

Espresso Patronum: The Magic of the Robot Pattern

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What is Espresso?

Use Espresso to write concise, beautiful, and reliable Android UI tests¹.

¹ <https://developer.android.com/training/testing/espresso/index.html>

Three Classes To Know

1. ViewMatchers
2. ViewActions
3. ViewAssertions

ViewMatchers

- `withId(...)`
- `withText(...)`
- `isFocusable()`
- `isChecked()`

ViewActions

- `typeText(...)`
- `scrollTo()`
- `swipeLeft()`
- `click()`

ViewAssertions

- `matches(Matcher)`
- `isLeftOf(Matcher)`
- `doesNotExist()`

Espresso Cheatsheet²

onView(ViewMatcher**)**

.perform(ViewAction**)**

.check(ViewAssertion**);**

View Matchers

USER PROPERTIES
withId(...)
withText(...)
withTagKey(...)
withTagValue(...)
hasContentDescription(...)
withContentDescription(...)
withHint(...)
withSpinnerText(...)
hasLinks()
hasEllipsizedText()
hasMultilineText()

UI PROPERTIES
isDisplayed()
isCompletelyDisplayed()
isEnabled()
hasFocus()
isClickable()
isChecked()
isNotChecked()
withEffectiveVisibility(...)
isSelected()

OBJECT MATCHER
allOf(Matchers)
anyOf(Matchers)
is(...)
not(...)
endsWith(String)
startsWith(String)
instanceOf(Class)

HIERARCHY
withParent(Matcher)
withChild(Matcher)
hasDescendant(Matcher)
isDescendantOfA(Matcher)
hasSibling(Matcher)
isRoot()

INPUT
supportsInputMethods(...)
hasIMEAction(...)

CLASS
isAssignableFrom(...)
withClassName(...)

ROOT MATCHERS
isFocusable()
isTouchable()
isDialog()
withDecorView()
isPlatformPopup()

SEE ALSO
Preference matchers
Cursor matchers
Layout matchers

onData(ObjectMatcher**)**

.DataOptions

.perform(ViewAction**)**

.check(ViewAssertion**);**

Data Options

inAdapterView(Matcher)
atPosition(Integer)
onChildView(Matcher)

View Actions

CLICK/PRESS
click()
doubleClick()
longClick()
pressBack()
pressIMEActionButton()
pressKey([Int/EspressoKey])
pressMenuKey()
closeSoftKeyboard()
openLink()

GESTURES
scrollTo()
swipeLeft()
swipeRight()
swipeUp()
swipeDown()


TEXT
clearText()
typeText(String)
typeTextIntoFocusedView(String)
replaceText(String)

View Assertions

matches(Matcher)
doesNotExist()
selectedDescendantsMatch(...)

LAYOUT ASSERTIONS
noEllipsizedText(Matcher)
noMultilineButtons()
noOverlaps([Matcher])

POSITION ASSERTIONS
isLeftOf(Matcher)
isRightOf(Matcher)
isLeftAlignedWith(Matcher)
isRightAlignedWith(Matcher)
isAbove(Matcher)
isBelow(Matcher)
isBottomAlignedWith(Matcher)
isTopAlignedWith(Matcher)



