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Mobile application development

移动应用开发



Lecture 013: Convas and example



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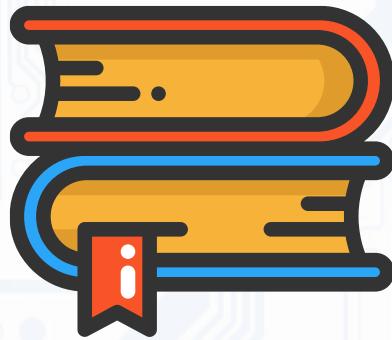
Prof Associate ,
School of information engineering Jiangxi
university of science and technology, China

Autumn _2021



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MOBILE APPLICATION DEVELOPMENT

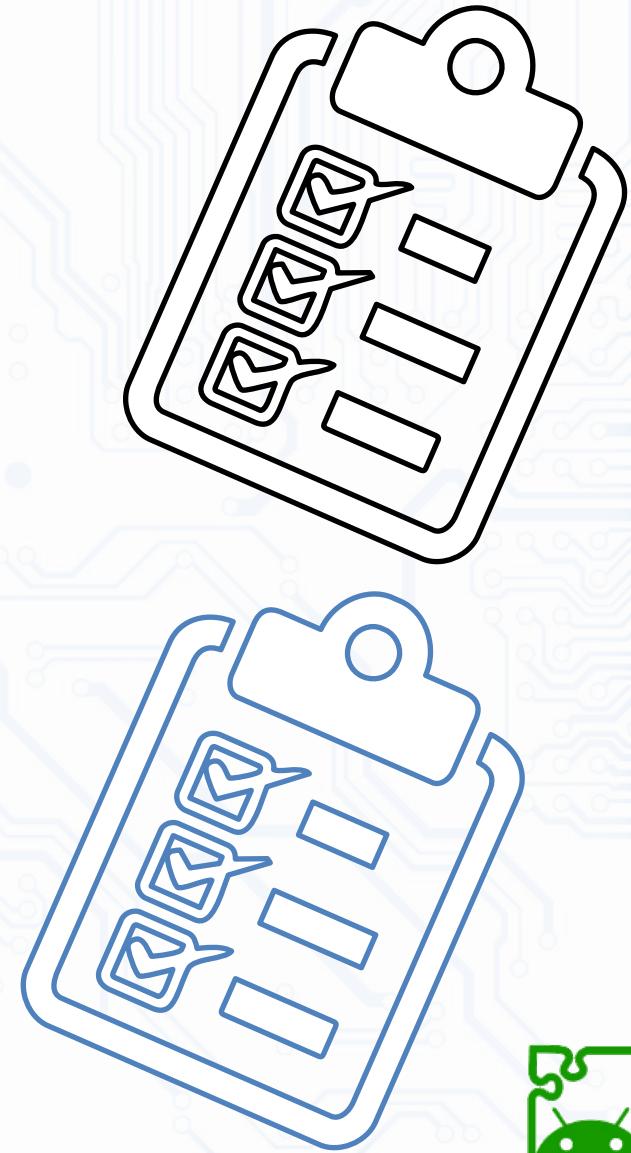
LECTURE 013: APP Inventor Example

Canvas and example



Agenda

- How do you draw shapes and images in an app?
 - Example 1. How do you create a drawing canvas?
 - Example 2. How do you draw a circle at 10,10?
 - Example 3. How do you draw a circle where the user touches?
 - Example 4. How do you move an image to the middle of the canvas?
- Practical Example 1:
- Practical Example 2:
- Practical Example 3:
- Practical Example 4:





How do you draw shapes and images in an app?



Example 1. How do you create a drawing canvas?

- The Canvas component is a sub-panel within your app. Canvases are used for drawing and animation-- your app can draw objects, and you can give the user the capability to draw objects.
- Typically, you want your canvas to fill the entire width of the app screen, so you'll set the Width to "Fill Parent" as in the blocks above. Generally you want to have other components above or below, so you'll set the Height to some fixed number.



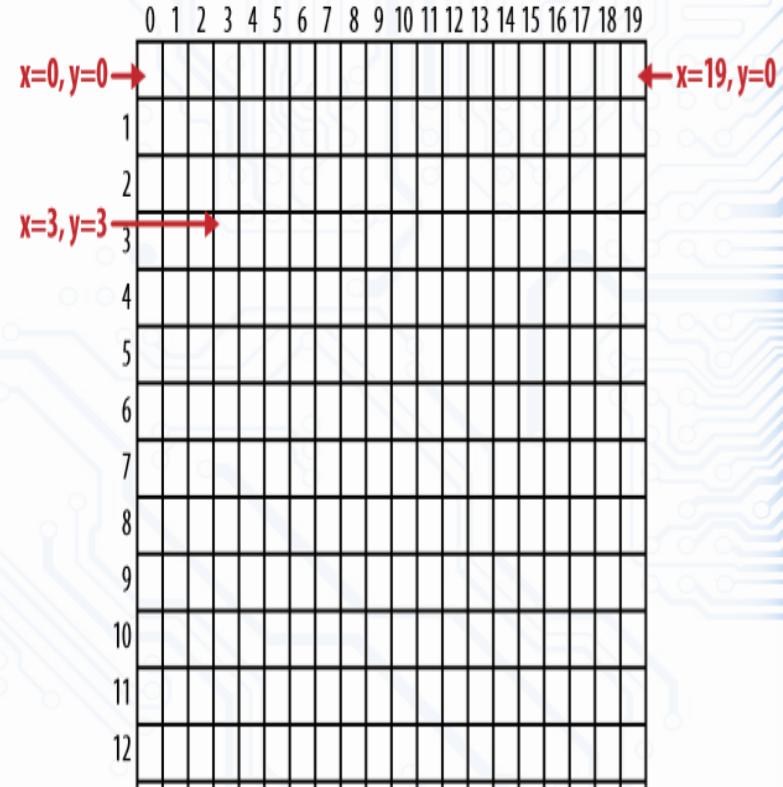


How do you draw shapes and images in an app?



