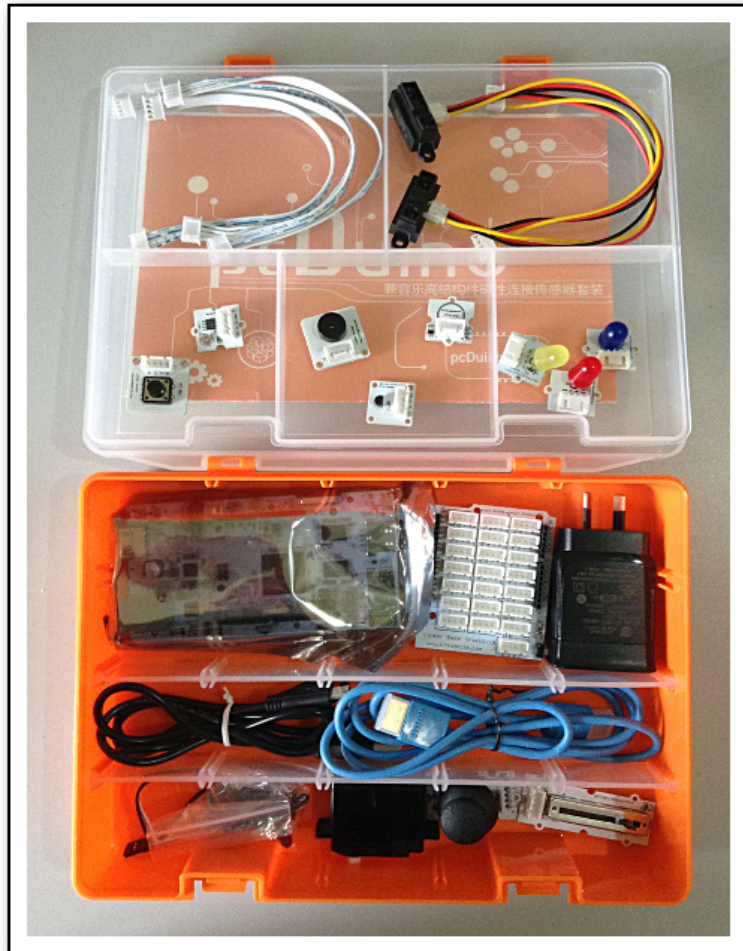


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This user manual contains an introductory course for the **LinkSprite Scratch Linker Kit**. It presents some relatively simple Scratch based projects. **Scratch** is a visual programming system developed in the U.S. at M.I.T. and is intended as an entry level environment for younger children into programming. It is however, still a fairly powerful programming language and capable of quite complex tasks. All of the course lessons will be conducted using only the contents of the Kit (shown below).

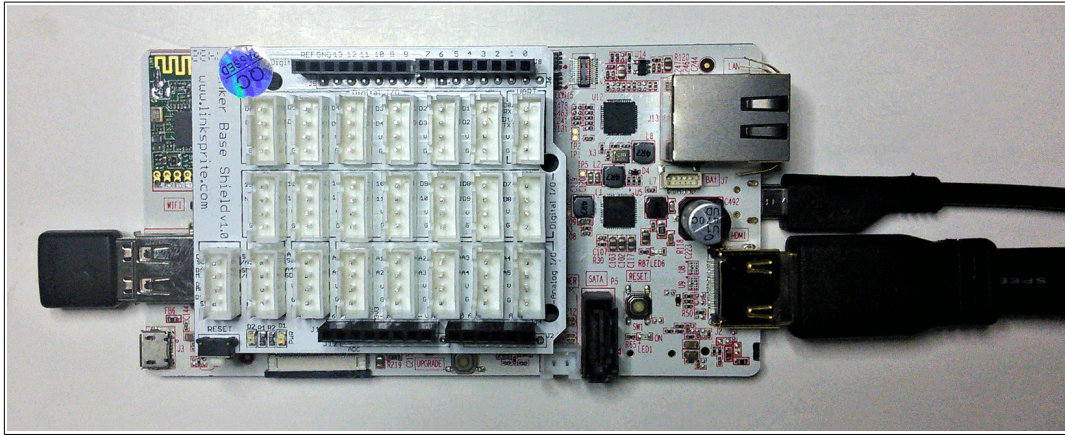


LinkSprite Scratch Linker Kit

Each project in this course builds on the one before it. The difficulty level increases with each project. At the end of this course you will have created a functional Scratch game and an Infrared Theremin using various hardware sensors and actuators running on the pcDuino single board computer contained in the kit. This course content is also available online at the LinkSprite Australia website, (www.linksprite.com.au). In addition, the USB Resource stick included with the kit contains additional projects and information.