² <https://developer.android.com/training/testing/espresso/cheat-sheet.html>

@AdamMc331
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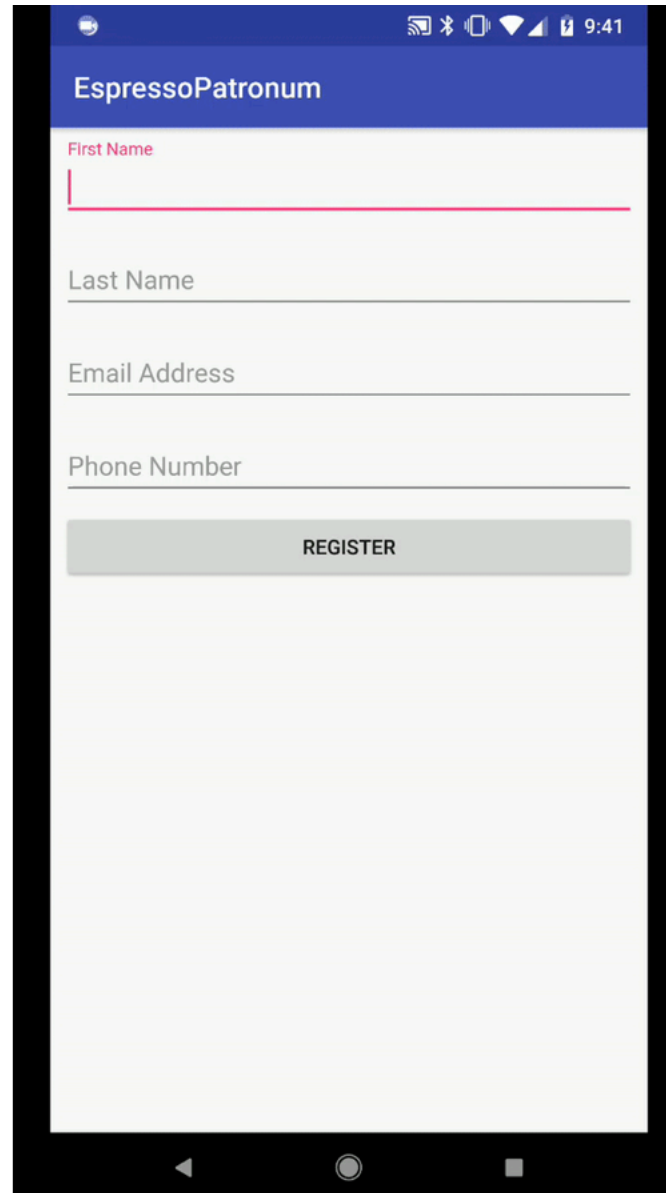
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Espresso Example

```
// onView gives us a ViewInteraction where we can perform an action
// or check an assertion.
onView(ViewMatcher)
    .perform(ViewAction)
    .check(ViewAssertion)

// Type into an EditText, verify it appears in a TextView
onView(withId(R.id.etInput)).perform(typeText("Adam"))
onView(withId(R.id.tvOutput)).check(matches(withText("Adam")))
```

Sample Project



The screenshot displays a mobile application interface for 'EspressoPatronum'. The app's title is shown in a blue header bar. Below the header, there is a registration form with four text input fields: 'First Name' (with a red label), 'Last Name', 'Email Address', and 'Phone Number'. Each field is outlined with a thin grey border. A grey button labeled 'REGISTER' is positioned below the input fields. The entire form is set against a light grey background. The top of the screen shows a standard Android status bar with various icons and the time '9:41'. The bottom of the screen features the Android navigation bar with back, home, and recent apps buttons.

Test Successful Registration

```
@Test
fun testSuccessfulRegistration() {
    onView(withId(R.id.etFirstName)).perform(typeText("Adam"))
    onView(withId(R.id.etLastName)).perform(typeText("McNeilly"))
    onView(withId(R.id.etEmail)).perform(typeText("amcneilly@okcupid.com"))
    onView(withId(R.id.etPhone)).perform(typeText("1234567890"))
    onView(withId(R.id.registerButton)).perform(click())

    onView(withId(R.id.tvFullName)).check(matches(withText("Adam McNeilly")))
    onView(withId(R.id.tvEmailAddress)).check(matches(withText("amcneilly@okcupid.com")))
    onView(withId(R.id.tvPhoneNumber)).check(matches(withText("(123)-456-7890")))
}
```

Test A Missing Field

```
@Test
fun testMissingEmailError() {
    onView(withId(R.id.etFirstName)).perform(typeText("Adam"))
    onView(withId(R.id.etLastName)).perform(typeText("McNeilly"))
    // onView(withId(R.id.etEmail)).perform(typeText("amcneilly@okcupid.com"))
    onView(withId(R.id.etPhone)).perform(typeText("1234567890"))
    onView(withId(R.id.registerButton)).perform(click())

    onView(withId(R.id.etEmail)).check(matches(hasErrorText("Must enter an email address.")))
}
```

One More Negative Test

```
@Test
fun testInvalidEmailError() {
    onView(withId(R.id.etFirstName)).perform(typeText("Adam"))
    onView(withId(R.id.etLastName)).perform(typeText("McNeilly"))
    onView(withId(R.id.etEmail)).perform(typeText("blahblah"))
    onView(withId(R.id.etPhone)).perform(typeText("1234567890"))
    onView(withId(R.id.registerButton)).perform(click())

    onView(withId(R.id.etEmail)).check(matches(hasErrorText("Must enter a valid email address.")))
}
```

