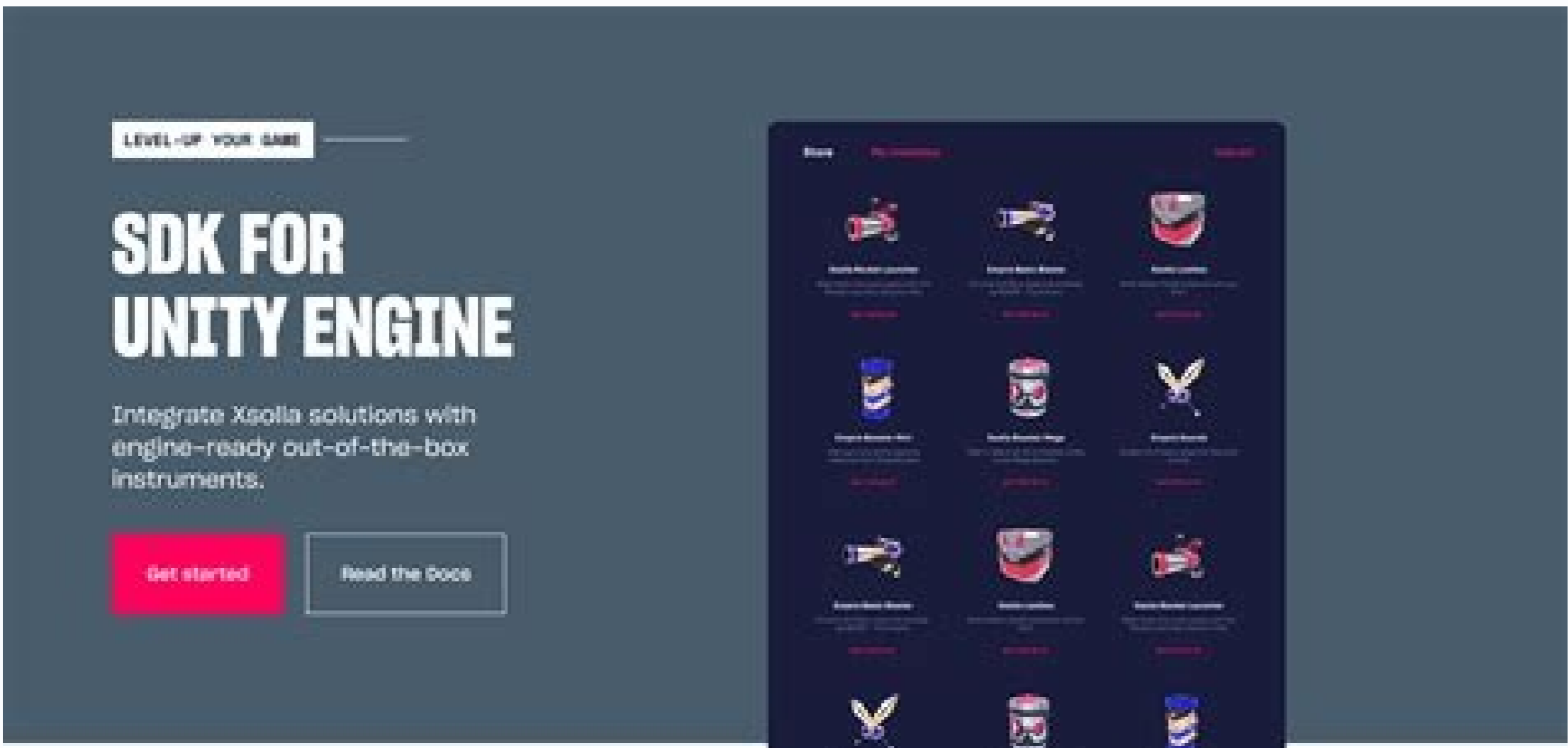


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In this article I would like to share my experience building quest / tutorial systems for simulation games. It will consist of a theoretical and slightly more practical part based on developing quests with ECS (and reactive systems). Without further ado let's start with the theoretical part. In games, quests are tasks, which player can accomplish in order to get further in the game and receive some kind of a reward. Tutorials can be seen as mandatory quests. A quest can contain a list of single tasks, but for simplicity I would like to define, that there is only one task per quest. Tasks are normally defined by game designers and are described through unlocking requirement, goals or completion requirements and rewards. In some cases it is good to provide task cancellation requirements. But before I go in depth on the ingredients of different requirements, let me first list all possible states of a task: pending—the task did not meet the unlocking requirement yet unlocked—the unlocking requirements are met, but it is not in progress yet, maybe because of the limit of possible tasks in progress in progress—the task was unlocked and shown to the player. It might be useful to have a sub-state, or a separate state for new task. This symbols that the task is technically in progress, but player did not read the objections yet. I did not give it a separate state because it is UI specific completed—task was in progress and player did everything necessary to complete it. Now it is time to collect the reward. If there is no reward the task might directly switch to the next state. There are also systems where quests autocompleted done—task was completed and user collected the reward canceled—this state is important if you want a quest to disappear. It's particularly useful, if you introduce a new quests which player, who advanced beyond a certain threshold, shall not see Now it is time to speak about different requirements. Unlocking Requirements Those are mainly based on game state / player progress. The simplest requirement is level or XP, but it is also very common to chain unlocking of the quest to a resource or a certain interaction. Say you want to teach a player to do crafting. When a player accumulates the right resources, we should unlock a quest where the player needs to use those resources for crafting. Same can apply to building, upgrading, training etc... Even using some distant, or just unlocked parts of the UI may be designed as a quest, with unlocking requirements of this UI element appearing. Another unlocking requirement which I find very useful is completion of another task. Task A unlocks only when task B and C are done. This way we control the flow of the quests, linearising the order quests are presented in. Cancellation Requirements As mentioned in the canceled state description, it is very important to avoid some basic quests when the player is too advanced. If you introduce a quest for beginners you will set unlocking requirements in a way that advanced player will also met. However you don't want advanced players to do basic tasks. In my opinion the simplest thing is to couple cancellation to an XP of some sort, or on a completion of another task. Completion Requirements There are mainly two requirement categories for completion: Game state based category we define that the quest is completed, when the player have 2000 apples. If apples is a consumable resource the player would have to stop consuming it and keep harvesting apples till she has 2000 of it. In the Ad-hoc actions category, we would define that player should harvest 2000 apples after the task moved to "in progress" state. This way we do not impose any consumption restriction on the player and don't care about previous achievements. Btw, quests with Game state based completion requirements can be auto-completed. Player might already reached the state needed for completion. However the Ad-hoc actions based, always needs to be worked on. Rewards A task/quest without reward is a little bit disappointing, specially if a quest involves some grinding. The simplest solution is to give players XP, but sometimes completion of a quest can be used to give a player some rare items, or random GATCHA. As mentioned before quests are defined by game designers, they are tools to steer players in to desirable direction. However there is only so much stuff a game designer can come up with. If your quest system is well-formed, you might try to procedurally generate them. From my experience, this is actually one of the last tasks a game production team gets to do before automation mode. How do I implement a quest system with ECS In my article Game Data and Entitas I argue that data can be divided into three categories: Configuration Game State Runtime Data