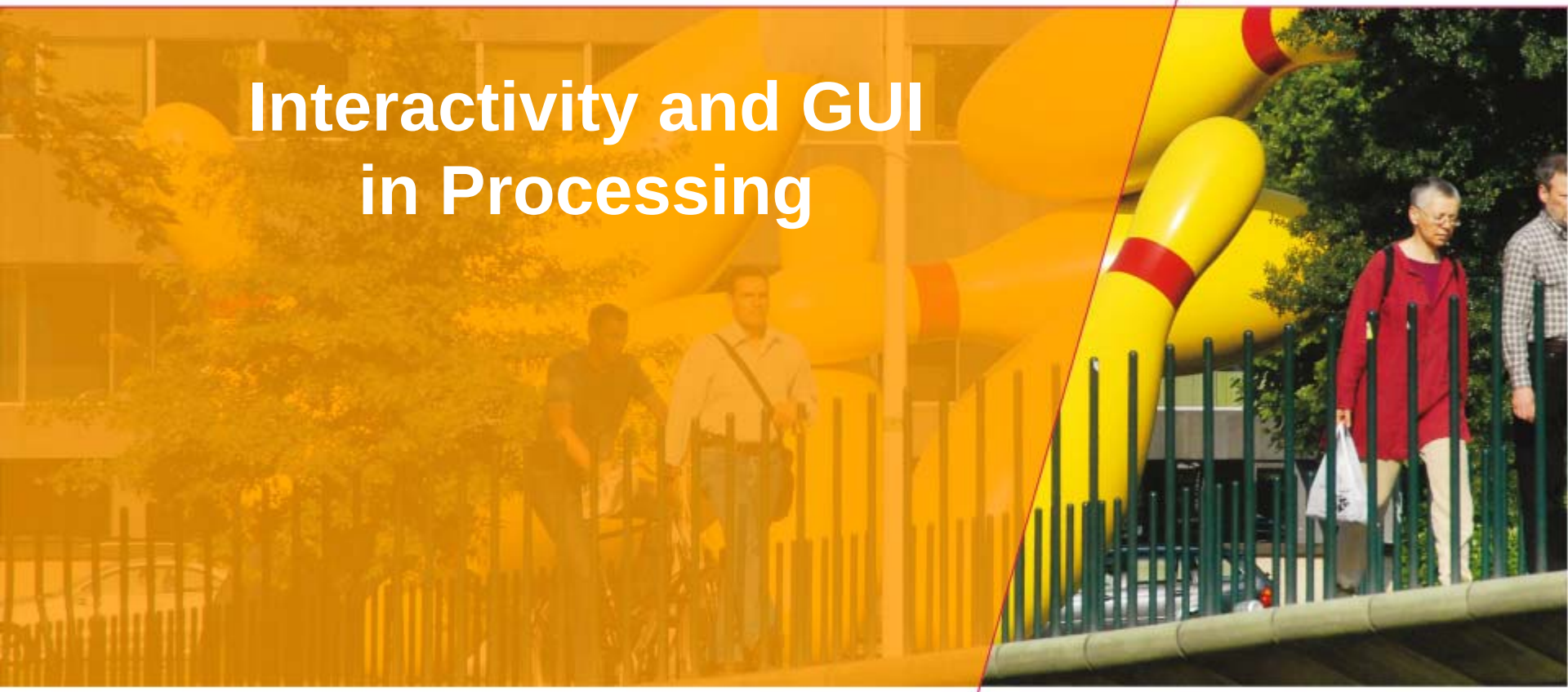
Interactivity and GUI in Processing



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Where innovation starts

Content

- User input in Processing
  - Mouse
  - Keyboard
- controlP5, a GUI library
  - Bang
  - Button
  - Toggle
  - Radio buttons
  - Numberbox
  - Slider
  - Textfield
  - Textlabel

Preparation

- First prepare your computer and the robot. Instructions:
  - http://wiki.id.tue.nl/creapro/SoftwareEnvironment
- Download GUIExamples.zip, extract it into your sketchbook location.
  - (Find the location in Processing, Menu File>Preferences)
- Run 2 sketches, check whether everything is in order:

1. Test\controlP5Test. You should see “controlP5 is OK” in the stage.
2. Test\AdMoVeoTest. Remember set the COM port first.

   You should see the stage the AdMoVeo LED changing color when move an object close to/away from the left distance sensor.

