

PROGRAMMING HANDHELD SYSTEMS

MULTI-TOUCH & GESTURES

TODAY'S TOPICS

MOTIONEVENTS

TOUCH HANDLING

GESTURES

MOTIONEVENT

REPRESENTS A MOVEMENT IN AN INPUT
DEVICE READING

PEN, TRACKBALL, MOUSE, FINGER

MOTIONEVENT

ACTION CODE

STATE CHANGE THAT OCCURRED

ACTION VALUES

POSITION AND MOVEMENT PROPERTIES,
SUCH AS TIME, SOURCE, LOCATION,
PRESSURE, AND MORE

THIS LESSON FOCUSES ON TOUCH
EVENTS READ FROM A TOUCH SCREEN

MULTITOUCH

MULTITOUCH SCREENS EMIT ONE MOVEMENT
TRACE PER TOUCH SOURCE

INDIVIDUAL TOUCH SOURCES ARE CALLED
POINTERS

MULTITOUCH

EACH POINTER HAS A UNIQUE ID FOR AS LONG AS IT IS ACTIVE

MotionEventS CAN REFER TO MULTIPLE POINTERS

EACH POINTER HAS AN INDEX WITHIN THE EVENT, BUT THAT INDEX MAY NOT BE STABLE OVER TIME

SOME MotionEvent ACTIONS

ACTION_DOWN

ACTION_POINTER_DOWN

ACTION_POINTER_UP

ACTION_MOVE

ACTION_UP

ACTION_CANCEL

CONSISTENCY GUARANTEES

FOR TOUCH EVENTS, ANDROID TRIES TO
GUARANTEE THAT TOUCHES

GO DOWN ONE AT A TIME

MOVE AS A GROUP

COME UP ONE AT A TIME OR ARE CANCELLED

APPLICATIONS SHOULD BE TOLERANT TO
INCONSISTENCY

MOTIONEVENT METHODS

getActionMasked()

getActionIndex()

getPointerId(int pointerIndex)

getPointerCount()

getX(int pointerIndex)

getY(int pointerIndex)

findPointerIndex (int pointerId)

HANDLING TOUCH EVENTS ON A VIEW

THE VIEW BEING TOUCHED RECEIVES

`View.onTouchEvent(MotionEvent event)`

`onTouchEvent()` SHOULD RETURN TRUE IF

THE `MotionEvent` HAS BEEN CONSUMED;

FALSE OTHERWISE

HANDLING TOUCH EVENTS WITH A LISTENER

View.OnTouchListener DEFINES TOUCH
EVENT CALLBACK METHODS

View.setOnTouchListener() REGISTERS
LISTENER FOR TOUCH CALLBACKS

HANDLING TOUCH EVENTS WITH A LISTENER

onTouch() CALLED WHEN A TOUCH EVENT, SUCH AS PRESSING, RELEASING OR DRAGGING, OCCURS

onTouch() CALLED BEFORE THE EVENT IS DELIVERED TO THE TOUCHED VIEW

SHOULD RETURN TRUE IF IT HAS CONSUMED THE EVENT; FALSE OTHERWISE

HANDLING MULTIPLE TOUCH EVENTS

MULTIPLE TOUCHES COMBINED TO FORM A
MORE COMPLEX GESTURE

IDENTIFY & PROCESS COMBINATIONS OF
TOUCHES,

FOR EXAMPLE, A DOUBLE TAP

ACTION_DOWN, ACTION_UP,
ACTION_DOWN, ACTION_UP IN QUICK
SUCCESSION

MULTI-TOUCH HANDLING

MULTI-TOUCH HANDLING

	Action	IDs
➔ #1 touch ➔	ACTION_DOWN	0
	ACTION_MOVE ...	0
#2 touch ➔	ACTION_POINTER_DOWN	1
	ACTION_MOVE ...	0,1
#1 lift ➔	ACTION_POINTER_UP	0
#2 lift ➔	ACTION_UP	1