All Together

```
@Test
fun testSuccessfulRegistration() {
    onView(withId(R.id.etFirstName)).perform(typeText("Adam"))
    onView(withId(R.id.etLastName)).perform(typeText("McNeilly"))
    onView(withId(R.id.etEmail)).perform(typeText("amcneilly@okcupid.com"))
    onView(withId(R.id.etPhone)).perform(typeText("1234567890"))
    onView(withId(R.id.registerButton)).perform(click())

    onView(withId(R.id.tvFullName)).check(matches(withText("Adam McNeilly")))
    onView(withId(R.id.tvEmailAddress)).check(matches(withText("amcneilly@okcupid.com")))
    onView(withId(R.id.tvPhoneNumber)).check(matches(withText("(123)-456-7890")))
}

@Test
fun testMissingEmailError() {
    onView(withId(R.id.etFirstName)).perform(typeText("Adam"))
    onView(withId(R.id.etLastName)).perform(typeText("McNeilly"))
    onView(withId(R.id.etPhone)).perform(typeText("1234567890"))
    onView(withId(R.id.registerButton)).perform(click())

    onView(withId(R.id.etEmail)).check(matches(hasErrorText("Must enter an email address.")))
}

@Test
fun testInvalidEmailError() {
    onView(withId(R.id.etFirstName)).perform(typeText("Adam"))
    onView(withId(R.id.etLastName)).perform(typeText("McNeilly"))
    onView(withId(R.id.etEmail)).perform(typeText("blahblah"))
    onView(withId(R.id.etPhone)).perform(typeText("1234567890"))
    onView(withId(R.id.registerButton)).perform(click())

    onView(withId(R.id.etEmail)).check(matches(hasErrorText("Must enter a valid email address.")))
}
```

Downfalls Of This Approach

1. Extremely Verbose
2. Unreadable
3. Not Easily Maintainable - What if a view changes?

Introducing Robots

A robot is the middle man between your view and your code. This is a way of separating concerns just like an MVC/MVP/MVWTF architecture does with your application's code.

Usage

```
@Test
fun testSuccessfulRegistration() {
    RegistrationRobot()
        .firstName("Adam")
        .lastName("McNeilly")
        .email("amcneilly@okcupid.com")
        .phone("1234567890")
        .register()
        .assertFullNameDisplay("Adam McNeilly")
        .assertEmailDisplay("amcneilly@okcupid.com")
        .assertPhoneDisplay("(123)-456-7890")
}
```

Define ViewMatchers

```
class RegistrationRobot {  
    companion object {  
        private val FIRST_NAME_INPUT_MATCHER = withId(R.id.etFirstName)  
        private val LAST_NAME_INPUT_MATCHER = withId(R.id.etLastName)  
        private val EMAIL_INPUT_MATCHER = withId(R.id.etEmail)  
        private val PHONE_INPUT_MATCHER = withId(R.id.etPhone)  
        private val REGISTER_INPUT_MATCHER = withId(R.id.registerButton)  
  
        private val FULL_NAME_DISPLAY_MATCHER = withId(R.id.tvFullName)  
        private val EMAIL_DISPLAY_MATCHER = withId(R.id.tvEmailAddress)  
        private val PHONE_DISPLAY_MATCHER = withId(R.id.tvPhoneNumber)  
    }  
}
```

Each Action As A Method

```
class RegistrationRobot {  
  
    fun firstName(firstName: String): RegistrationRobot {  
        onView(FIRST_NAME_MATCHER).perform(clearText(), typeText(firstName), closeSoftKeyboard())  
        return this  
    }  
  
    fun register(): RegistrationRobot {  
        onView(REGISTER_INPUT_MATCHER).perform(click())  
        return this  
    }  
  
    fun assertFullNameDisplay(fullName: String): RegistrationRobot {  
        onView(FULL_NAME_DISPLAY_MATCHER).check(matches(withText(fullName)))  
        return this  
    }  
  
    ...  
}
```

Benefits

1. Readability
2. Maintainability

What Else?