User input in Processing
Mouse

- System variables: mouseX and mouseY
  - contain the current coordinate of the mouse.
  - Load example: Mouse\mouseXmouseY:

```
void draw(){
  background(128);
  line(0,0, mouseX, mouseY);
}
```

User input in Processing
Mouse

- System variables: pmouseX and pmouseY
  - contain the coordinate of the mouse in the frame previous to the current one.
  - Load example: Mouse\mouse_pmouseXpmouseY:

```
void draw(){
  background(204);
  line(mouseX, 20, pmouseX, 80);
}
```

User input in Processing
Mouse

- System variables: pmouseX and pmouseY
  - contain the coordinate of the mouse in the frame previous to the current one.
  - Load example: Mouse\pmouseXpmouseY:

```
void draw(){
  background(204);
  line(mouseX, 20, pmouseX, 80);
}
```

User input in Processing
Mouse

- System variable: mousePressed
  - true if a mouse button is pressed; false if a button is not pressed
  - Load example: Mouse\mousePressedVariable :

```
void draw() {
  background(204);
  if (mousePressed == true) {
    fill(0);
  } else {
    fill(255);
  }
  rect(mouseX-10, mouseY-10, 20, 20);
}
```

User input in Processing
Mouse

- System variable: mouseButton
  - either **LEFT**, **RIGHT**, or **CENTER** depending on which button is pressed.
  - Load example: Mouse\mouseButton :

```
void draw() {
  background(204);
  if (mousePressed == true & mouseButton == LEFT) {
    fill(0,255,0);
  }
  else if (mousePressed == true & mouseButton == RIGHT) {
    fill(255,0,0);
  }
  else {
    fill(255,255,255);
  }
  rect(mouseX-10, mouseY-10, 20, 20);
}
```

User input in Processing
Mouse

- Event: mousePressed()
  - called once after every time a mouse button is pressed.
  - Load example: Mouse\mousePressedEvent :

```
void draw() {
  background(204);
  rect(mouseX-10, mouseY-10, 20, 20);
}

void mousePressed(){
  if (mouseButton == LEFT) {
    fill(0,255,0);
  }
  else if (mouseButton == RIGHT) {
    fill(255,0,0);
  }
  else {
    fill(255,255,255);
  }
}
```

Should have the same behavior as previous one.

Something is different.

User input in Processing
Mouse

- Event: mouseReleased()
  - called every time a mouse button is released.
  - Load example: Mouse\mouseReleased :

```
void draw() {
  background(204);
  rect(mouseX-10, mouseY-10, 20, 20);
}

void mousePressed(){
  if (mouseButton == LEFT) {
    fill(0,255,0);
  }
  else if (mouseButton == RIGHT) {
    fill(255,0,0);
  }
}
```

```
void mouseReleased(){
  fill(255,255,255);
}
```

User input in Processing
Mouse

- Event: mouseMoved
  - called every time the mouse moves and a mouse button is not pressed.
  - Load example: Mouse\mouseMoved :

```
int value = 0;

void draw() {
  fill(value);
  rect(25, 25, 50, 50);
}

void mouseMoved() {
  value = value + 5;
  if (value > 255) {
    value = 0;
  }
}
```

User input in Processing
Mouse

- Event: mouseDragged
  - called once every time the mouse moves and a mouse button is pressed.
  - Load example: Mouse\mouseDragged :

```
int value = 0;

void draw() {
  fill(value);
  rect(25, 25, 50, 50);
}

void mouseDragged()
{
  value = value + 5;
  if (value > 255) {
    value = 0;
  }
}
```

User input in Processing Keyboard

System Variables		
key	**keyCode**: if(Key == CODED)	**keyPressed**
‘A’, ‘B’, …’Z’, ‘a’,’b’,…’z’, ‘0’,’1’,…’9’, ‘`’,’~’,’!’,’@’…’?’ etc.	BACKSPACE, TAB, ENTER, RETURN, ESC, DELETE, UP, DOWN, LEFT, RIGHT, ALT, CONTROL, SHIFT.	true false

Events
keyPressed() keyReleased()

User input in Processing Keyboard

- Load example: Keyboard\keyPressedVariable

```
void draw() {
  if(keyPressed) {
    if (key == 'b' || key == 'B') {
      fill(0);
    }
  }
  else {
    fill(255);
  }
  rect(25, 25, 50, 50);
}
```

User input in Processing Keyboard

- Load example: Keyboard\keyPressedEvent

```
int fillVal = 126;

void draw() {
  fill(fillVal);
  rect(25, 25, 50, 50);
}

void keyPressed() {
  if (key == CODED) {
    if (keyCode == UP) {
      fillVal = fillVal<255 ? fillVal+5 : 255;
    }
    else if (keyCode == DOWN) {
      fillVal = fillVal>0 ? fillVal-5 : 0;
    }
  }
  else {
    fillVal = 126;
  }
}
```

GUI in Processing Libraries

- See http://processing.org/reference/libraries/index.html#interface
  - controlP5 : “highly recommended”.
  - Interfascia: Not really completed.
  - MyGUI: Poor documentation
  - SpringGUI: Based on Java AWT. Problems in the “stage”.

