

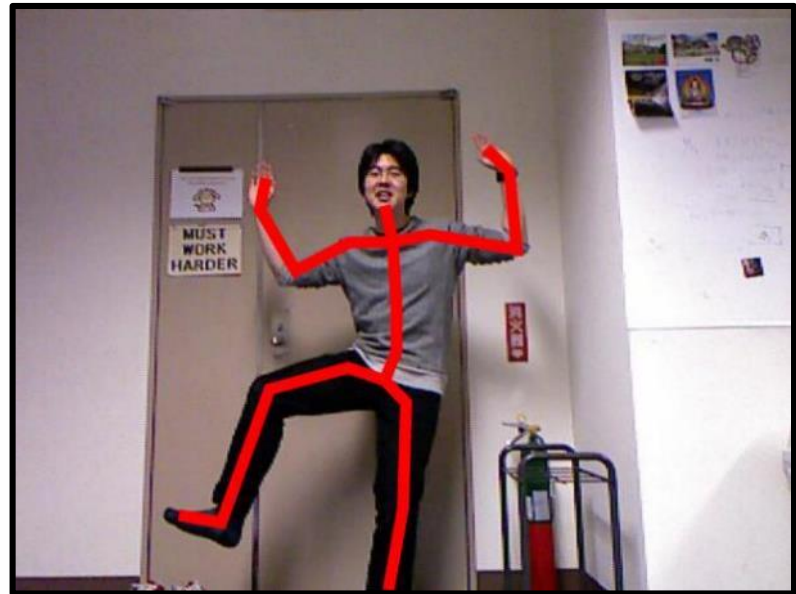
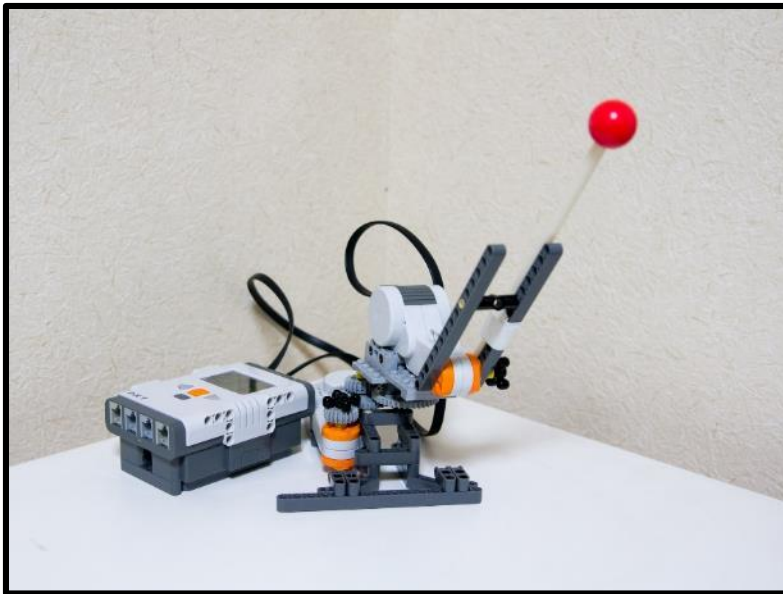
Picode:

Inline Photos Representing Posture Data in Source Code

JUN KATO, DAISUKE SAKAMOTO, TAKEO IGARASHI
IGARASHI LAB., THE UNIVERSITY OF TOKYO

BACKGROUND

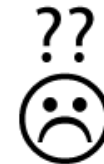
We deal with posture data
retrieved from robots or Kinect devices.