In case of quests, we need to use all three of those categories. The definition of the quest is stored as a configuration. In progress, Done and canceled quests are stored as game state. At game initialisation, we would go through the configuration and create a set of "pending" and "in progress" quests, according to quests already persisted in the game state. We also check if we can store new quests as canceled. At runtime we need a set of reactive systems, which will monitor the relevant parts of the game state and transform pending quests to unlocked and if possible to in progress. Quests based on ad-hoc actions, will have components storing the progress. We need another set of reactive systems, which monitor the game state and events in order complete a quest, or at least change quest progress in case of ad-hoc actions. When a quest moves to done, it will be persisted in the game state. This is basically the magic sauce. The details can become a bit more involved, but in my opinion, ECS is a very quest friendly architecture. Specifically if you are following it strictly and turn every player event to a component. BTW, writing reactive systems for procedural generated quests is not a rocket science. What is an entrepreneur? There are many answers to this question. However, the one that I like the most is, "Anyone who provides value in exchange for monetary compensation, with or without their having to be there." That last part is critical because if all you had to do is exchange value for money, an entrepreneur would be no different from a freelancer. The added statement of "with or without them having to be there" is what allows an entrepreneur to differentiate themselves from a freelancer.To build a business where they can make money without being there, they have to be a builder of systems. These can be systems you set up through software, hiring, or a hybrid of the two. However, to be an entrepreneur, you must have systems in place to be successful.Many entrepreneurs go wrong when building systems because they try to start with an overcomplicated system. They want it to be complex and full of jargon to try to prove that they are the next big thing.Unfortunately, when startups begin with a complex system, they often see their systems fall apart. The most reliable systems, especially when you're starting, are the ones that are both simple and digestible enough to be understood and accepted by others. If your system is complicated from the start, no one will buy into your vision, nor will they know how to replicate it if you're not there.This theory is nicely summed up by the famous author and pediatrician John Gall. Gall wrote a book called Systemantics: How Systems Really Work and How They Fail. In the book, he states: "A complex system that works is invariably found to have evolved from a simple system that worked. A complex system designed from scratch never works and cannot be patched up to make it work. You have to start over with a working simple system."In essence, this law is in favor of underspecification. Gall's law can be used to explain some of the biggest companies in the world, ranging from Google to Facebook. Most of the large companies that exist today grew from simple to complex systems incrementally. So, when building your business, it is essential to start as simple as possible. By doing this, you give yourself the building blocks to grow your company into a more complex set of systems. One of the strengths of the Android platform compared to iOS, for example, is that it has an open source basis, which makes it easier to produce your own applications and distribute them without waiting for a lengthy approval process. You can set up your own Android app on your PC as long as you have the right software installed, and you can even take it for a test drive using an Android emulator so you can see what it will look like when it's run on a smartphone. There are two techniques that you can use to produce Android applications with a PC. The first uses the Android Software Development Kit (SDK). This lets you write raw code and helps you get it working in the Android environment. The second uses App Inventor, a Google Labs tool that's still in beta. This provides you with a simple drag-and-drop environment that you can use to generate new applications made up of building blocks of code and media. It's an attempt to make application development possible for people who aren't hardcore coders, but it's not recommended for production environments.Assuming that you'd like to try the full coded environment, we'll demonstrate how to produce a simple 'hello world' application. If you'd rather work in a GUI, we'll discuss App Inventor later on. Android apps are written in Java code, so you'll need a Java development kit installed on your PC. You also need an integrated development environment (IDE) so you can write and test the code. You also need to get your computer ready for the Android SDK. Start by installing a Java Development Kit for your version of Windows. You also need to install Eclipse IDE for Java developers. When you install Eclipse it will check for the JDK. It's best to unzip Eclipse in the same directory as the JDK. If it can't find the JDK it won't install, but you can always move the required files to whatever directory the Eclipse installer is examining. With Eclipse up and running, you can download the Android SDK. Extract it to a safe directory on your PC and make a note of where it is. Back in Eclipse you need to add the Android Development Tools. To do this, choose 'Help > Install new software'. Next to 'Work with', enter and click 'Add'. In the pane below this, check 'Development tools' and click 'Next'. Select 'Android DDMS' and 'Android Development Tools'. Click 'Next', accept the terms and restart. You need to point the ADT plugin to where you extracted the Android SDK. In Eclipse choose 'Window > Preferences > Android'. Next to 'SDK location' click 'Browse' and locate the folder with the SDK. Click 'Apply' and 'OK'. Android platform Now that you've sorted out the programming environment, you also need to get at least one version of the Android platform. You can do this in the Android SDK and AVD Manager, which you can launch in Eclipse if you've set your system up correctly. Choose 'Window > Android SDK and AVD Manager' to open it, then select 'Available packages' and tick the box next to '. After a brief scan of the repository, you'll see the available components. Tick those that you want to install and clear the rest. The most important package to install is the latest version of the Android platform. You'll only need older ones if you plan to release your app and need to test it in a range of different versions. At this stage you can also clear the samples, Google APIs and USB driver. It's also necessary to be unique across the Android system, which is why a domain style package is used: 'com.example' is reserved for examples like this. If you develop an app that's published, you'll need to use your own namespace. This usually relates to the organisation publishing the app. 'Create activity' relates to the class stub generated by the plug-in. An activity is basically an action. It might need to set up a user interface if it needs one. We left other project fields at their default values, but it's useful to know what they do. 'Min SDK version' lets you set the minimum API required by your application. If 'Use default location' is ticked, your project will be saved in your workspace. You can opt to change this if you want to store the files elsewhere. 'Build target' is the platform target for your application. It's the minimum version of Android that it will run on. If you develop an app to run on an earlier version of Android, it should run on a later one too, but one developed for a later version of the platform probably won't run on an earlier version. For an example like this, the build target isn't critical as long as you can get your application to run in the emulator. It's more of a concern when you come to release an app. Finally, the option to create the project from an existing example enables you to select some existing code to modify. You'll find this of more interest as you move on to greater programming challenges. Modify the code You should now see your project displayed in the Package Explorer, which is shown in the left-hand pane of Eclipse. Double-click 'HelloAndroid' to expand it. Also expand 'src' and 'com.example.helloandroid'. Double-click 'HelloAndroid.java' to see the code that's already been set up. In the main pane you should see the following text: package com.example.helloandroid; import android.app.Activity; import android.os.Bundle; public class HelloAndroid extends Activity { /\*\* Called when the activity is first created. \*/ @Override public void onCreate(Bundle savedInstanceState) { super.onCreate(savedInstanceState); setContentView(R.layout.main); } } If you can't see all of this, try looking to the left-hand side of the pane and expanding any plus signs that indicate collapsed code. This defines your application without actually doing anything at this stage. To make it do some work, we need to add an object that will contain your text. Having done that, we also need to specify the text. Below 'import android.os.Bundle;' add the following line: import

