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 tests[1].

[1] https://developer.android.com/training/testing/espresso/index.html

Three Classes To Know

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- ViewMatchers

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- ViewActions

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- ViewMatchers
- ViewActions
- ViewAssertions

ViewMatchers

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- `withId(...)`

ViewMatchers

- `withId(...)`
- `withText(...)`

ViewMatchers

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

ViewMatchers

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

ViewActions

ViewActions

- `typeText(...)`

ViewActions

- `typeText(...)`
- `scrollTo()`

ViewActions

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

ViewActions

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

ViewAssertions

ViewAssertions

- `matches(Matcher)`

ViewAssertions

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

ViewAssertions

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

Espresso Example

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

Espresso Example

```
// 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 App

Happy Path Test

```
@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("adam@testing.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("adam@testing.com")))
    onView(withId(R.id.tvPhoneNumber)).check(matches(withText("(123)-456-7890")))
}
```

Test Leaving Out A Field

```
@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 An Invalid Field

```
@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("adam@testing.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("adam@testing.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.")))
}
```

The Problem

The Problem

- Verbose

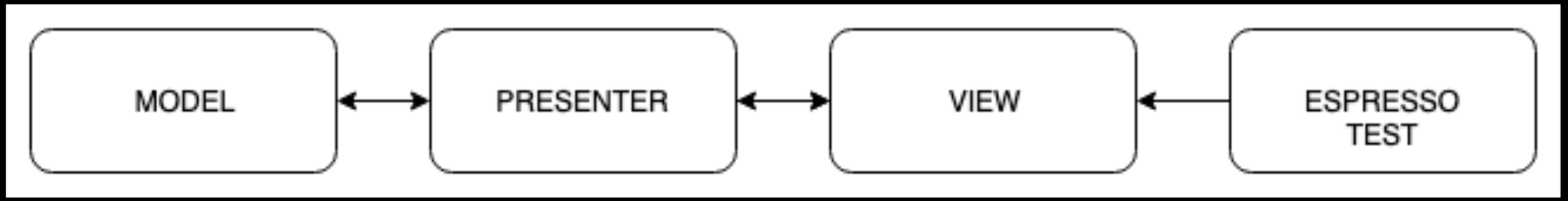
The Problem

- Verbose
- Difficult To Read

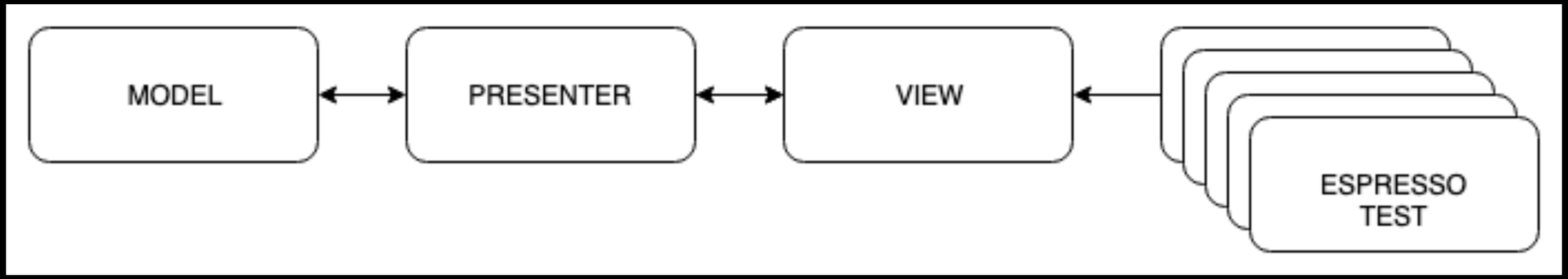
The Problem

- Verbose
- Difficult To Read
- Difficult To Maintain - No Separation Of Concerns