Example 1. How do you create a drawing canvas?

- A location of an object on the canvas is defined with an X,Y value relative to the canvas's left-top corner.
- X is the horizontal location of the object, 0 being the left-border and X getting bigger as an object is moved to the right.
- Y is the vertical location with 0 the top border and Y getting bigger as an object is moved down.



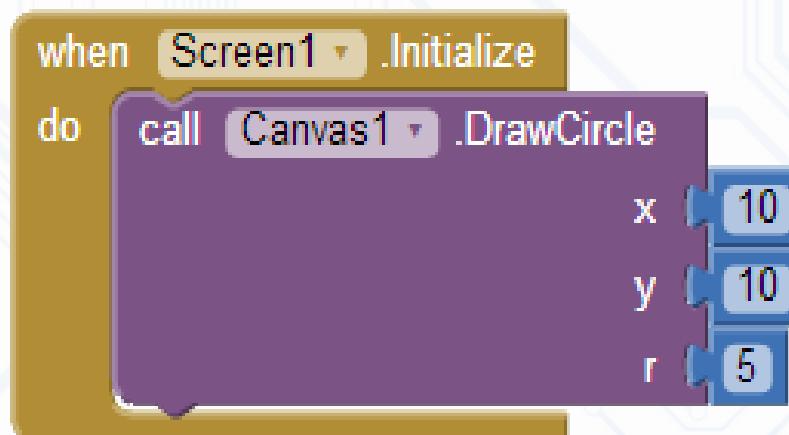


How do you draw shapes and images in an app?



Example 2. How do you draw a circle at 10,10?

- Canvas has function blocks for drawing a circle or line.
- The DrawCircle has three parameters, x, y, and radius. x is the horizontal location, y is the vertical location, and r is the radius of the circle to be drawn.
- An x-value of 10 means the circle will be located 10 pixels to the right of the left border of the canvas.
- A y-value of 10 means the circle is located 10 pixels down from the top of the canvas.





How do you draw shapes and images in an app?



DEMO: Example 2. How do you draw a circle at 10,10?

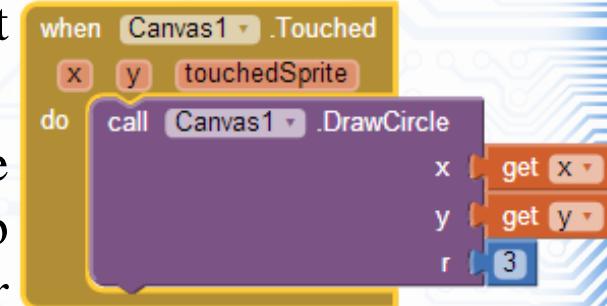


How do you draw shapes and images in an app?



Example 3. How do you draw a circle where the user touches?

- The Canvas.Touched event is triggered when the user touches (clicks) the canvas. It has parameters x and y which specify the location of the touch.
- The parameter touchedSprite specifies whether or not the touch occurred on an ImageSprite-- it is not important to this behavior.
- You want to draw the circle at the location of the touch, so mouse over the x and y parameters, grab get blocks for them, and plug them into the slots for x and y in the DrawCircle block.
- It is somewhat confusing because the Touched event parameters are named the same as the parameters (slots) for the DrawCircle function.





How do you draw shapes and images in an app?



DEMO Example 3. How do you draw a circle where the user touches?

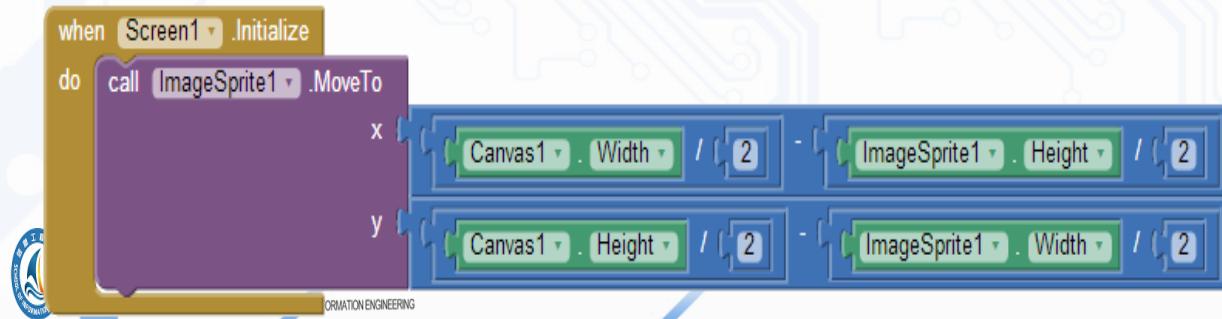


How do you draw shapes and images in an app?



Example 4. How do you move an image to the middle of the canvas?

- The blocks in the sample locate ImageSprite1 in the middle of the canvas using the Width and Height properties. Such abstract references mean the code will work even if the Canvas is resized.
- Alternatively, you could place fixed numbers in for the X and Y of the MoveTo (similarly to how 10,10 was used in the above example).
- Do you know why 1/2 the width and height of the sprite is subtracted?
- Note that there is no "DrawImage" block like DrawCircle. Instead, with the designer you drag ImageSprite components into a Canvas and specify the image file (picture) that defines their appearance.
- There is no way to dynamically create sprites with blocks, you can only make them (in-)visible and locate them as in this example.



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How do you draw shapes and images in an app?



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DEMO: Example 4. How do you move an image to the middle of the canvas?



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MOBILE APPLICATION DEVELOPMENT

Practical Example 01:

Canvas. Drawing lines with your finger on
the screen.



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Example 01:

Canvas. Drawing lines with your finger on the screen.



