CS1013 – Programming Project

Dr. Gavin Doherty
ORI LG.19
Gavin.Doherty@cs.tcd.ie

Trinity College Dublin

DSG
Distributed Systems Group

Button Widget class

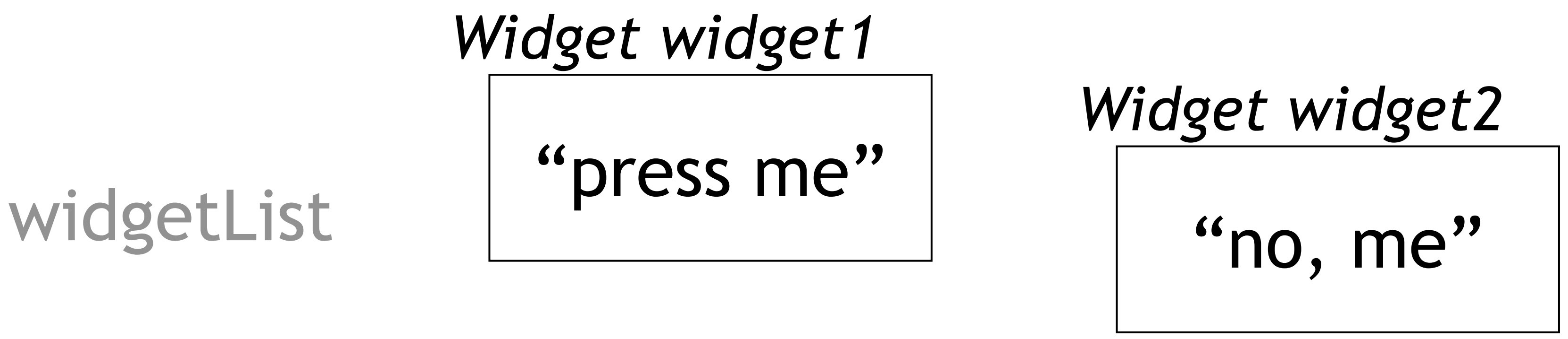
```
class Widget {
  int x, y, width, height;
  String label; int event;
  color widgetColor, labelColor;
  PFont widgetFont;

  Widget(int x,int y, int width, int height, String label,
  color widgetColor, PFont widgetFont, int event){
    this.x=x; this.y=y; this.width = width; this.height= height;
    this.label=label; this.event=event;
    this.widgetColor=widgetColor; this.widgetFont=widgetFont;
    labelColor= color(0);
   }
  void draw(){
    fill(widgetColor);
    rect(x,y,width,height);
    fill(labelColor);
    text(label, x+10, y+height-10);
  }
  int getEvent(int mX, int mY){
     if(mX>x && mX < x+width && mY >y && mY <y+height){
        return event;
     }
     return EVENT_NULL;
  }
}
```