GUI in Processing Libraries

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- Next we will continue with both visuals and AdMoVeo.

controlP5 Framework

nameOfTheCompoent:
- identifies the component,
- is the default label
- defines the name of the callback function

```
//first import the controlP5 library
import controlP5.*;

//Define an ControlP5 varialbe.
ControlP5 controlP5;

void setup() {
  //create a top level control manager
  controlP5 = new ControlP5(this);

  //add GUI components to the manager
  controlP5.add<Component>("nameOfTheComponent", param1, param2, ... paramn);

 //and if necessary, change the default properties of the component
  controlP5.controller("nameofTheComponent").setLabel("This is the new label");
}

void draw() {
  //draw as usual
}

// callback when an action is performed with the component "nameOfTheComponent“
void nameOfTheComponent([<Type> <value>]) {
  //do something...
}
```

controlP5
Bang

- addBang(theName, theX, theY, theWidth, theHeight);
- Load example: controlP5\firstBang

```
import controlP5.*;
ControlP5 controlP5;
float x=200, y = 200;

void setup() {
  size(400, 400);

  controlP5 = new ControlP5(this);
  controlP5.addBang("firstBang", 10, 10, 40, 20 );
}

void draw() {
  background(0);
  fill(255);
  ellipse(x,y, 40, 40);
}

void firstBang() {
   x=random(400); y=random(400);
}
```

controlP5
Bang

- Load example: controlP5\secondBang

```
import controlP5.*;

ControlP5 controlP5;
color c = color(0,0,0);
void setup() {
  size(400, 400);
  controlP5 = new ControlP5(this);
  controlP5.addBang("firstBang", 10, 10, 40, 20 );
  controlP5.addBang("secondBang", 10, 60, 40, 20 );
  controlP5.controller("firstBang").setLabel("Red");
  controlP5.controller("secondBang").setLabel("Blue");
}

void draw() {
  background(c);
}

void firstBang() {
   c = color(255,0,0);
}

void secondBang() {
  c = color(0,0,255);
}
```

controlP5
Bang

- Load example: controlP5\thirdBangRobot

```
import nl.tue.id.creapro.admoveo.*;
import processing.serial.*;
import controlP5.*;

ControlP5 controlP5;
AdMoVeo admoveo;
color c = color(0,0,0);

void setup() {
  size(400, 400);
  admoveo = new AdMoVeo(this, "COM11");
  controlP5 = new ControlP5(this);
  controlP5.addBang("red", 10, 10, 40, 20 );
  controlP5.addBang("green", 10, 50, 40, 20);
  controlP5.addBang("blue", 10, 90, 40, 20 );
}

void draw() {
  background(c);
}

(cont.)
```

controlP5
Bang

- Load example: controlP5\thirdBangRobot (cont.)

```
void red() {
   c = color(255,0,0);
   admoveo.getRedLed().setPower(255);
   admoveo.getGreenLed().setPower(0);
   admoveo.getBlueLed().setPower(0);
}

void green() {
  c = color(0,255,0);
   admoveo.getRedLed().setPower(0);
   admoveo.getGreenLed().setPower(255);
   admoveo.getBlueLed().setPower(0);
}

void blue(){
  c = color(0,0,255);
   admoveo.getRedLed().setPower(0);
   admoveo.getGreenLed().setPower(0);
   admoveo.getBlueLed().setPower(255);
}
```

controlP5 Button

- addButton(theName, theValue, theX, theY, theW, theH);
- Load example: controlP5\button

```
import controlP5.*;

ControlP5 controlP5;
int c = 128;
void setup() {
  size(400, 400);
  controlP5 = new ControlP5(this);
  controlP5.addButton("black", 0, 10, 10, 40, 20 );
  controlP5.addButton("grey", 128, 10, 50, 40, 20);
  controlP5.addButton("white", 255, 10, 90, 40, 20 );
}

void draw() {
  background(c);
}

void black(float value) { c = (int)value; }

void grey(float value) { c = (int)value; }

void white(float value){ c = (int)value; }
```