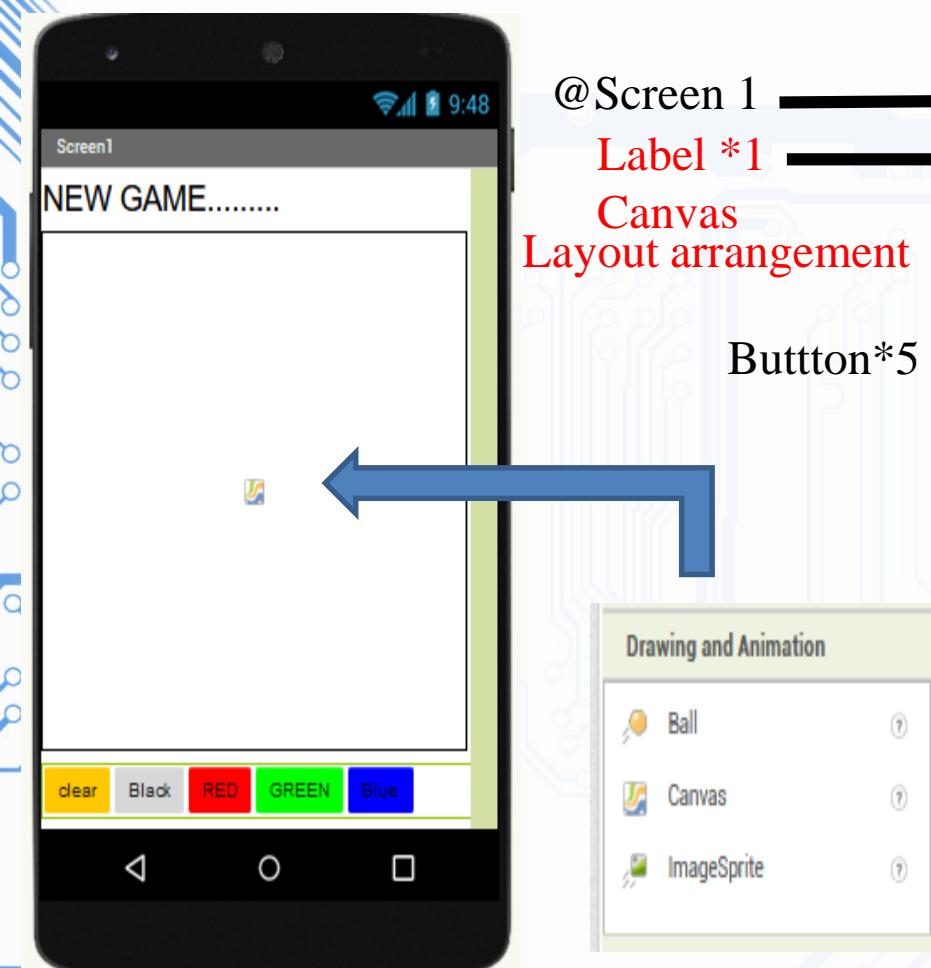
Canvas is an area of the screen where you can draw, draw lines, circles points ...

- Let's create a **Canvas** and we will draw on it with your finger using multiple colors.
- Create a **Canvas**, it is in drawing and animation.
- We put in **Width and Height of Canvas** that **Fills parents**, ie the entire screen.
- Insert a **HorizontalArrangement1** and within five **Buttons** .
- The buttons we place as shown in the figure below.





Example 01: @designer section



@Screen 1
Label *1
Canvas
Layout arrangement

Button*5

The image shows the App Inventor Designer interface. On the left is the "Components" panel, which lists "Label1" and "Canvas1" under "Screen1", and "TableArrangement1" under "TableArrangement1". On the right is the "Properties" panel for "Canvas1", showing settings for BackgroundColor (Default), BackgroundImage (None...), ExtendMovesOutsideCanvas (unchecked), FontSize (14.0), Height (Fill parent...), Width (Fill parent...), LineWidth (2.0), PaintColor (Default), TextAlignement (center : 1), and Visible (checked). Below the Components panel is the "Drawing and Animation" panel, which includes options for "Ball", "Canvas", and "ImageSprite". At the bottom are "Rename" and "Delete" buttons, and a "Media" section with an "Upload File..." button.



Blocks: Example 01



```
when Canvas1.Dragged
  startX  startY  prevX  prevY  currentX  currentY  draggedAnySprite
  do call Canvas1..DrawLine
    x1 get prevX
    y1 get prevY
    x2 get currentX
    y2 get currentY
```

```
when clear.Click
  do call Canvas1.Clear
```

```
when RED.Click
  do set Canvas1.PaintColor to RED
```

```
when BLACK.Click
  do set Canvas1.PaintColor to BLACK
```

```
when Blue.Click
  do set Canvas1.PaintColor to BLUE
```

```
when Green.Click
  do set Canvas1.PaintColor to GREEN
```





Example 01



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MIT App Inventor Games and Animations 2.1-1; www.BANDICAM.com

https://ai2-test.appinventor.mit.edu/#5752800206127104 80%

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ATA_05 Screen1 Add Screen ... Remove Screen Publish to Gallery Designer Blocks

Palette Search Components... User Interface Layout Media Drawing and Animation Ball Canvas ImageSprite Maps Sensors Social Storage Connectivity LEGO® MINDSTORMS® Experimental Extension

Viewer Display hidden components in Viewer Phone size (505,320)

Components Screen1

Properties Screen1 AboutScreen AccentColor Default AlignHorizontal Left: 1 AlignVertical Top: 1 AppName ATA_05 BackgroundColor Default BackgroundImage None... BlocksToolkit All CloseScreenAnimation Default Icon None... OpenScreenAnimation Default PrimaryColor Default PrimaryColorDark

The screenshot shows the MIT App Inventor interface. The project title is "ATA_05". The "Canvas" component is selected in the palette. The viewer displays a blank white screen titled "Screen1". The properties panel shows basic settings like "AppName" set to "ATA_05". The status bar at the bottom shows system icons and the time "15:55 18/11/2020".





Example 01



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ATA_05 Screen1 Add Screen ... Remove Screen Publish to Gallery Designer Blocks

Blocks

- Built-in
 - Control
 - Logic
 - Math
 - Text
 - Lists
 - Dictionaries
 - Colors
 - Variables
 - Procedures
- Screen1
 - Label1
 - Canvas1
- TableArrangement1
 - clear
 - BLACK
 - RED
 - Green

Rename Delete

Media Upload File ...