PROBLEMS

Raw posture data cannot be represented well in textual or symbolic representations.

```
HumanPose pose = new HumanPose(  
-0.0139, -0.0856, 2.2563, -0.0255, -0.0284, 2.3022, -0.0226, 0.2881, 2.2856, 0.012, 0.4823, 2.2662,  
-0.1898, 0.1982, 2.248, -0.4059, 0.2173, 2.2121, -0.393, 0.4257, 2.1835, -0.3946, 0.4749, 2.1794,  
0.1536, 0.1636, 2.3229, 0.3501, 0.1161, 2.3202, 0.4462, 0.3234, 2.3088, 0.4632, 0.3953, 2.3172,  
-0.0926, -0.1627, 2.2235, -0.0298, -0.5136, 2.1015, -0.0223, -0.7798, 2.0743, -0.0015, -0.8185, 1.9894,  
0.0693, -0.1669, 2.2707, 0.371, -0.3215, 2.0965, 0.5015, -0.6241, 2.0075, 0.5338, -0.6467, 1.9204  
);
```



```
HumanPose pose = PoseLibrary.query("Whoa");
```



CONTRIBUTION

Inline photos representing posture data
in text-based source code.

HumanPose pose =





INTEGRATED SUPPORT FOR PROGRAMMING WITH POSTURE DATA

BallShooter | Picode

Sketch File View

Run Stop

BallShooter

```
if (pose.eq()) {  
  showText("Got the command!");  
  
    
  nxt.setPose(  
}  
}
```