MULTI-TOUCH HANDLING

MULTI-TOUCH HANDLING

	Action	ID
➔ #1 touch ➔	ACTION_DOWN	0
	ACTION_MOVE ...	0
#2 touch ➔	ACTION_POINTER_DOWN	1
	ACTION_MOVE ...	0,1
#2 lift ➔	ACTION_POINTER_UP	1
#1 lift ➔	ACTION_UP	0

MULTI-TOUCH HANDLING

MULTI-TOUCH HANDLING

➔ #1 touch →

#2 touch →

#3 touch →

#2 lift →

#1 lift →

#3 lift →

Action	ID
ACTION_DOWN	0
ACTION_POINTER_DOWN	1
ACTION_POINTER_DOWN	2
ACTION_MOVE	0,1,2
ACTION_POINTER_UP	1
ACTION_POINTER_UP	0
ACTION_UP	2

TOUCHINDICATETOUCHLOCATION

APPLICATION DRAWS A CIRCLE WHEREVER THE
USERS TOUCHES THE SCREEN

CIRCLE'S COLOR IS RANDOMLY SELECTED

REDRAWS CIRCLES WHEN USER DRAGS
FINGER ACROSS THE SCREEN

TOUCHINDICATE TOUCHLOCATION

THE SIZE OF THE CIRCLES ARE PROPORTIONAL
TO THE NUMBER OF CURRENTLY ACTIVE
TOUCHES



Demonstration of the
TouchIndicateTouchLocation
project in the IDE

GESTUREDETECTOR

A CLASS THAT RECOGNIZES COMMON
TOUCH GESTURES

SOME BUILT-IN GESTURES INCLUDE
CONFIRMED SINGLE TAP, DOUBLE TAP,
FLING

GESTUREDETECTOR

ACTIVITY CREATES A GestureDetector
THAT IMPLEMENTS THE GestureDetector.
OnGestureListener interface