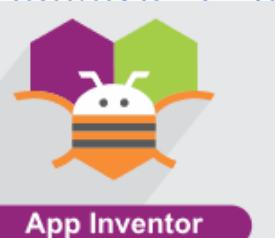
Viewer

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16:02 ENG 18/11/2020



Example 01



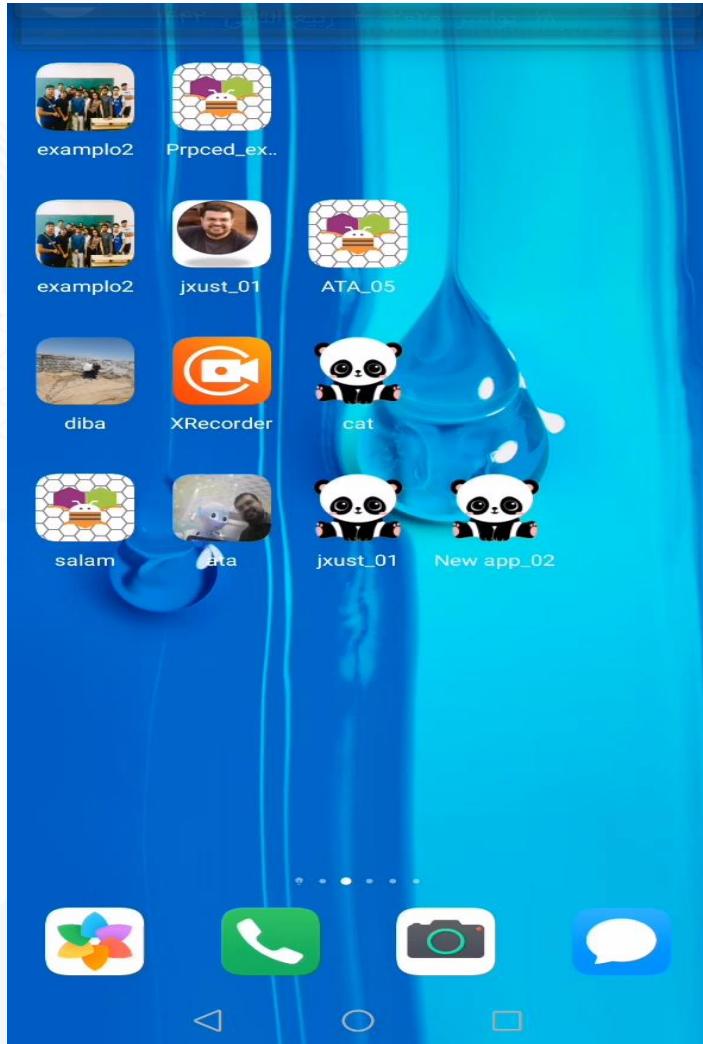
The screenshot shows the MIT App Inventor 2 environment. The top bar displays the URL <https://ai2-test.appinventor.mit.edu/#5752800206127104>. The main workspace is titled "ATA_05". On the left, the "Blocks" sidebar lists categories such as Built-in, Control, Logic, Math, Text, Lists, Dictionaries, Colors, Variables, and Procedures. Under "Screen1", there are components like Label1, Canvas1, and TableArrangement1. The "Media" section has an "Upload File..." button. The central workspace contains a script for the "when Canvas1.Dragged" event:

```
when Canvas1.Dragged
  startX [startX]
  startY [startY]
  prevX [prevX]
  prevY [prevY]
  currentX [currentX]
  currentY [currentY]
  draggedAnySprite [draggedAnySprite]
do
  [get prevY]
  [get prevY]
  [get prevY]
  [get startY]
```

The bottom right corner of the workspace features three circular buttons with symbols: a minus sign, a plus sign, and a circle. The bottom navigation bar includes links for "Privacy Policy and Terms of Use", "16:04", "ENG", and the date "18/11/2020".



DEMO: Example 01



- When you drag your finger across the **Canvas**, a line between the previous point and the current point is drawn.
- When you press one **Button**, the stroke color is set according to the button pressed.





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MOBILE APPLICATION DEVELOPMENT

Practical Example 2:
Drawing of a function.



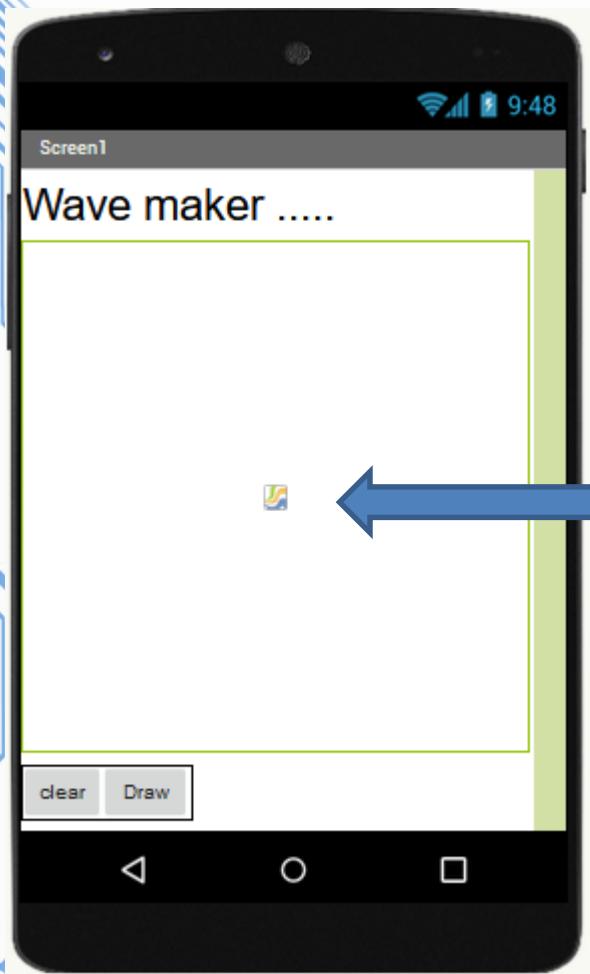
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Design: Example 02