71 lines

Human Robot

My NXT (MindstormsNXT) Edit

both

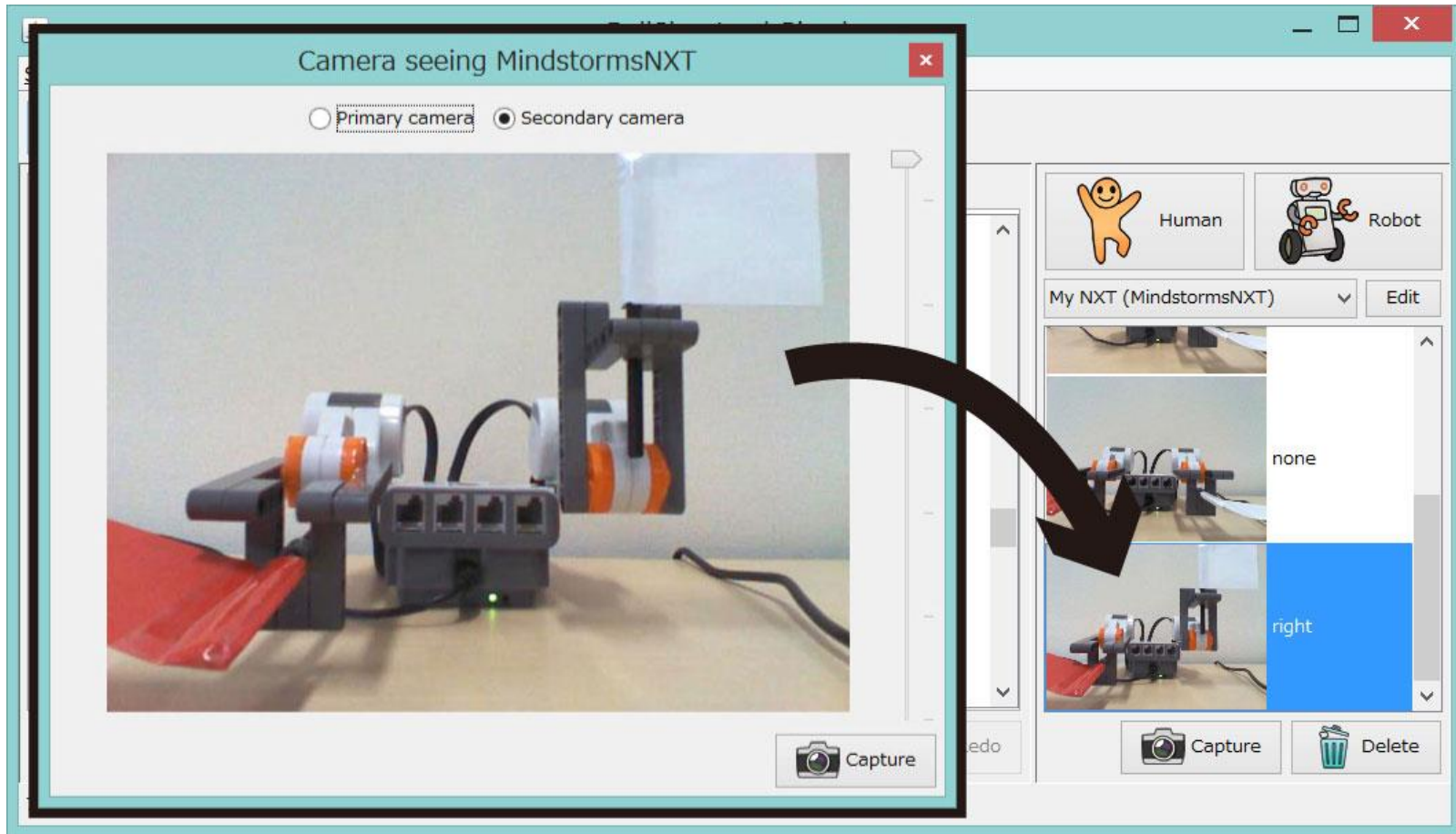
left

Capture Delete

Undo Redo

INTEGRATED SUPPORT (1)

CAPTURE A PHOTO WITH POSE DATA



INTEGRATED SUPPORT (2)



DRAW & DROP PHOTOS, WRITE CODE

BallShooter | Picode

Sketch File View

Run Stop

BallShooter

```
if (pose.eq()) {  
  showText("Got the command!");  
  
  nxt.setPose();  
}
```