ACTIVITY WILL RECEIVE CALLS TO
onTouchEvent() WHEN ACTIVITY IS
TOUCHED

ONTouchEvent DELEGATES CALL TO
GestureDetector.OnGestureListener

TOUCHGESTUREVIEWFLIPPER

SHOWS A TextView DISPLAYING A NUMBER

IF THE USER PERFORMS A RIGHT TO LEFT
“FLING” GESTURE,

THE TextView WILL SCROLL OFF THE SCREEN

A NEW TextView WILL SCROLL IN BEHIND IT



Demonstration of the
TouchGestureViewFlipper
project in the IDE

CREATING CUSTOM GESTURES

THE GESTUREBUILDER APPLICATION LETS YOU
CREATE & SAVE CUSTOM GESTURES

COMES BUNDLED WITH SDK

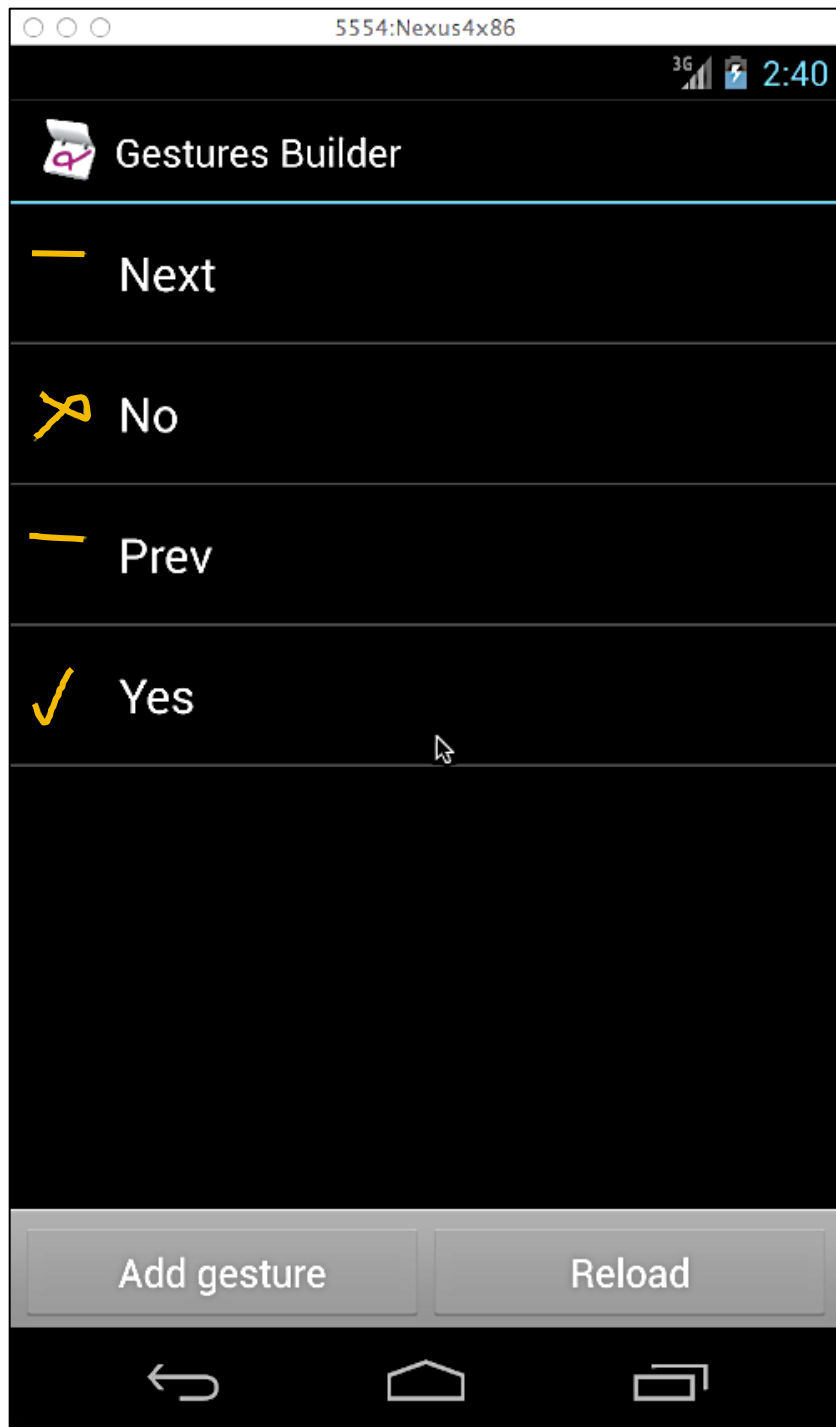
CREATING CUSTOM GESTURES

GestureLibraries SUPPORTS LOADING
CUSTOM GESTURES & THEN RECOGNIZING