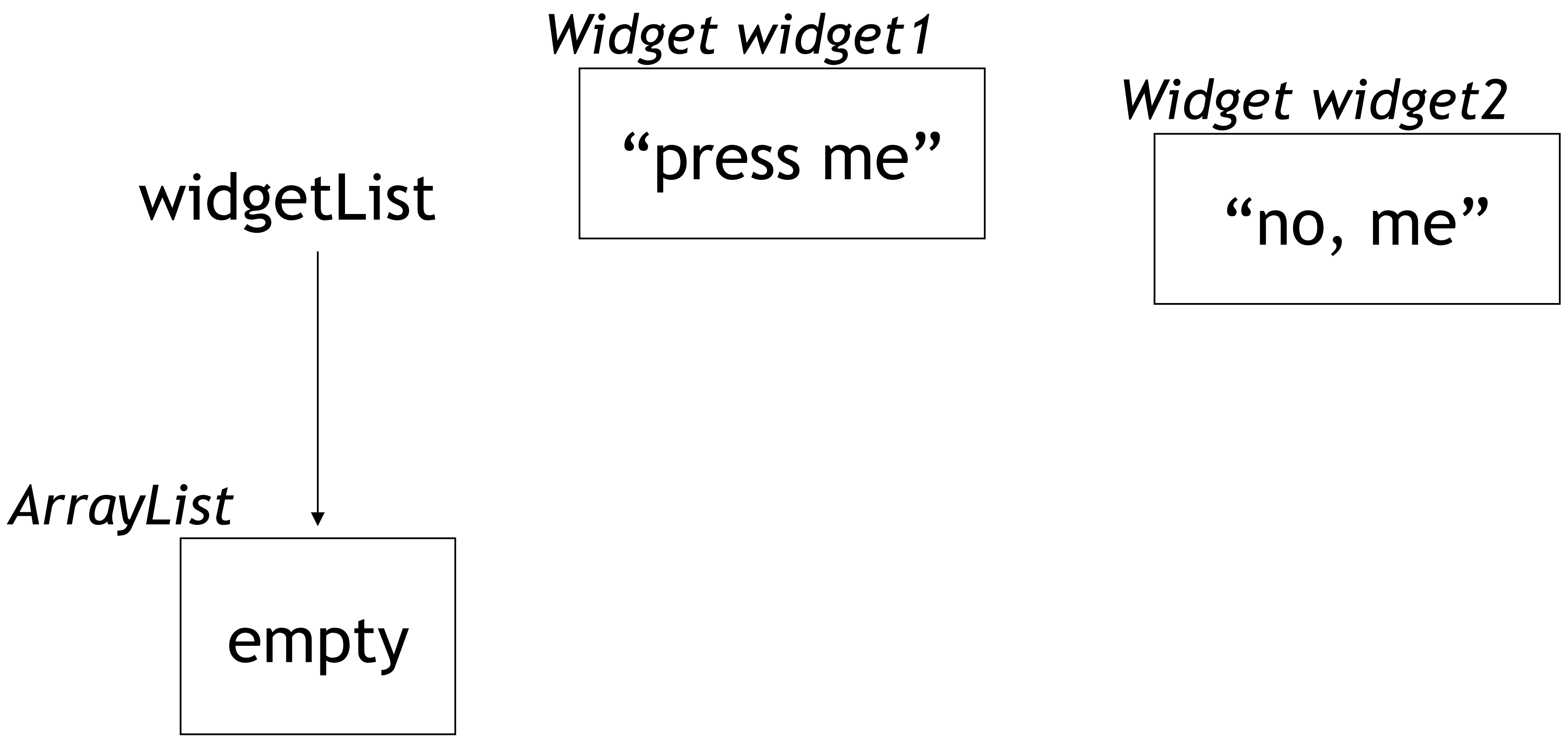
ArrayList of Widgets

```
ArrayList widgetList;
PFont stdFont;
final int EVENT_BUTTON1=1;
final int EVENT_BUTTON2=2;
final int EVENT_NULL=0;
void setup(){
  Widget widget1, widget2;
  size(400, 400);
  stdFont=loadFont("Chiller-Regular-36.vlw"); textFont(stdFont);
  widget1=new Widget(100, 100, 100, 40,
                    "press me!", color(100), stdFont, EVENT_BUTTON1);
  widget2=new Widget(100, 200, 100, 40,
                    "no, me!", color(150), stdFont, EVENT_BUTTON2);
  widgetList = new ArrayList();
  widgetList.add(widget1); widgetList.add(widget2);
}
void draw(){
  for(int i = 0; i<widgetList.size(); i++){
     Widget aWidget = (Widget) widgetList.get(i);
     aWidget.draw();
  }
}
```