Human Robot

My NXT (MindstormsNXT) Edit

none

right

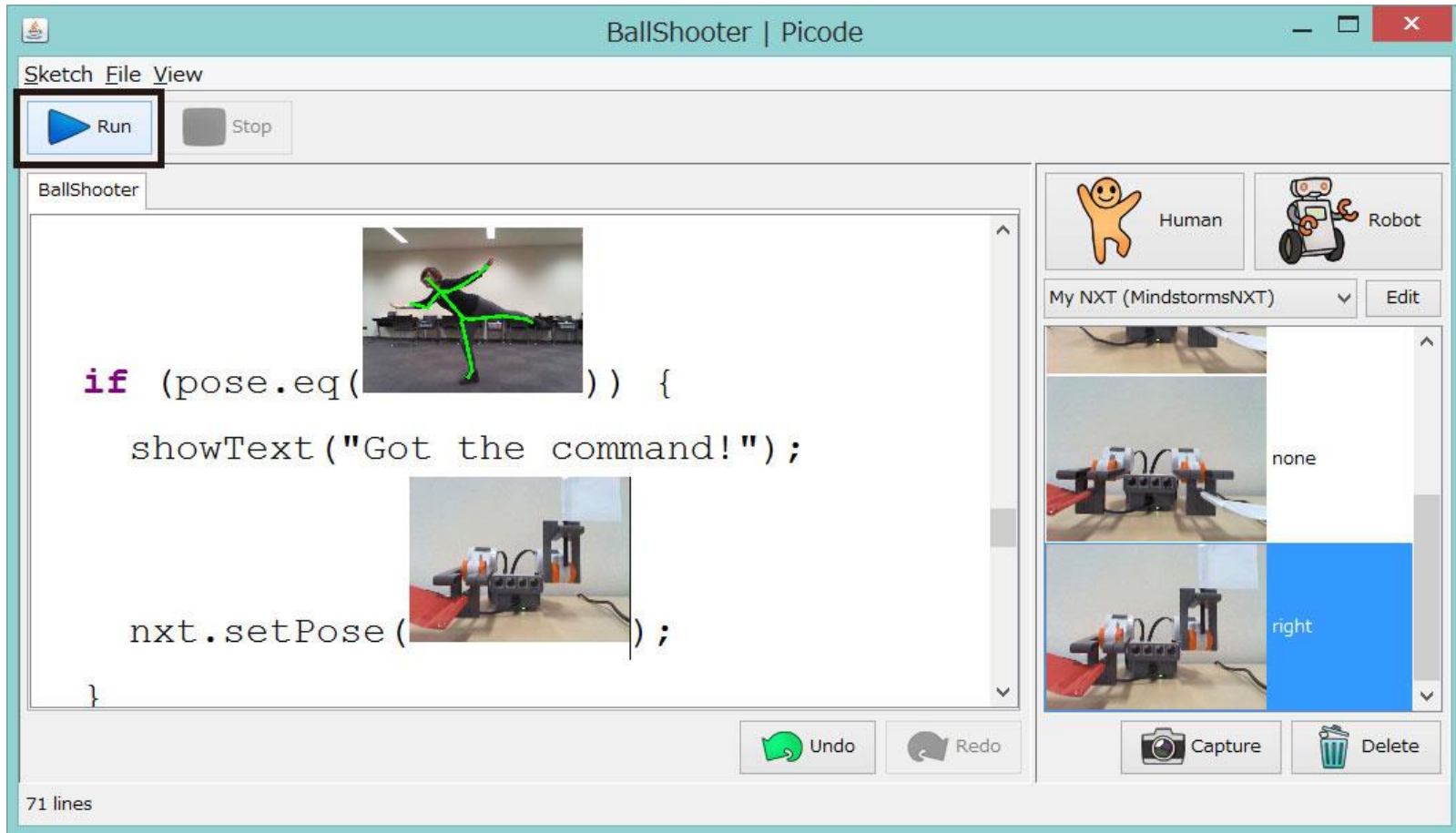
Undo Redo

Capture Delete

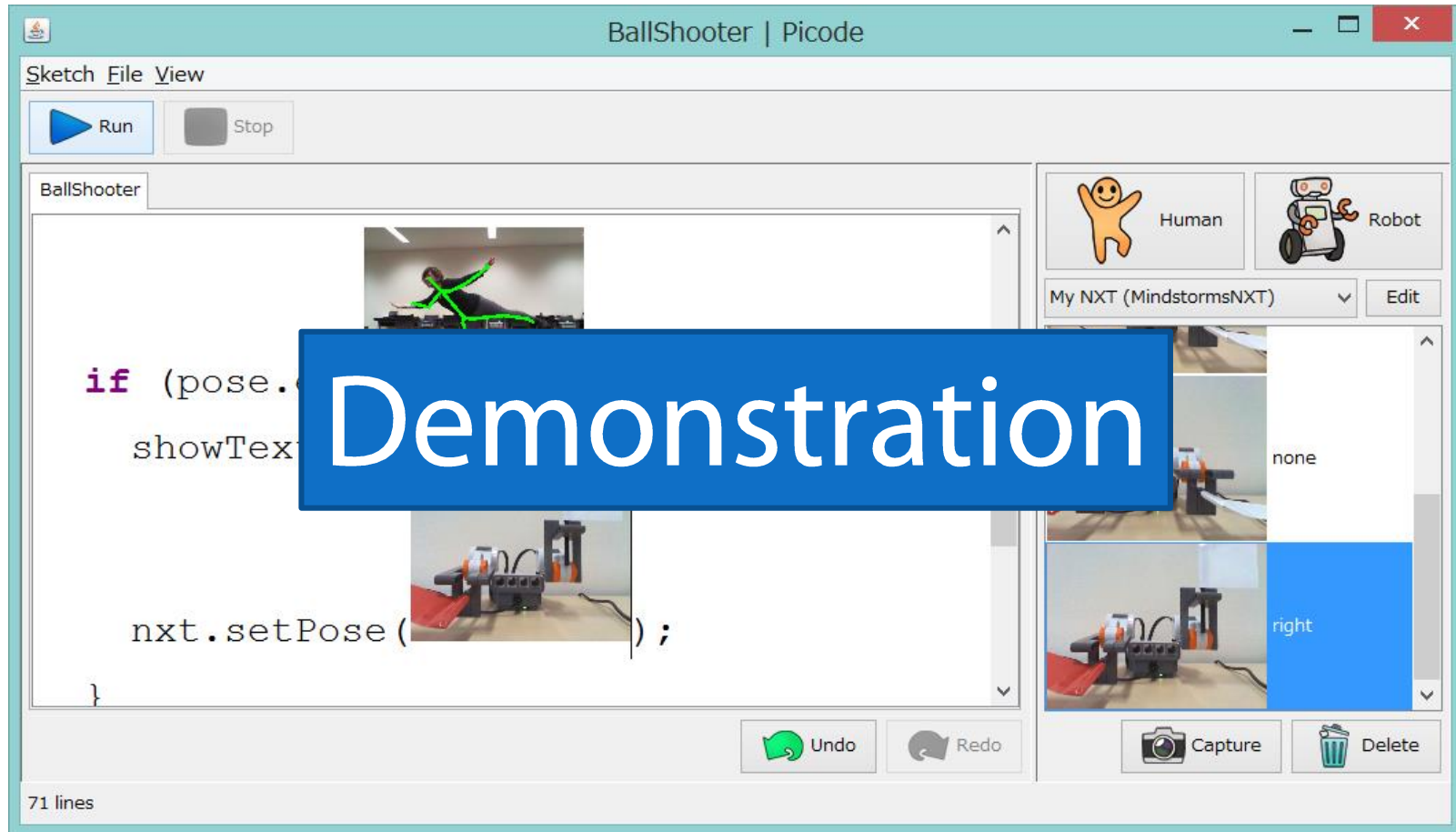
71 lines

INTEGRATED SUPPORT (3)

RUN THE PROGRAM



INTEGRATED SUPPORT FOR PROGRAMMING WITH POSTURE DATA



INPUT OR OUTPUT POSTURE DATA

Input: retrieve posture and compare it.

```
Pose pose = human.getPose();
```



```
if (pose.eq( )) { /* do sth */ }
```

Output: set posture.