No Separation Of Concerns



No Separation Of Concerns



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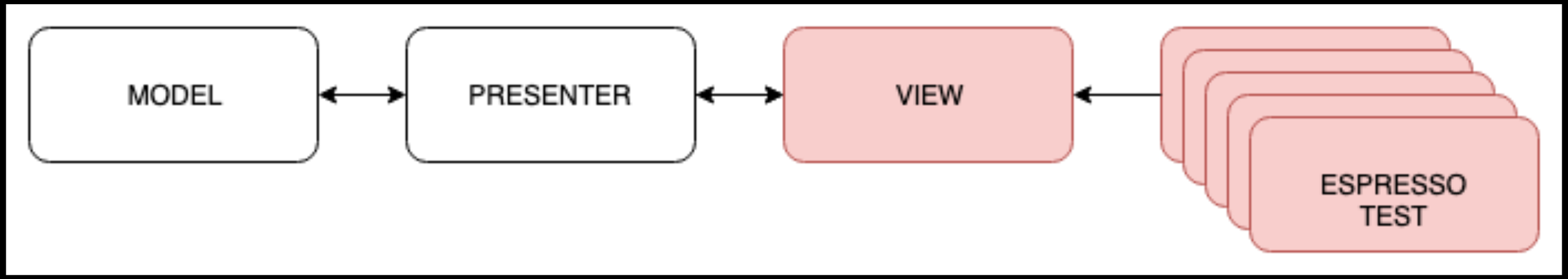
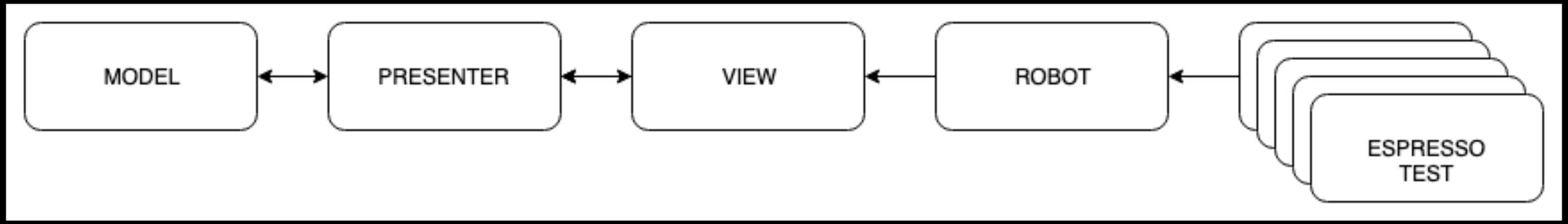
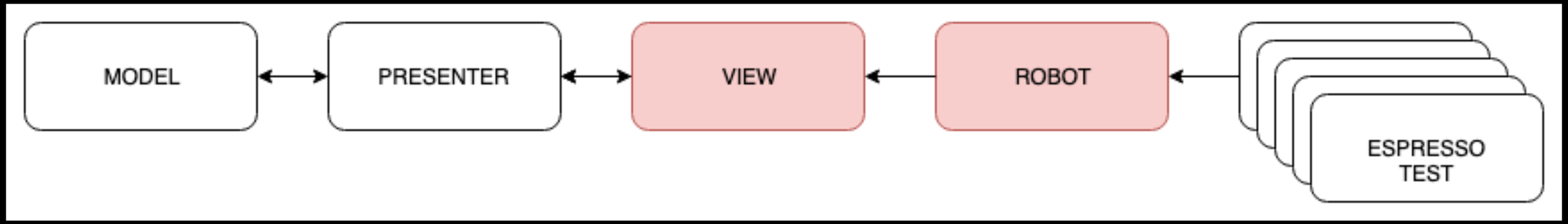


Introducing Robots



Separation Of Concerns



Let's Create A Robot

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

Write your tests as if you're telling a Quality Assurance Engineer what to do.