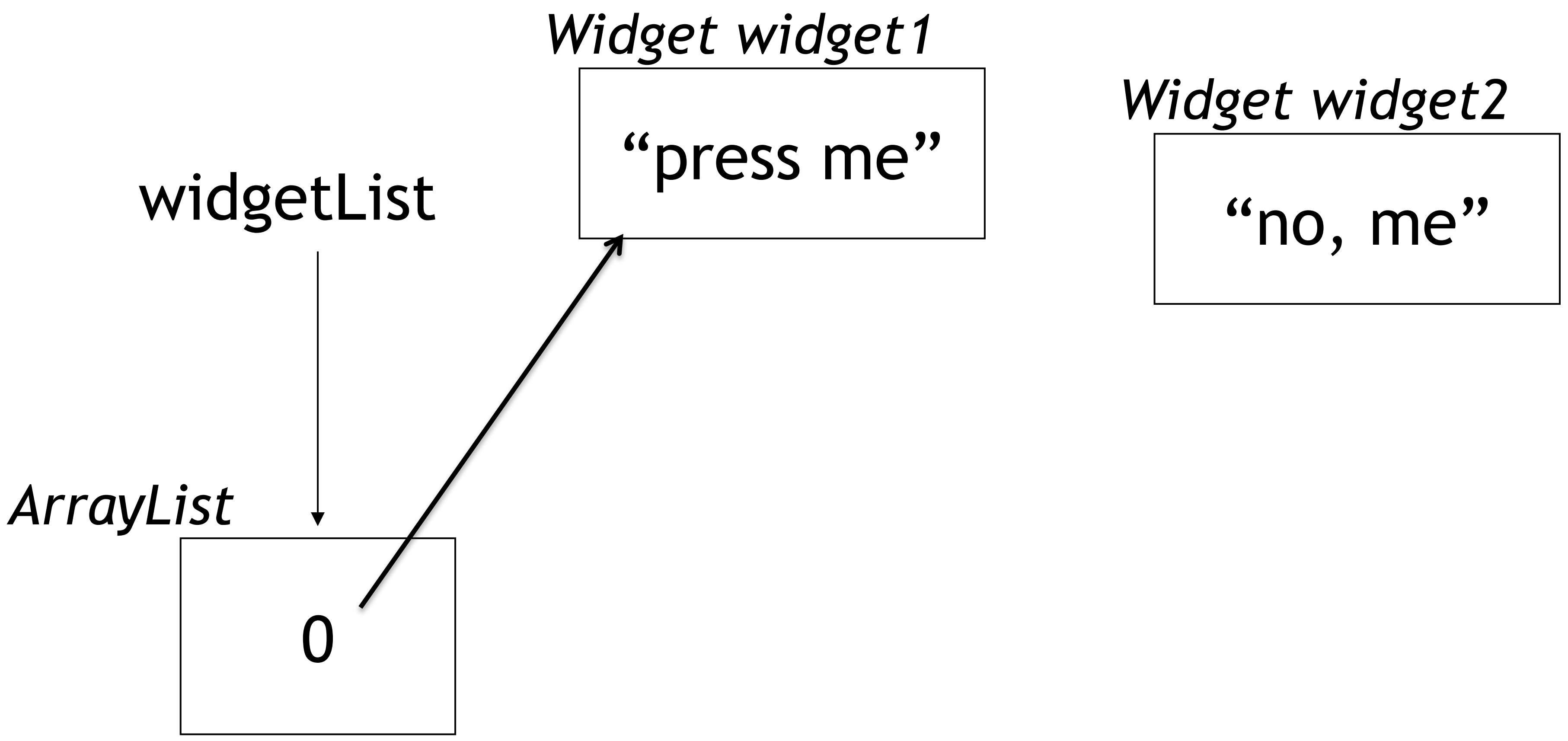
Constructing the list



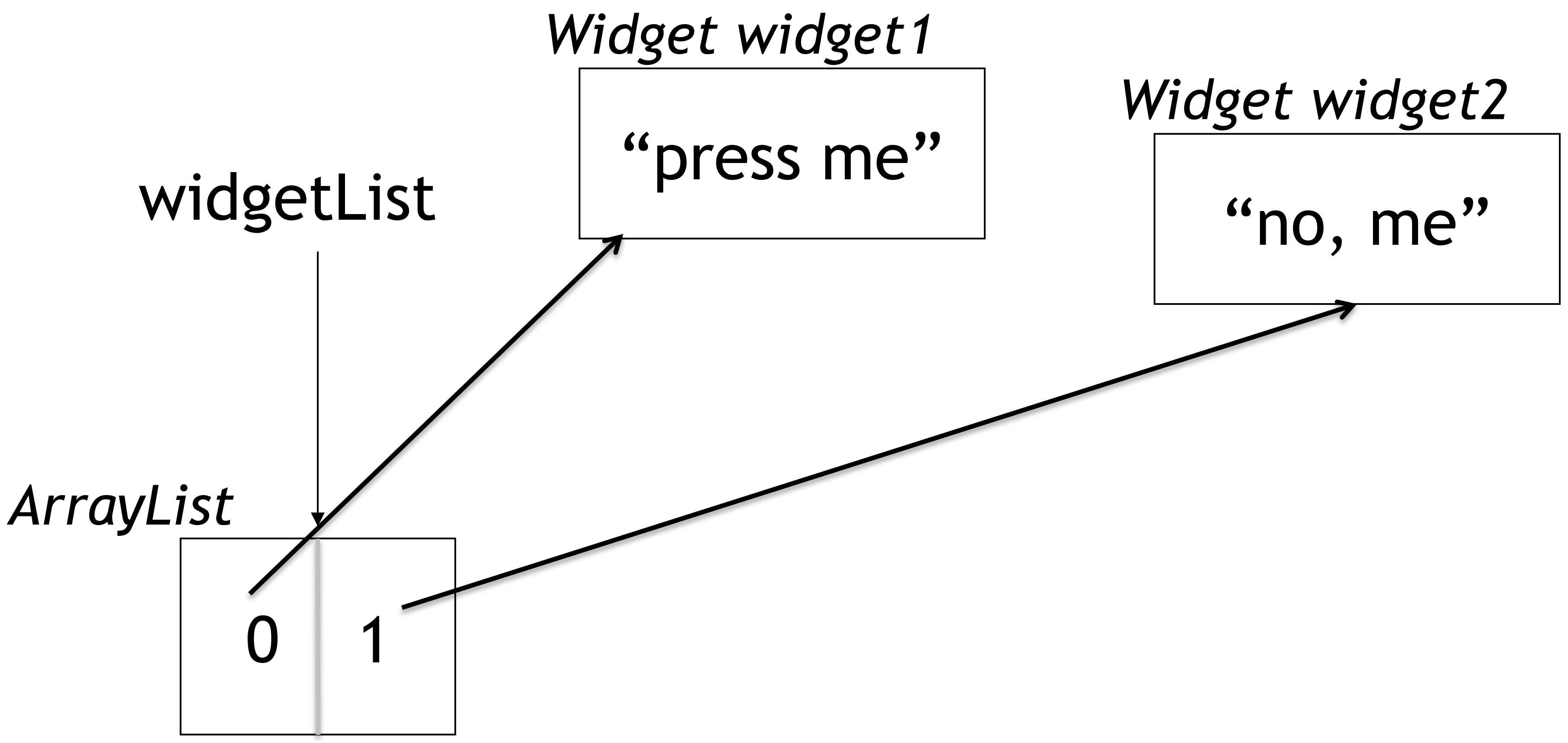
Constructing the list



Constructing the list



Constructing the list



Input handling

```
void mousePressed(){
  int event;

  for(int i = 0; i<widgetList.size(); i++){
    Widget aWidget = (Widget) widgetList.get(i);
      event = aWidget.getEvent(mouseX,mouseY);
      switch(event) {
        case EVENT_BUTTON1:
          println("button 1!");
          break;
        case EVENT_BUTTON2:
          println("button 2!");
          break;
      }
  }
}
```

Exercise – Week 6

- Define a **Screen** class which contains an **ArrayList** of Widgets. The screen should have it's own background colour. Give **Screen** a ***getEvent*** method which returns an event (the Widget pressed), and define a ***draw*** method in **Screen** which draws the screen's widgets. Each screen has it's own background color.
- Create an ***addWidget*** method to add a widget to the ArrayList of the screen. Use your **Screen** class to write a program where there are two screens, and two buttons on each screen, one of the buttons on each screen should move you forward and back through the different screens as illustrated below. You can do this by creating two instances of Screen. Pressing the other button should result in some text output from `println` that that button has been pressed. *Hint: you can create an extra Screen variable currentScreen which keeps track of the current screen – i.e. one of the existing instances.*
- Your mousePressed method in the main program will no longer require a loop (Screen should provide a `getEvent()` method), but should still deal with the different events.

Program with two screens

- Pseudo-code:
- setup:
  - create screen 1.
  - add widgets to screen 1.
  - create screen 2
  - add widgets to screen 2
  - set current screen to screen 1
- draw:
  - ask current screen to draw itself
- mousepressed:
  - ask current screen if any of it’s widgets have been pressed.
  - if so, take appropriate action for that event

Screen class

```
class Screen {

  ArrayList screenWidgets;
  color screenColor;

  Screen(color in_color){
    screenWidgets=new ArrayList();
    screenColor=in_color;
  }
  void add(Widget w){
    screenWidgets.add(w);
  }
void draw(){
    background(screenColor);
    for(int i = 0; i<screenWidgets.size(); i++){
      Widget aWidget = (Widget)screenWidgets.get(i);
      aWidget.draw();
    }
  }
  int getEvent(int mx, int my){
    for(int i = 0; i<screenWidgets.size(); i++){
      Widget aWidget = (Widget) screenWidgets.get(i);
      int event = aWidget.getEvent(mouseX,mouseY);
      if(event != EVENT_NULL){
        return event;
      }
    }
    return EVENT_NULL;
  }

}
```