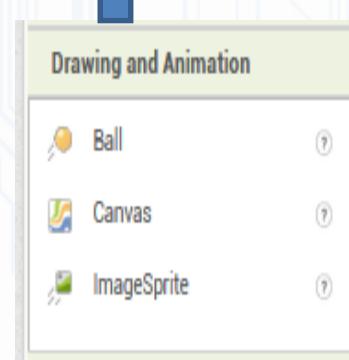
@Screen 1

Label *1

Canvas

Layout arrangement

Buttton*2



The screenshot shows the App Inventor interface with the following components and properties:

- Components Palette:** Shows "Screen1" as the main screen. Inside "Screen1", there is a "Label1" (with a red border), a "Canvas1" (with a red border), a "TableArrangement1" (with a red border), and two "Button" components labeled "Clear" and "Draw" (both with red borders).
- Properties Palette:** For the "Canvas1" component:
 - Canvas1
 - BackgroundColor: Default
 - BackgroundImage: None...
 - ExtendMovesOutsideCanvas:
 - FontSize: 14.0
 - Height: Fill parent... (highlighted with a red border)
 - Width: Fill parent... (highlighted with a red border)
 - LineWidth: 2.0
 - PaintColor: Default
 - TextAlignment: center : 1
 - Visible:
- Drawing and Animation Palette:** Shows "Ball", "Canvas" (highlighted with a red border), and "ImageSprite".





Blocks : Example 02



```
when Clear .Click  
do call Canvas1 .Clear
```

```
when Draw .Click  
do foreach number from 0  
    to 360  
    by 1  
    do set Canvas1 .PaintColor to red  
    call Canvas1 .DrawPoint  
        x : Screen1 .Width * get number / 360  
        y : 220 + (-100 * sin get number )  
    set Canvas1 .PaintColor to black  
    call Canvas1 .DrawPoint  
        x : Screen1 .Width * get number / 360  
        y : 220 + (-100 * cos get number )  
    set Canvas1 .PaintColor to blue  
    call Canvas1 .DrawPoint  
        x : Screen1 .Width * get number / 360  
        y : 220 - (get number * 0.04) ^ 2
```





Example 02



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Palette

User Interface

- Button Text for Button1
- DatePicker
- Image
- Label
- ListPicker
- ListView
- Notifier
- PasswordTextBox
- Slider
- Spinner
- Switch
- TextBox
- TimePicker
- WebViewer

Components

Screen1

Properties

- AccentColor Default
- AlignHorizontal Left : 1
- AlignVertical Top : 1
- AppName ATA_06
- BackgroundColor Default
- BackgroundImage None...
- BlocksToolkit All
- CloseScreenAnimation Default
- Icon None...
- OpenScreenAnimation Default
- PrimaryColor Default

Media

Upload File ...

Viewer

Display hidden components in Viewer

Phone size (505,320)

Screen1

9:48

Screen1

Rename Delete

Windows taskbar icons

19:25 18/11/2020



Example 02



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ATA_06 Screen1 Add Screen ... Remove Screen Publish to Gallery Designer Blocks

Blocks Viewer

Built-in

- Control
- Logic
- Math
- Text
- Lists
- Dictionaries
- Colors
- Variables
- Procedures

Screen1

- Label1
- Canvas1

TableArrangement1

- Clear
- Draw

Any component

Rename Delete

Media

Upload File ...

Show Warnings

0 0

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19:32 ENG 18/11/2020

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Example 02



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ATA_06 Screen1 Add Screen... Remove Screen Publish to Gallery Designer Blocks

Blocks Viewer

when Clear .Click
do call Canvas1 .Clear

when Draw .Click
do for each number from 0 to 360 by 1
do set Canvas1 .PaintColor to red
call Canvas1 .DrawPoint
x : Screen1 .Width * 1 / 360
y : 220 + -100 * sin number
set Canvas1 .PaintColor to green
call Canvas1 .DrawPoint
x : Screen1 .Width * 1 / 360
y : 220 + -100 * cos number
set Canvas1 .PaintColor to blue
call Canvas1 .DrawPoint
x : Screen1 .Width * 1 / 360
y : 220 - 100 * 0.04 ^ 2

Built-in Screen1 Any component

Rename Delete

Media Show Warnings

Upload File ...

Download audio from this page ?

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19:45 ENG 18/11/2020

The screenshot shows the MIT App Inventor interface with a project titled "ATA_06". The "Blocks" tab is selected. A script is displayed in the "Viewer" pane, triggered by a "when Clear .Click" event. It contains three nested loops. The innermost loop uses "for each number from 0 to 360 by 1" to iterate 360 times. Inside this loop, there are two "call Canvas1 .DrawPoint" blocks. The first draw point has an x-value of "Screen1 .Width * 1 / 360" and a y-value of "220 + -100 * sin number". The second draw point has an x-value of "Screen1 .Width * 1 / 360" and a y-value of "220 + -100 * cos number". Both draw points have a "set Canvas1 .PaintColor to" block preceding them, setting the color to red, green, and blue respectively. The "Blocks" pane on the left lists categories like Control, Logic, Math, Text, Lists, Dictionaries, Colors, Variables, and Procedures, along with components for the current screen (Label, Canvas1, TableArrangement1) and any component.



Demo On Example 02



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We must make a match:

360 ----- WithScreen

X ----- number

$X = \text{WithScreen} * \text{number} / 360$

That is, we adapt the value of the variable X for the 360 WithScreen match.

-Multiply by 100, if we do not high signal will have very small values.

-Multiply by -100 as the dimensioning of the screen goes up and down and not bottom-up, ie as we go down the greater the variable Y.