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)
    }
}
```

One Method For Each Action

```
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
    }
}
```

One Method For Each Assertion

```
class RegistrationRobot {

    fun assertEmailDisplay(email: String) = apply {
        onView(EMAIL_DISPLAY_MATCHER).check(matches(withText(email)))
    }

    fun assertEmailError(error: String) = apply {
        onView(EMAIL_INPUT_MATCHER).check(matches(hasErrorText(error)))
    }
}
```

Implementation

```
@Test
fun testSuccessfulRegistration() {
    RegistrationRobot()
            .firstName("Adam")
            .lastName("McNeilly")
            .email("adam@testing.com")
            .phone("1234567890")
            .register()
}
```

Easy To Create Negative Test

```
@Test
fun testMissingEmailError() {
    RegistrationRobot()
            .firstName("Adam")
            .lastName("McNeilly")
            .phone("1234567890")
            .register()
            .assertEmailError("Must enter an email address.")
}
```

Work Some Kotlin Magic, If You Want

```
fun registration(func: RegistrationRobot.() -> Unit) = RegistrationRobot().apply(func)

// ...

@Test
fun testSuccessfulRegistrationWithOptIn() {
    registration {
        firstName("Adam")
        lastName("McNeilly")
        email("adam@testing.com")
        phone("1234567890")
        emailOptIn()
    }.register()
}
```

Best Practices

Leverage Them For Better Test Reporting

```
class RegistrationRobot {

    // Take a screenshot
    fun firstName(firstName: String) = apply {
        onView(FIRST_NAME_MATCHER).perform(clearText(), typeText(firstName), closeSoftKeyboard())
        takeScreenshot("entered_first_name")
    }

    // Log the step
    fun firstName(firstName: String) = apply {
        onView(FIRST_NAME_MATCHER).perform(clearText(), typeText(firstName), closeSoftKeyboard())
        Timber.d("Entering first name")
    }
}
```

Use One Robot Per Screen

```
@Test
fun testSuccessfulRegistrationWithOptIn() {
    RegistrationRobot()
            .firstName("Adam")
            .lastName("McNeilly")
            .email("adam@testing.com")
            .phone("1234567890")
            .emailOptIn()
            .register()

    UserProfileRobot()
            .assertFullNameDisplay("Adam McNeilly")
            .assertEmailDisplay("adam@testing.com")
            .assertPhoneDisplay("(123)-456-7890")
            .assertOptedIn()
}
```

Don't Chain Robots

```
// Sounds reasonable...
fun register(): UserProfileRobot {
    onView(REGISTER_INPUT_MATCHER).perform(click())
    return UserProfileRobot()
}

// Unable to run negative tests now
@Test
fun testMissingEmailError() {
    RegistrationRobot(spoon)
            .register()
            .assertEmailError("Must enter an email address.") // Undefined Method
}
```

Don't Put Conditional Logic In Robot

```
// Sounds reasonable...
// But who tests the tests?
class UserProfileRobot {
    fun assertOptInStatus(optedIn: Boolean) = apply {
        val optInMatcher = if (optedIn) isChecked() else isNotChecked()
        onView(EMAIL_OPT_IN_DISPLAY_MATCHER).check(matches(optInMatcher))
    }
}
```

Use Separate Methods Instead

```
class UserProfileRobot {
    fun assertOptedIn() = apply {
        onView(EMAIL_OPT_IN_DISPLAY_MATCHER).check(matches(isChecked()))
    }

    fun assertOptedOut() = apply {
        onView(EMAIL_OPT_IN_DISPLAY_MATCHER).check(matches(isNotChecked()))
    }
}
```

Recap

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  - Don't include any logic in the robot methods

Recap

- Utilize robot pattern for more readable and maintainable tests
- Take advantage of this pattern to introduce better test reporting
- Don't code yourself into a corner with additional complexity
  - Don't chain robots
  - Don't include any logic in the robot methods
- This concept is not specific to Espresso