Main program

```
PFont stdFont;
final int EVENT_BUTTON1=1; final int EVENT_FORWARD=2;
final int EVENT_BUTTON2=3; final int EVENT_BACKWARD=4;
final int EVENT_NULL=0;
Widget widget1, widget2, widget3, widget4;
Screen currentScreen, screen1, screen2;
void setup(){
  stdFont=loadFont("Chalkboard-30.vlw");
  textFont(stdFont);
  widget1=new Widget(100, 100, 180, 40,
  "Button 1”, color(200, 0, 0), stdFont, EVENT_BUTTON1);
  widget2=new Widget(100, 200, 180, 40,
  "Forward", color(0, 200, 0), stdFont, EVENT_FORWARD);
  widget3=new Widget(100, 100, 180, 40,
  "Button 2", color(0,0,200), stdFont, EVENT_BUTTON2);
  widget4=new Widget(100, 200, 180, 40,
  "Backward", color(0,200,200), stdFont, EVENT_BACKWARD);
  size(400, 400);
  screen1 = new Screen(color(255));
  screen2 = new Screen(color(150));
  screen1.add(widget1);
  screen1.add(widget2);
  screen2.add(widget3);
  screen2.add(widget4);
  currentScreen = screen1;
}
void draw(){
  currentScreen.draw();
}
```

```
void mousePressed(){
  switch(currentScreen.getEvent(mouseX, mouseY)) {
  case EVENT_BUTTON1:
    println("button 1!");
    break;
  case EVENT_BUTTON2:
    println("button 2!");
    break;
  case EVENT_FORWARD:
    println("forward"); currentScreen = screen2;
    break;
  case EVENT_BACKWARD:
    println("backward"); currentScreen = screen1;
    break;
  }
}
```

Structure

To start with, we want to read in the data from file.

We'll need to put the data somewhere: what should you use to store the data?

Do we need 1 class or many classes?

Where should this code go?

Setup would be a reasonable place.

Extracting data

- We typically only want to look at a small portion of the data at once.
- So we want to define a number of queries on the data.
- Some queries will just select a smaller part of the dataset.
- Other queries will generate new information – eg. the average rating for a hotel. You will have to decide how to pass this information around within your program.
- Where will the queries be called?
- Generally in response to user input, but may have initial (default) displayed.

Rendering – this week’s task

- The data has been loaded in, the information we want has been extracted from it, now we want to draw it to the screen.
- We’ve already looked at drawing images, text, shapes.
- Where does this code go?
- Lots of different ways of displaying the information.

User Input

- In the outline program, you could just use `keyPressed()` and use the keyboard to invoke the different queries.
- After this could use something like Widget and widgetList classes from Week 6 to handle input.
- Could interact with the rendering itself, but this is more challenging.
- Various GUI libraries for processing are available. Might not be worth the effort for just a few buttons.

Main Program (Pseudo-code)

- Setup

```
read_in_the_file(); // done, week 1
result = default_query();
current_query = query3;// whatever type of query is default
```

- Draw

```
switch(current_query){
    case query1:
        render_query1(results); /week 2
        break;
    case query2:
        Etc…..
    }
render_controls();
```

Main Program (Pseudo-code)

- mousePressed()
  - Work out which button pressed

```
switch(event)
    case button 1:
        current_query = query1;
        results=query1();
        break;
    case button 2:
        current_query = query2;
        results=query2();
    Etc.
```

  - You may need several “results” variables for different types of data returned by different queries.

Rendering

- The way you draw results for the query depends on the type of query:
- Most rated (popular) hotel in a date range could be displayed as a bar chart, with hotel name, and number of times rated.
- Highest rated hotels in a date range could be displayed using combination of text and horizontal bar representing the average rating (between 1 and 10).

Classes

- You will have some classes representing the user interface widgets.
- You will have one or more classes for storing the data.
- You may also have classes representing the results of a query. Taking this approach, the class representing the query result might have a method to draw itself.

Outline of minimal code for tomorrow

- read in the csv file and store the data (in setup), as for last week.
- create a (fake) query result and set this to be the current query (in setup)
- write a method which will draw this query result as a bar chart.
- draw the results of this query as a bar chart (in draw), using the method you have defined.