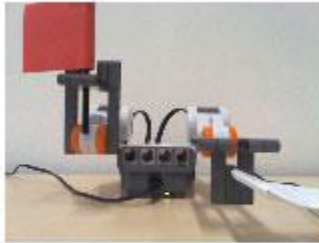


```
robot.setPose( );
```

INPUT OR OUTPUT POSTURE DATA

Output: play an action consisted of multiple poses.

```
Action a = robot.action();
```



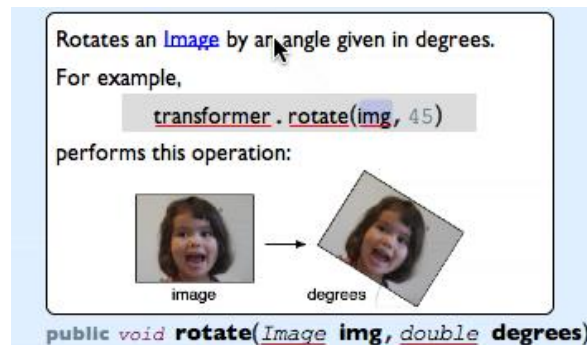
```
a = a.pose( ) .wait(100) .pose( ) ;  
a.play();
```



RELATED WORK:



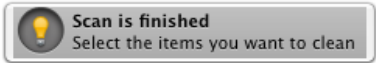

IMPROVEMENTS ON CODE EDITORS

Barista: augmenting code editors with visuals



[Ko et al., CHI '06]