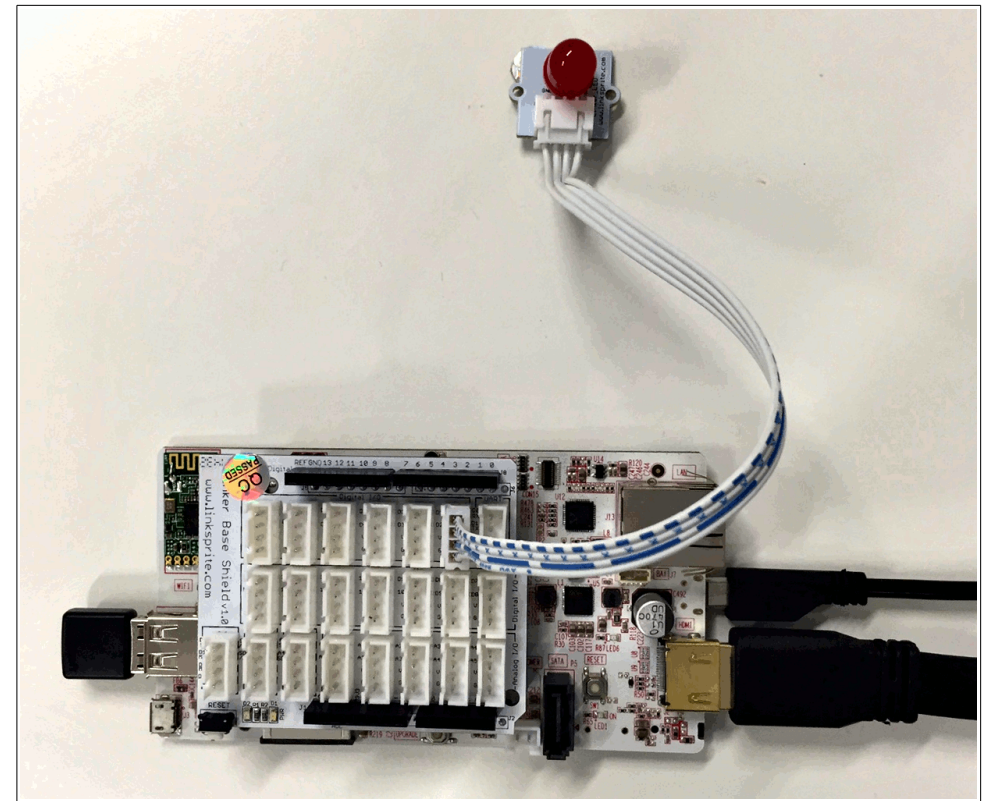
Project 1: "Blink an LED"

This project introduces the Scratch Linker Kit and creates two simple designs with it. The image below shows the Linker Base Shield and the pcDuino circuit boards from the Kit that form the basis of all of the projects in this manual.



Assemble the printed circuit boards, (PCB's) by plugging your Linker Base Shield into the pcDuino motherboard as shown. Take care to ensure that all pins are correctly aligned and to avoid bending or damaging pins and connectors. Connect the Keyboard-Mouse wireless dongle into the USB port then the HDMI cable. Finally attach the Micro-USB power cable into the Micro-USB power port located under the PCB. (Take care to ensure it is correctly oriented and do not force it.)