android.widget.TextView;Also add the following to the two sets of closing curly brackets:TextView tv = new TextView(this);tv.setText("My First Android App"); You can replace the text within the quotes to make your app say whatever you like. Check that the code in its entirety reads as follows, assuming you kept the displayed text the same:package com.example.helloandroid;import android.app.Activity;import android.os.Bundle;import android.widget.TextView;public class HelloAndroid extends Activity {*/\*\* Called when the activity is first created. \*/*@Override public void onCreate(Bundle savedInstanceState) {super.onCreate(savedInstanceState);TextView tv = new TextView(this); tv.setText("My First Android App"); setContentView(tv; }}Save the changes to your code. You can now try it out in the Android emulator. In Eclipse, choose 'Run > Run > Android application'. The emulator launches. It can take a few minutes to boot into Android, so be patient. Once booted, your app should run automatically and you'll see a grey title bar with the app name in it. Below this, your chosen text is displayed.Press the 'Home' button in the emulator to return to the Android home screen. Click the 'Applications' button to see the list of available applications. Among these you should see 'Hello, Android'. Select this to launch your app again.Test your app on an Android deviceNow you've successfully run your app in the emulator, you can try running it on a real device. First you need to ensure that the USB driver is installed in the Android SDK and AVD manager. Choose 'Window > Android SDK and AVD manager > Available packages'. Select the Android repository, ensure that the USB driver is ticked and click 'Install selected'.Connect your phone to a spare USB port and wait for Windows to detect it. In the New Hardware wizard, choose 'Locate and install drivers' and opt to browse your computer for the driver software. Browse to the 'Android SDK' folder and locate the subfolder for the USB driver. Windows should find and install it from here.Now you need to declare your app as debuggable. In Eclipse, expand your HelloAndroid application and double-click 'AndroidManifest.xml'. Move to the 'Application' tab and select 'True' from the Debuggable dropdown list. Save the project.Go to your Android phone and choose 'Menu' from the home screen, then select 'Applications > Development' and enable USB debugging. Now you can reconnect it to your PC via USB. If you want to check that the SDK can see your phone, browse to the 'Tools' directory in your 'Android SDK' folder. Launch 'adb.exe' and you should be able to see your phone listed as 'Device'.To launch your application on the connected phone, you need to choose 'Run > Run > Android application in Eclipse'. Now you have both the emulator and your phone connected, you need to specify which you want to run it on. Eclipse presents you with a Device Chooser that lists all the available devices and emulators. Select your phone from this list to install and run the app.Now you've produced and run a very basic application from raw code in an emulator and on an Android device, you can begin to learn how to develop your own. It helps to have some knowledge of Java programming, but you'll also find a number of stepped tutorials in the Android Developer Resources pages.These include introductions to the different views available to apps and how to implement them. You'll also find ways to use common resources like location information, and find out how to debug your work.You can find a full list of sample code on these pages too. This will help you to work through example applications that you can modify to your own ends. These include games such as Snake and Lunar Lander, plus utilities like Note Pad and Wiktionary. You can find even more samples at Apps-for-Android. Page 2 For those whose eyes glaze over at the sight of a few lines of code, App Inventor may well be the answer. This Google Labs innovation lets you create applications using your browser and either a connected phone or an Android phone emulator. All your work is stored on the App Inventor servers, so you can come back to it at any point.App Inventor consists of three main components. The App Inventor Designer lets you select components for your app, including media, buttons, labels and everything else that's related to the way your app looks and feels.The App Inventor Blocks Editor is concerned with the processing components of your application. Any decision handling is dealt with here, and it's shown as a kind of puzzle. You drag and drop program pieces like a jigsaw.The emulator provides a virtual phone so you can try your program out, and it's updated as you make changes in real time.You can opt to use a real Android phone instead of the emulator, as long as there are Windows drivers to support it that will work with App Inventor.While it's partially cloud-based, there are still components that need to run locally, with the most important being the most recent version of Java. It's worth running a couple of tests to ensure your browser can execute Java code correctly before downloading the full App Inventor local program. If you have any browser extensions installed that stop code running in the browser, such