Sikuli: GUI automation script with inline screenshot images

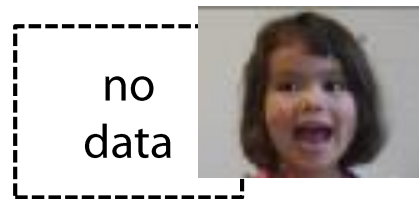
```
switchApp("CleanMyMac.app")
click()
click()
while not find():
    sleep(5)
click()
```

[Yeh et al., UIST'09]

RELATED WORK:

IMPROVEMENTS ON CODE EDITORS

Barista: no data behind an image



Sikuli: image data visualized as an image



Picode: posture data is associated with a photo



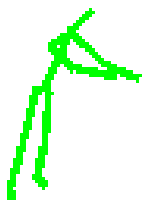
WHY PHOTOS? (1/2)

RICH CONTEXTUAL INFORMATION

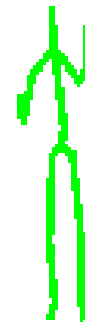
With photos



Without photos



20
23
0



WHY PHOTOS? (2/2)

CODE AS COMMUNICATION MEDIA

Mere text code

```
MindstormsNXT();
boolean flag = false;

void setup() {
  nxt = new MindstormsNXT();
  nxt.connect();

  // Show the preview window so that
  // CHI people can see the robot :)
  nxt.showCaptureFrame(true);
}

void draw() {

  // If the robot is handling a task, do nothing.
  if (nxt.isActing()) {
    return;
  }

  if (flag == true) {
    // If the flag is true
    nxt.setPose(Picode.pose("both"));
    flag = false;
  }
  else {
    // Otherwise, if the flag is false,
    nxt.setPose(Picode.pose("none"));
    flag = true;
  }
}
```

With inline photos



```
MindstormsNXT();
boolean flag = false;

void setup() {
  nxt = new MindstormsNXT();
  nxt.connect();

  // Show the preview window so that
  // CHI people can see the robot :)
  nxt.showCaptureFrame(true);
}

void draw() {

  // If the robot is handling a task, do nothing.
  if (nxt.isActing()) {
    return;
  }

  if (flag == true) {
    // If the flag is true
    
    nxt.setPose(Picode.pose("both"));
    flag = false;
  }
  else {
    // Otherwise, if the flag is false,
    
    nxt.setPose(Picode.pose("none"));
    flag = true;
  }
}
```


EVALUATION

Preliminary study:

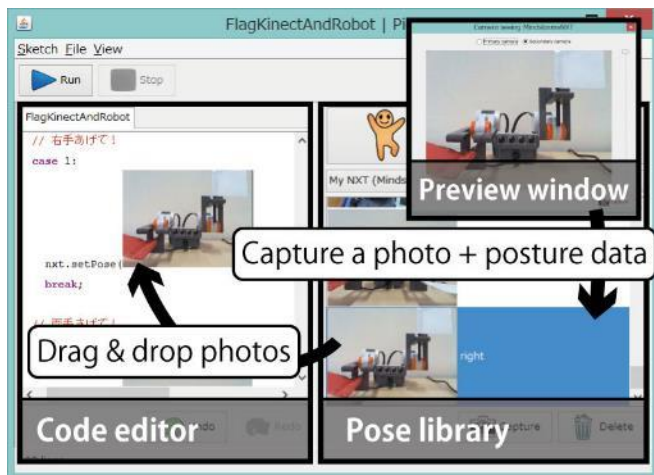
- Pair of a programmer and a non-programmer, together
- 2 hours of free use

Result:

- A non-programmer could take part in the dev process
- She felt the ownership by replacing photos by d&d
- Good starting point for learnable programming

CONCLUSION (AND GOOD NEWS FOR YOU)

- **Picode** augments a source code editor with **inline photos representing posture data**.
- Photos provides **rich contextual information**.
- They also work as a **communication medium** between programmers and non-programmers.



- **Picode is an open-source project** on GitHub available at <http://junkato.jp/picode/>
- Teachers' materials including pptx might be released. (YOUR help is needed!)