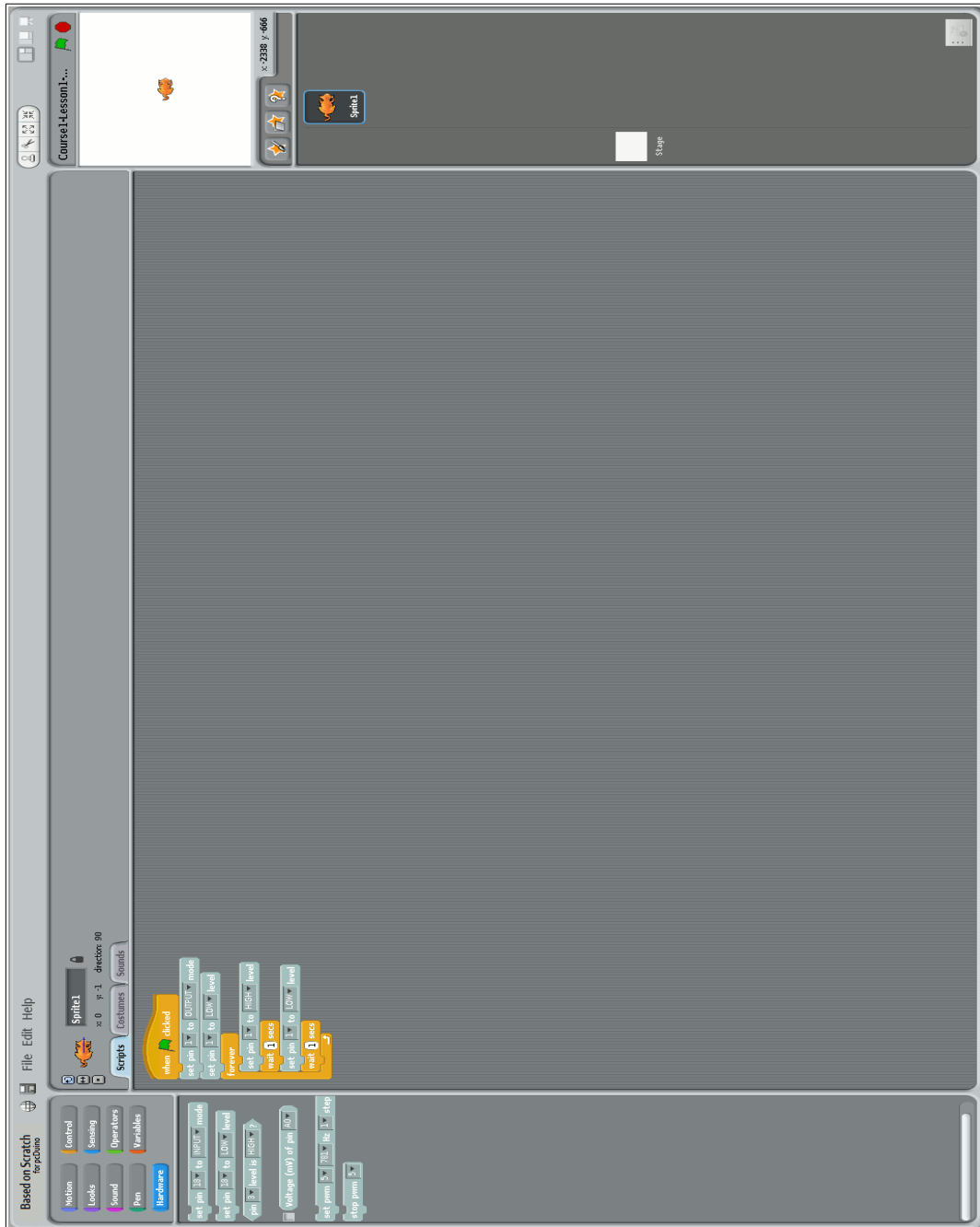
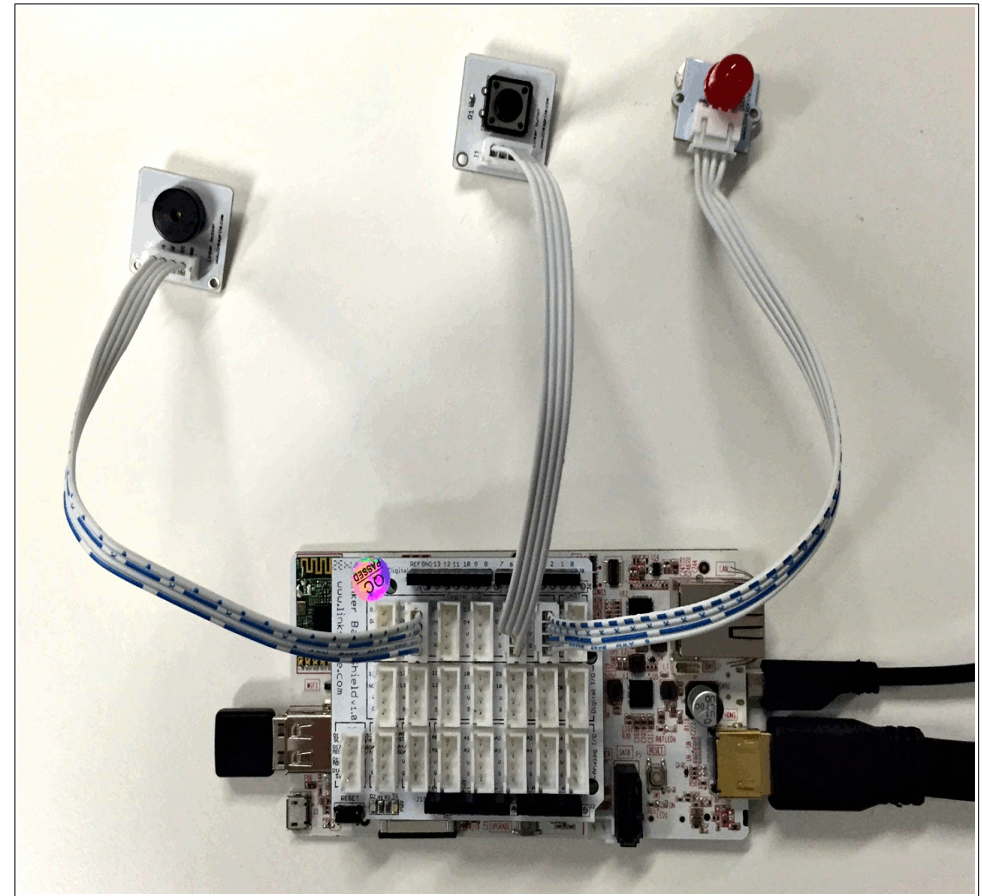
Connect the LED, ("Light Emitting Diode") into the D1 Port of the Digital I/O of the Linker Base Shield as shown in the following image.