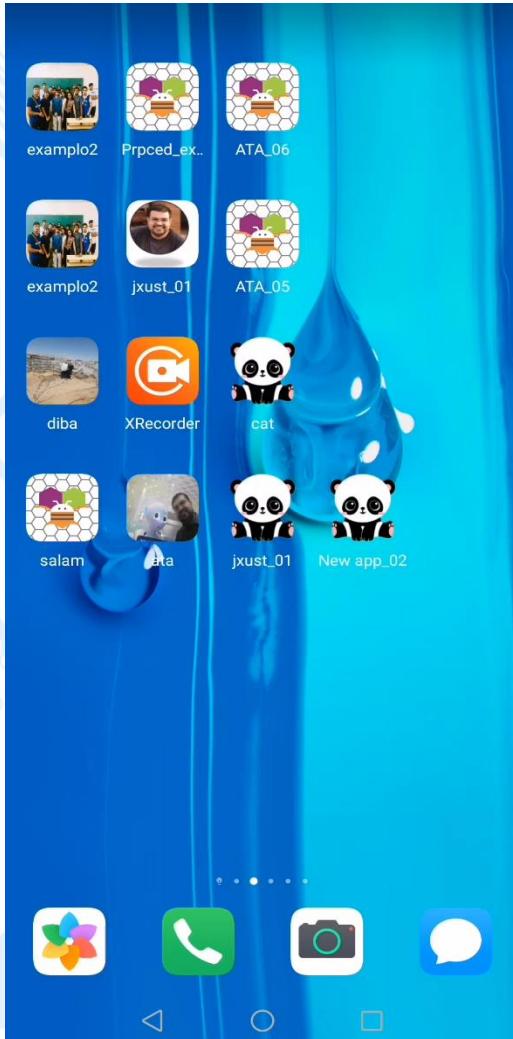
(We could also have use subtraction instead of addition, as is done then in the parable)

-- We added 220 for the center of the signal coincides with the center of the screen.

-- It takes time to draw the signals.

-- We must study the horizontal and vertical scale of the signal we want to see.

-- Another way would be to use small lines instead of points block **DrawLine**.





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MOBILE APPLICATION DEVELOPMENT

Practical Example 3:

Canvas. Image Sprite. Launched property

Drag my Boat



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Example 03: Drag my Boat

In this example By putting your finger on an image and quickly drag, the image moves in that direction and with the speed that you have done with your finger.

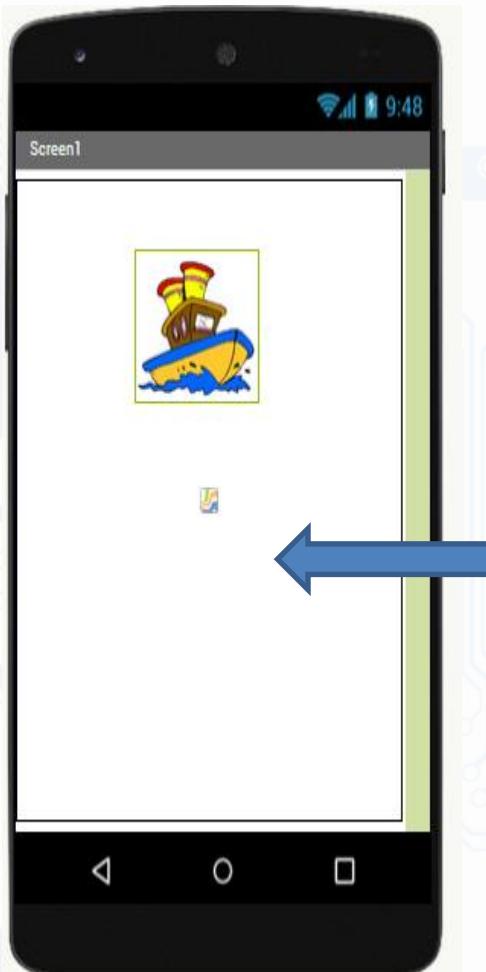
In Design, insert:

- A **Canvas**, occupying the Width and Height of the parent.
- Within the canvas a **SpriteImage**.
- In its **Property Photo**, put the image of the boat





Example 03: Design



@Screen 1

Canvas

ImageSprite1

Drawing and Animation

Ball

Canvas

ImageSprite

Components

- Screen1
- Canvas1
- ImageSprite1

Properties

| | |
|--------------|-------------------------------------|
| ImageSprite1 | |
| Enabled | <input checked="" type="checkbox"/> |
| Heading | 0 |
| Height | Automatic... |
| Width | Automatic... |
| Interval | 100 |
| Picture | barquito2.png... |
| Rotates | <input checked="" type="checkbox"/> |
| Speed | 0.0 |
| Visible | <input checked="" type="checkbox"/> |





Example 03: Block



```
when ImageSprite1 Flung
  do set ImageSprite1^.Heading to get heading
     set ImageSprite1^.Speed to get speed
```

```
when ImageSprite1^.EdgeReached
  do call ImageSprite1^.Bounce
     edge get edge
```





Example 03: Design



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Palette

User Interface

- Button
- CheckBox
- DatePicker
- Image
- Label
- ListPicker
- ListView
- Notifier
- PasswordTextBox
- Slider
- Spinner
- Switch
- TextBox
- TimePicker
- WebViewer

Layout

Media

Drawing and Animation

Maps

Sensors

Components

Screen1

Screen1

AboutScreen

AccentColor Default

AlignHorizontal Left : 1 ▾

AlignVertical Top : 1 ▾

AppName ATA_07

BackgroundColor Default

BackgroundImage None...

BlocksToolkit All ▾

CloseScreenAnimation Default ▾

Icon None...

OpenScreenAnimation Default ▾

PrimaryColor Default

PrimaryColorDark Default

ScreenOrientation Unspecified ▾

Scalable

Viewer

Display hidden components in Viewer

Phone size (505,320)

Screen1

9:48

Screen1

Upload File ...

20:38
18/11/2020



Example 03: Block



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ATA_07 Screen1 Add Screen Remove Screen Publish to Gallery Designer Blocks

Blocks

- Built-in
 - Control
 - Logic
 - Math
 - Text
 - Lists
 - Dictionaries
 - Colors
 - Variables
 - Procedures
- Screen1
- Canvas1
 - ImageSprite1
- Any component

Rename Delete

Media

barquito2.png Upload File ...