as No Script for Firefox, it's a good idea to disable or even uninstall these before attempting to run App Inventor.Once you have App Inventor installed, you need to run it by connecting to the App Inventor site. You can't just launch it from the Start menu. In your chosen browser, head to App Inventor at Google Labs; if you have everything in place, the program will start. You may need to log into your Google Account if you haven't already done so, because this is where your development data will be stored.Create your first Android app: step-by-stepTo create an Android app in App Inventor, first download the most recent version of your browser and get Java.Run a couple of tests to ensure that your system is set up to run App Inventor, first by running the Java test. If it works, you'll be presented with a success message. If it fails, reinstall Java. After this, browse to the Check Java for App Inventor page, signing in with a Google account if prompted. The page will tell you if your browser is correctly configured.If it is, click the 'Launch' button to check that you can run a simple application in your browser using Java.Now you know that App Inventor will run in your browser, go to the App Inventor Setup page and click 'Download'. Once downloaded, browse to the file named 'AppInventor\_Setup\_Installer\_v\_1\_2.exe' and launch it. Follow the installation. Make a note of the installation directory in case you need it later, but don't change it.The software already supports a number of popular Android phones. These include T-Mobile G1 / ADP1, T-Mobile myTouch 3G / Google Ion / ADP2, Verizon Droid (not Droid X), Google Nexus One and Google Nexus S. If you have a different phone, visit the Windows Drivers page to get its drivers. Alternatively, you can run your app in the emulator.Next, go to App Inventor at Google Labs and wait for App Inventor to launch. Click 'New' to start a new project, name it 'HelloPurr' as one word and click 'OK'. This project uses two media files: a picture of a cat in PNG format and an MP3 of purring. You can download them from the Building Your First App tutorial webpage or use your own.The Designer opens. In the left-hand pane you'll see the palette, which shows each of the components you can use. Click and drag a button onto Screen 1 in the viewer, to the right of the palette. To the right of this is a list of components in use.Select Button 1 and click 'None' under 'Image'. Choose 'Add', then browse to your cat picture. This changes the appearance of the button. Click under 'Text' and delete the existing wording.You now need to set up the app in the Blocks Editor. This can run your app via its emulator or through your phone. Click 'Open the blocks editor' and wait for the editor to open in a new window. Keep the existing window open. Choose 'Connect to device' and select your phone from the dropdown list. Wait for the editor to connect properly. If all is well, you'll see a picture of a cat on your phone. Alternatively, click 'New emulator'.If you're using an emulator, once it's running you need to connect to it in the same way as a phone. Click 'Connect to device' and select the emulator. Once connected, you'll see your cat picture on the emulator's screen. You may need to unlock the emulated phone by dragging the green lock button to the right.Return to the Designer window and drag a label from the palette to the viewer in Screen 1 so it appears below the picture. In the label properties on the right, enter the text 'Stroke the cat'. Change the font size to 30 and choose a different colour if you like. We'll now add the purring sound for when the cat is stroked.In the Designer window, click 'Palette > Media > Player'. Drag it to Screen 1 in the Viewer. Select 'Components > Player1 > Source and add'. Find the MP3 file of the purring sound, select it and choose 'OK'.Everything is now in place, but the application needs to know to play the sound only when the cat is touched.Return to the Blocks Editor, select the tab 'My blocks' and click 'Button 1'. Drag the element 'when Button1.Click do' into the main editor screen. Now click 'Player1' and drag the element 'call Player1.Start' into the space within the existing element. Now click the cat to play the sound.Back in the editor, choose 'Package for phone and download to this computer', and that's it.Once you have the simple Hello Purr program running, you can stretch your wings a little. There's a wide range of tutorials for developing applications at App Inventor. These include a simple painting program, various quiz and arcade style games, and apps that use a phone's GPS chip to help find your way back to your car.You can use and modify these programs to help you to develop similar ones. If you need to get more information about App Inventor, you can find out more about components, blocks and more in the Reference pages.