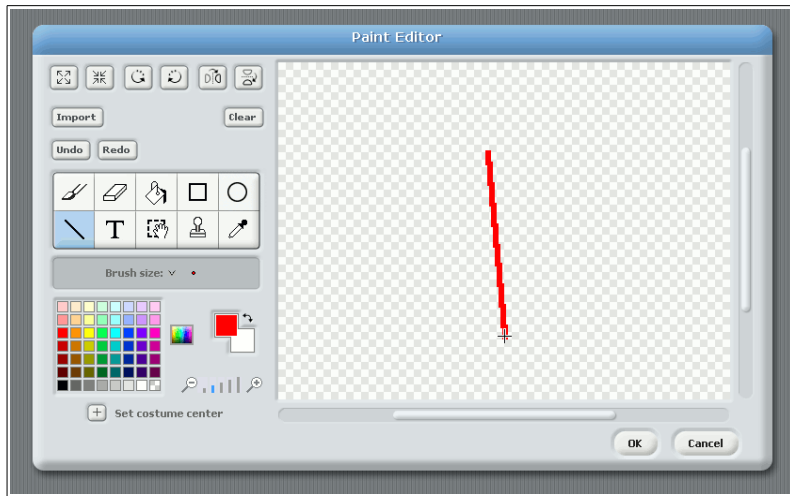
Open the Scratch development environment and create the script for Sprite1 as shown in the following image. Test the script by clicking on the Green "Start" flag. The LED should blink once a second. Save your project as "Project1".

Project 2: "Start Cat with Button"

Open and save your previous Scratch project, ("Project1") as "Project2". Plug the Button and the Buzzer into the D2 and D5 Ports of the Digital I/O section on the Linker Base Shield as shown in the following image.