Show Warnings

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20:51 ENG 18/11/2020



Example 03: Demo



- When you put your finger on the image and move it quickly, it will move the image in that direction and with that speed.
- When the image reach an edge, bounces.





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MOBILE APPLICATION DEVELOPMENT

Practical Example 4:

Paddle tennis. Ball and Image Sprite.

Wall and Ball



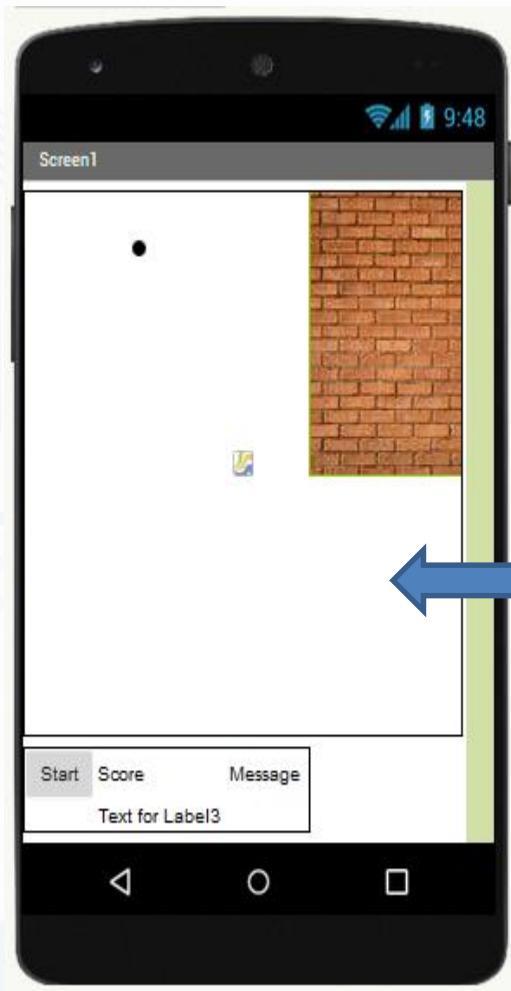


Example 04: Wall and Ball

Paddle tennis. Ball and Image Sprite.



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@Screen 1

Canvas

Ball

ImageSprite1

Label *3

Button*1

Components

Screen1

Canvas1

Ball1

ImageSprite1

TableArrangement1

Button1

Label1

Label2

Label3

Drawing and Animation

Ball

Canvas

ImageSprite

Rename

Delete

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Example 04: Wall and Ball

Paddle tennis. Ball and Image Sprite.



```
initialize global score to 0
when Button1 .Click
do set Ball1 . Heading to random integer from 100 to 360
set Ball1 . Speed to 10
call Ball1 . MoveTo
  x Screen1 . Width / 2
  y Ball1 . Radius
set Ball1 . Interval to 100
set Ball1 . Enabled to true
```

```
when ImageSprite1 .Dragged
startX startY prevX prevY currentX currentY
do call ImageSprite1 . MoveTo
  x get currentX
  y get currentY
```

```
when ImageSprite1 .CollidedWith other
do set global score to + get global score + 1
set Label1 . Text to join " TOUCH " get global score
if get global score = 10
then set Label3 . Text to " OUT "
set Ball1 . Heading to 360 - Ball1 . Heading
set Ball1 . Enabled to true
```

```
when Ball1 .EdgeReached edge
do if get global score = -1
then set Ball1 . Enabled to false
else call Ball1 . Bounce
edge get edge
```





Example 04: Wall and Ball

Paddle tennis. Ball and Image Sprite.



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Palette

User Interface

- Button
- CheckBox
- DatePicker
- Image
- Label
- ListPicker
- ListView
- Notifier
- PasswordTextBox
- Slider
- Spinner
- Switch
- TextBox
- TimePicker
- WebView

Layout

Media

Drawing and Animation

Sensors

Viewer

Display hidden components in Viewer

Phone size (505,320)

Screen1

Components

Properties

Screen1

AboutScreen

AccentColor Default

AlignHorizontal Left : 1 *

AlignVertical Top : 1 *

AppName AATA_08

BackgroundColor Default

BackgroundImage None...

BlocksToolkit All *

CloseScreenAnimation Default

Icon None...

OpenScreenAnimation Default

PrimaryColor Default

PrimaryColorDark Default

ScreenOrientation Unspecified *

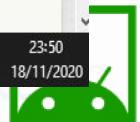
Scrollable

Rename Delete

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Example 04: Wall and Ball



App Inventor

MIT App Inventor X App inventor. Canvas. ImageSp ... + www.BANDICAM.com

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AATA_08 Screen1 Add Screen ... Remove Screen Publish to Gallery Designer Blocks

Blocks

- Built-in
 - Control
 - Logic
 - Math
 - Text
 - Lists
 - Dictionaries
 - Colors
 - Variables
 - Procedures
- Screen1
- Canvas1
 - Ball1
 - ImageSprite1
- TableArrangement1
 - Button1
 - Label1
 - Label2

Media

wall.jpg

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Example 04:

Paddle tennis. Ball and Image Sprite.



MIT App Inventor

www.BANDICAM.com

ai2.appinventor.mit.edu/#4998100316192768

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AATA_08 Screen1 Add Screen... Remove Screen Publish to Gallery Designer Blocks

Blocks

- Logic
- Math
- Text
- Lists
- Dictionaries
- Colors
- Variables
- Procedures

Screen1

- Canvas1
 - Ball1
 - ImageSprite1
- TableArrangement1
 - Button1
 - Label1
 - Label2
 - Label3

Any component

Rename Delete

Media

wall.jpg

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initialize global **score** to 0

when **Button1** .Click
do
set **Ball1** . Heading to random integer from 100 to 360
set **Ball1** . Speed to 100
call **Ball1** .MoveTo
x **Screen1** . Width / 2
y **Ball1** . Radius
set **Ball1** . Interval to 100
set **Ball1** . Enabled to true

when **ImageSprite1** .CollidedWith other
do
set global score to + 1
set Label1 . Text to join "Puntos" get global score
if get global score = 10
then set Label3 . Text to "GANASTE"

startX startY prevX prevY currentX currentY
do call **ImageSprite1** .MoveTo
x get currentX
y get currentY

set **Ball1** . Heading to -

Designer Blocks

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App Inventor



Example 04:

Paddle tennis. Ball and Image Sprite.