Better Test Reporting

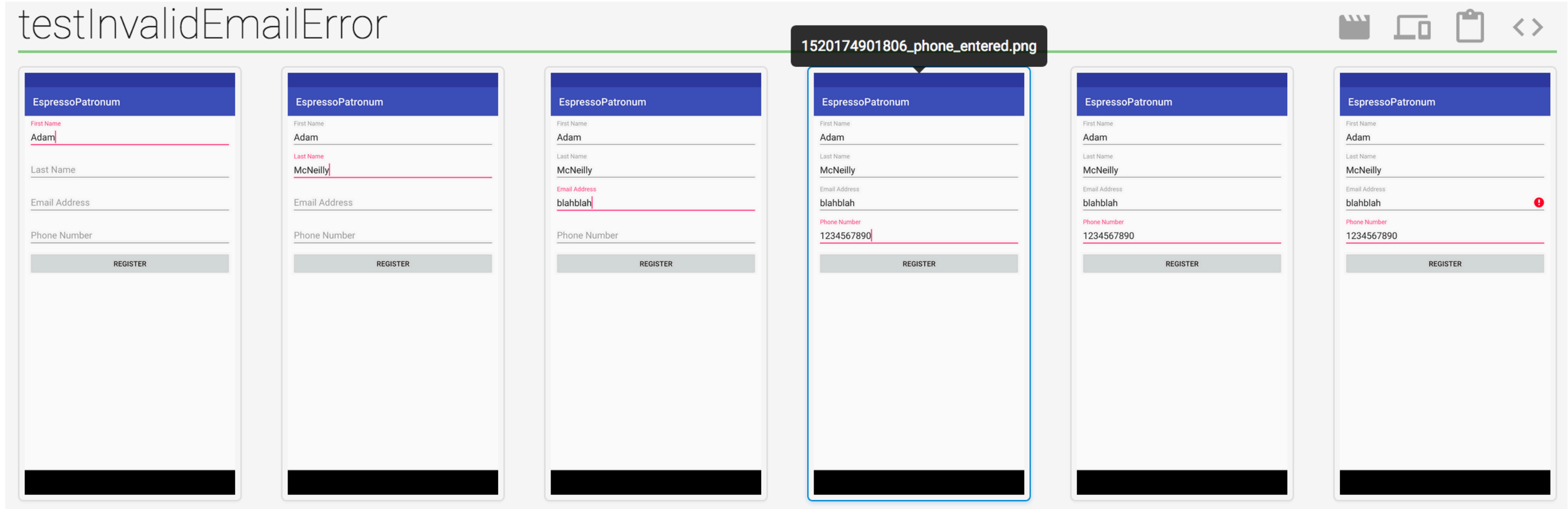
Now that we've established the robot pattern for clean and maintainable tests, let's take it a step further.

Better Test Reporting Using Spoon³

Spoon will run all of our instrumentation tests and build us a static HTML report at the end.

³ <https://github.com/square/spoon>

Example Spoon Report



When To Take Screenshots

- After assertions
- After actions - unless that action leads to another screen
- On failure

Adding Screenshots To Our Robot

```
fun firstName(firstName: String): RegistrationRobot {
    onView(FIRST_NAME_INPUT_MATCHER).perform(clearText(), typeText(firstName), closeSoftKeyboard())
    takeScreenshot(spoon, "first_name_entered")
    return this
}

fun register(): RegistrationRobot {
    takeScreenshot(spoon, "register_clicked")
    onView(REGISTER_INPUT_MATCHER).perform(click())
    return this
}

fun setFailureHandler(spoon: SpoonRule, context: Context) {
    Espresso.setFailureHandler { error, viewMatcher ->
        takeScreenshot(spoon, "test_failed")
        DefaultFailureHandler(context).handle(error, viewMatcher)
    }
}
```

Why screenshots?

- Human readable output
- Shows exactly what was tested and how
- Diagnose failures faster

Takeaways

1. Use the robot pattern to make your tests more maintainable.
2. Your actual tests become easier and quicker to write once you've created a robot.
3. Robots can be leveraged for additional and more thorough reporting.
4. This idea is not specific to Espresso or Spoon.

Contact

- Twitter - @AdamMc331
- <https://github.com/AdamMc331/EspressoPatronum>