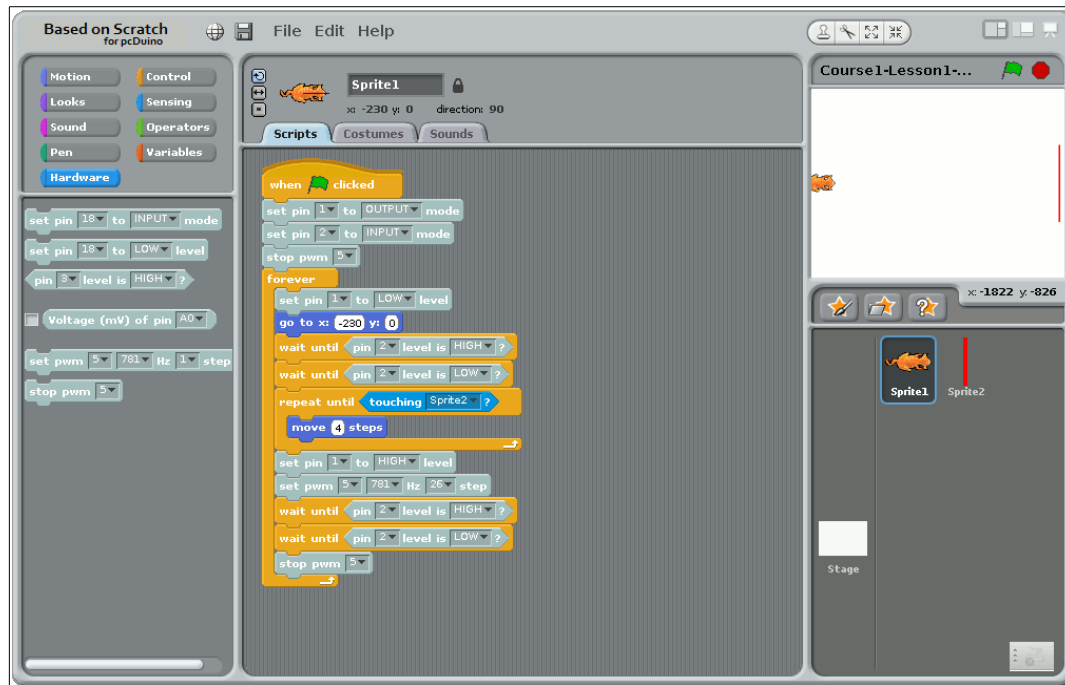


Create a second Sprite by clicking on the "Paint new sprite" button to open the Scratch Paint Editor. Draw a red straight line wall image for Sprite2 as shown in the following image.



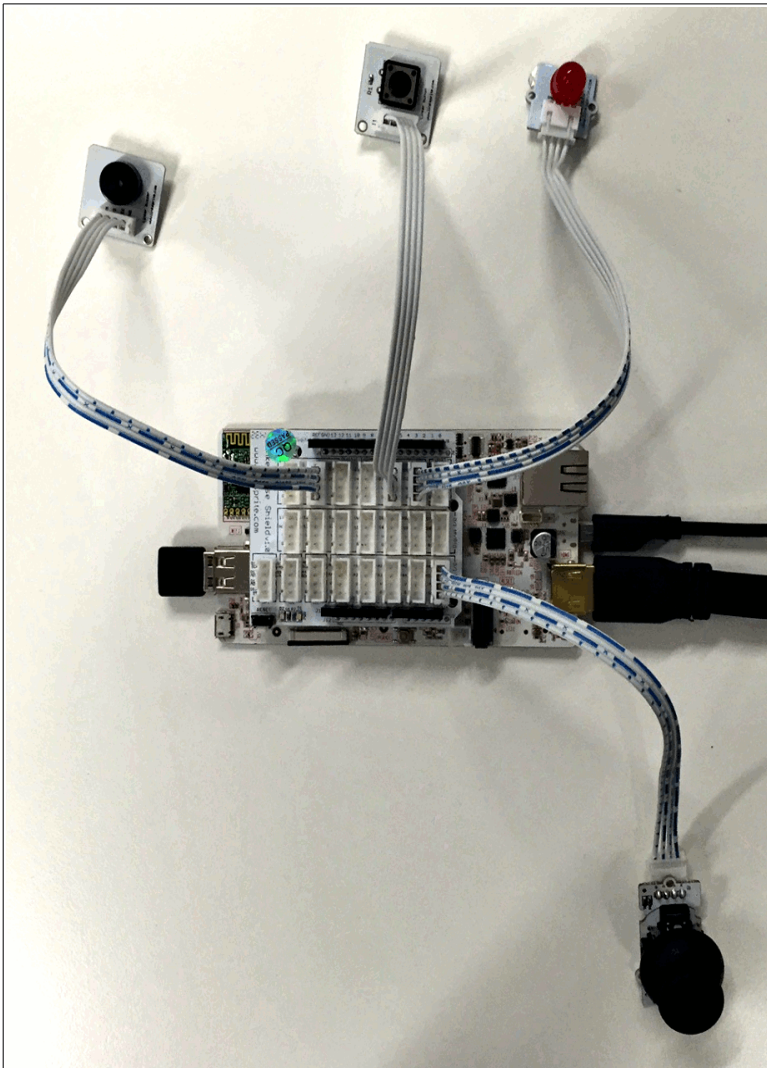
Modify the script for Sprite1 as shown in the image above. Test the script by clicking on the Green "Start" flag. When the button is pressed, the Cat should move towards the Wall until it touches at which point the LED should turn on and the buzzer will sound.. Don't forget to save your project as "Project2".