controlP5
Toggle

- addToggle(theName, theDefaultValue, theX, theY, theWidth, theHeight);
- Load example: controlP5\toggle

```
import controlP5.*;

ControlP5 controlP5;
int c = 0;
boolean isRound = false;
void setup() {
  size(400, 400);
  controlP5 = new ControlP5(this);
  controlP5.addToggle("on", false, 10, 10, 10, 10 );
  controlP5.addToggle("round", false, 50,10,10,10 );
}

void draw() {
  background(204);
  fill(c);
  if(isRound)
    ellipse(200,200,200,200);
  else
    rect(100,100,200,200);
}
```

```
void on(boolean value) {
   if(value) c = 255;
   else c = 0;
}

void round(boolean value) {
  isRound = value;
}
```

controlP5
Radio buttons

- addRadio(theName, theX, theY);
- Load example: controlP5\radio

```
import controlP5.*;
ControlP5 controlP5;
color c = color(255,0,0);
void setup() {
  size(400, 400);
  controlP5 = new ControlP5(this);
  Radio r = controlP5.addRadio("myradio", 10,10);
  r.addItem("red", 0);
  r.addItem("green", 1);
  r.addItem("blue", 2);
}
void draw() {
  fill(c); rect(100,100,200,200);
}
void myradio(int value) {
  switch(value){
    case 0: c = color(255,0,0); break;
    case 1: c = color(0,255,0); break;
    case 2: c = color(0,0,255); break;
  }
}
```

controlP5 Numberbox

- addNumberbox(theName, theDefaultValue, theX, theY, theWidth, theHeight);
- Load example: controlP5\numberbox

```
import controlP5.*;

ControlP5 controlP5;
int c = 128;
void setup() {
  size(400, 400);
  controlP5 = new ControlP5(this);
  controlP5.addNumberbox("wierdbox", 128, 10,10, 80, 15);
}

void draw() {
  fill(c); rect(100,100,200,200);
}

void wierdbox(int value) {
 if(value>255) c = 255;
 else if(value<0) c = 0;
 else c = value;
}
```

controlP5
Slider

- addSlider(theName, theMin, theMax, theDefaultValue, theX, theY, theW, theH);
- Load example: controlP5\slider

```
import controlP5.*;

ControlP5 controlP5;
int c = 128;
void setup() {
  size(400, 400);
  controlP5 = new ControlP5(this);
  controlP5.addSlider("mygod", 0, 255, 128, 10, 10, 200, 15);
}

void draw() {
  fill(c); rect(100,100,200,200);
}

void mygod(int value) {
   c = value;
}
```

controlP5
Slider

- Load example: controlP5\sliderRobot

```
ControlP5 controlP5;
AdMoVeo admoveo;
Slider s;

int c = 0;
void setup() {
  size(400, 400);
  admoveo = new AdMoVeo(this, "COM11");
  admoveo.getLeftLightSensor().enable();
  controlP5 = new ControlP5(this);
  s = controlP5.addSlider("mygod", 0, 255, 0, 10, 10, 200, 15);
}

void draw() {
  fill(0, 0, c); rect(100,100,200,200);
}

void mygod(int value) {
   c = value;
}

void inputAvailable(Sensor sensor, int oldValue, int newValue){
  c = newValue/4;
  s.setValue(c);
}
```

controlP5
Textfield

- addTextfield(theName, theX, theY, theW, theH);
- Load example: controlP5\textfield

```
import controlP5.*;

ControlP5 controlP5;
int c = 128;
void setup() {
  size(400, 400);
  controlP5 = new ControlP5(this);
  controlP5.addTextfield("eindhoven", 10, 10, 200, 20);
}

void draw() {
  fill(c); rect(100,100,200,200);
}

void eindhoven(String value) {
   println(value);
   c = int(value);
}
```

controlP5 Textlabel

- addTextlabel(theName, theText, theX, theY);
- Load example: controlP5\textlabel

```
import controlP5.*;

ControlP5 controlP5;
int c = 128;
Textlabel label;
void setup() {
  size(400, 400);
  controlP5 = new ControlP5(this);
  controlP5.addTextfield("eindhoven", 10, 10, 200, 20);
  label = controlP5.addTextlabel("delft","Now, type something, or try a number", 10, 60);
}

void draw() {
  background(64);
  fill(c); rect(100,100,200,200);
}

void eindhoven(String value) {
   label.setValue(value);
   c = int(value);
}
```

ControlP5

- More at: http://www.sojamo.de/libraries/controlP5/