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AATA_08 Screen1 Add Screen ... Remove Screen Publish to Gallery Designer Blocks

Blocks Viewer

Built-in

- Control
- Logic
- Math
- Text
- Lists
- Dictionaries
- Colors
- Variables
- Procedures

Screen1

Canvas1

Ball1

ImageSprite1

TableArrangement1

Button1

Label1

Label2

Rename Delete

Media

wall.jpg

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other

```
to random integer from [100 to 360]
to [10
Screen1 Width / 2
Ball1 Radius
to [100
to [true

if [get global score = 10
then set Label3 Text to [OUT
set Ball1 Heading to [360 - Ball1 Heading
set Ball1 Enabled to [true

when [Ball1 EdgeReached
do if [get global score = -1
then set Ball1 Enabled to [false
else call [Ball1 Bounce
edge [get edge]
```





Example 04:

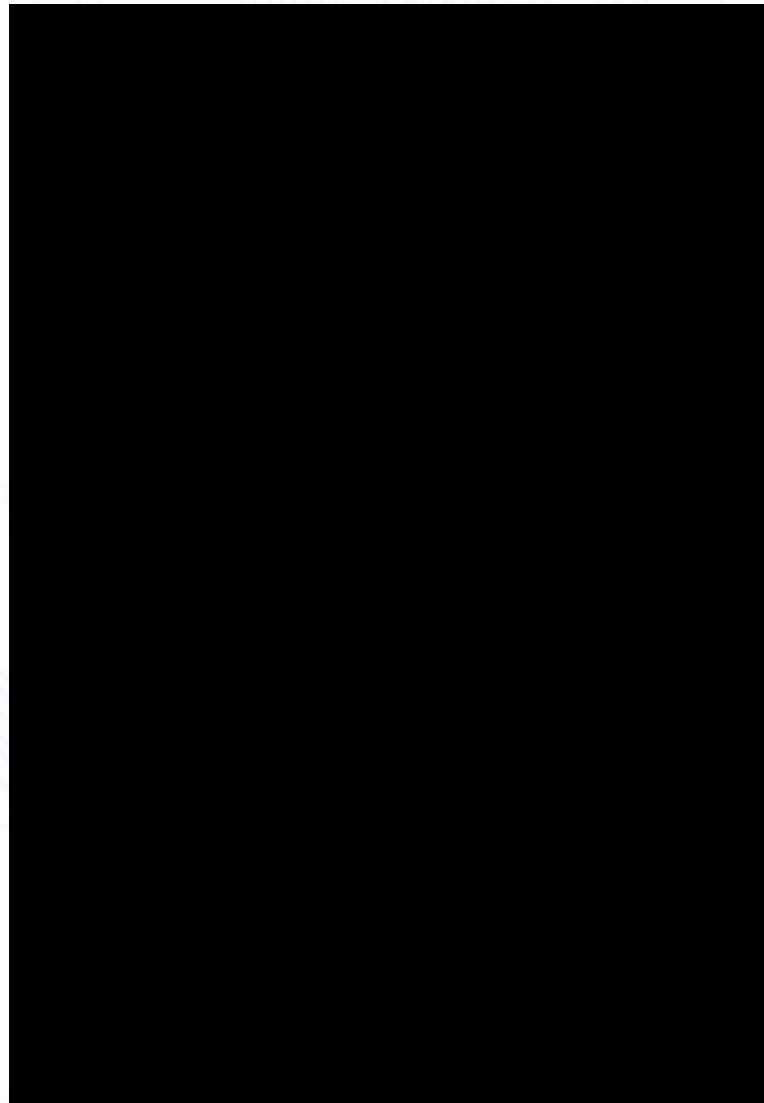
Demo:Paddle tennis. Ball and ImageSprite.



Wall and Ball

Trick

If you want the canvas fills the top of the screen, **uncheck and check** the property **Scrollable** in the Screen1 screen and places the Hight Property **Fill parent** on Canvas





Student Task_10



Repeat this examples and make based on our task format

You can change the game and add the part to examples but you should describe the added part and logic in your task ppt

- Add this part to example 04(**Wall and Ball**):
 - After push the start the counting ball become zero
 - Change the speed of ball movement
 - Also describe the logic to number that we assign in the block section

Next lecture

- Send the file in PPT(power point format) to this email :
MOOC
- Your file should have this format of name
<Task number><student name><Student ID>.ppt





Reference

- <http://kio4.com/appinventori/7canvas.htm>
- <http://ai2.appinventor.mit.edu/reference/blocks/lists.html#selectlistitem>
- **<https://appinventor.mit.edu/explore/content/alertme.html>**
- **Teaching with AppInventor** <http://appinventor.mit.edu/explore/teach.html>
- **AppInventor Tutorials:**
<http://appinventor.mit.edu/explore/ai2/tutorials.html>
- **Sounds** <http://www.soundbible.com>
- **App Inventor:** <http://appinventor.googlelabs.com/>
- **Appinventor.org:** <http://www.appinventor.org/>
- **Wolber, Abelson et al. text:** <http://www.appinventor.org/text2011>
- **Group:** <http://groups.google.com/group/app-inventor-instructors>
- **Wolber course:** <http://appinventor.org/course-in-a-box>
- **Morelli course:** <http://turing.cs.trincoll.edu/~ram/cpsc110/>

“We are one
society. We are
one globe.”

STEVEN CHU
Nobel Prize in Physics 1997



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Jiangxi University of Science and Technology

信息工程学院

School of information engineering

Digital Image Processing

THANK YOU





**“BE HUMBLE. BE HUNGRY.
AND ALWAYS BE THE
HARDEST WORKER
IN THE ROOM.”**