THEM AT RUNTIME

CREATING CUSTOM GESTURES

INCLUDE A `GestureOverlayView` IN YOUR LAYOUT

THE OVERLAY INTERCEPTS USER GESTURES AND INVOKES YOUR APPLICATION CODE TO HANDLE THEM



GESTUREBUILDER

GESTUREBUILDER

STORES GESTURES TO
/mnt/sdcard/gestures

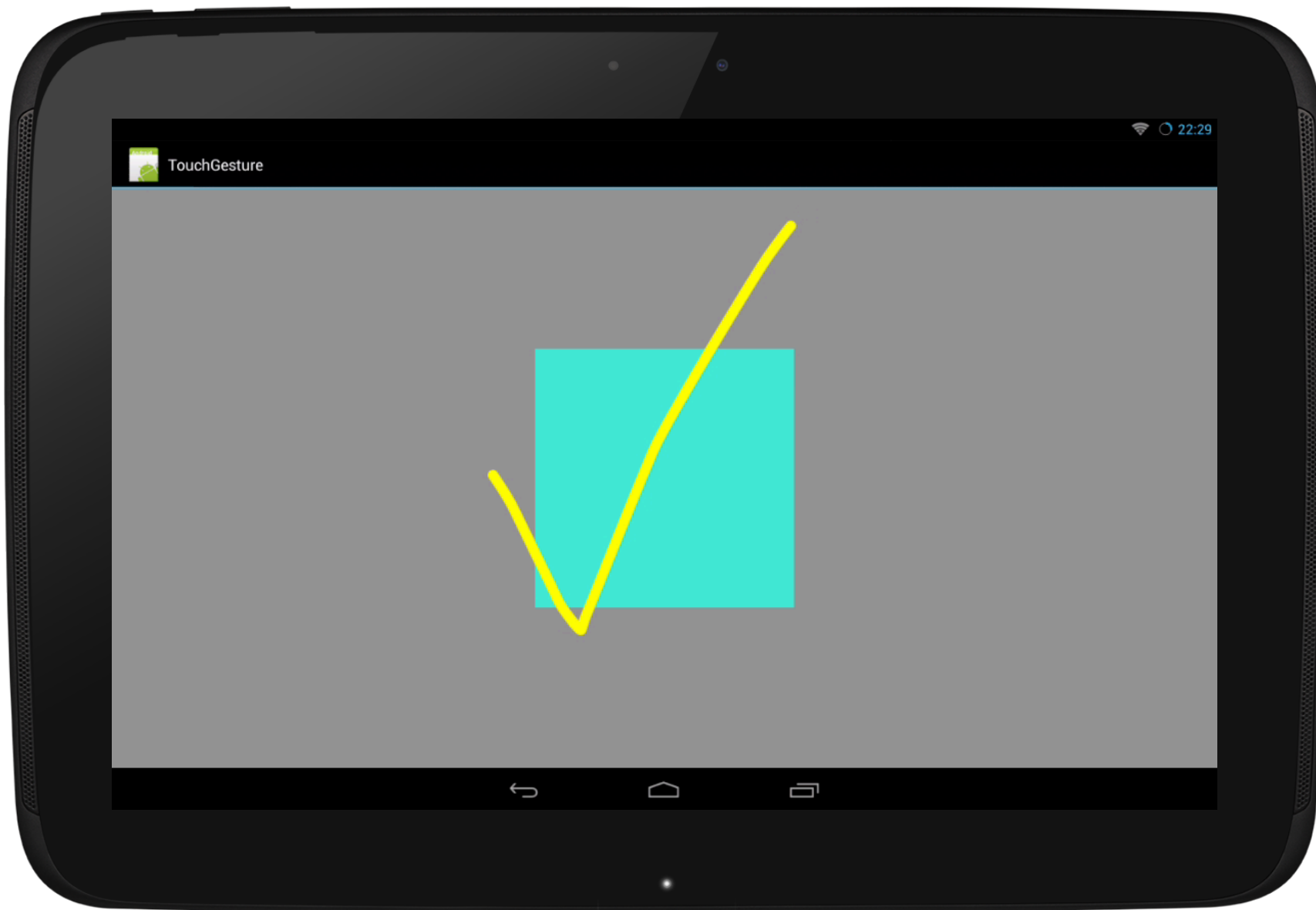
COPY THIS FILE TO
/res/raw DIRECTORY

TOUCHGESTURES

APPLICATION DISPLAYS A SMALL View WITH
A COLORED BACKGROUND

USER CAN SWIPE LEFT AND RIGHT TO CYCLE
BETWEEN DIFFERENT CANDIDATE
BACKGROUND COLORS

CAN MAKE AN CHECK OR X-LIKE GESTURE
TO SET OR CANCEL THE APPLICATION'S
CURRENT BACKGROUND COLOR



Demonstration of the
TouchGestures
project in the IDE

NEXT TIME

MULTIMEDIA