Create the script for Sprite2 as shown below.

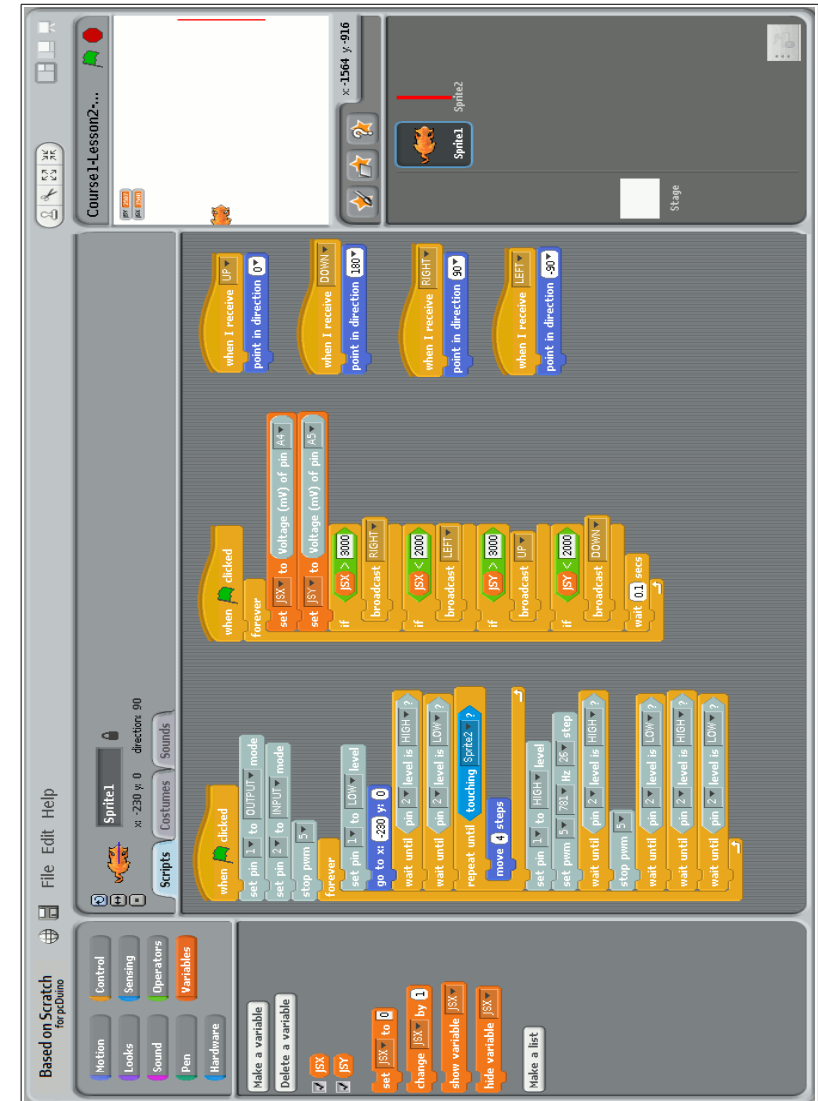


Project 3: "Control Cat with Joystick"

In this project we will extend the previous project by adding more Linker modules and functionality. The image below shows the additional Joystick module plugged into the A4 Port of the Analog I/O on the Linker Base Shield.



Open and save your previous Scratch project, ("Project2") as "Project3". Modify the script for Sprite1 as shown below. The changes include a new module to read the analogue voltages from the Joystick and convert these broadcast messages, "RIGHT", "LEFT", "UP" and "DOWN". Event handlers for each of these messages are created to set the direction of Sprite1, (the Cat).

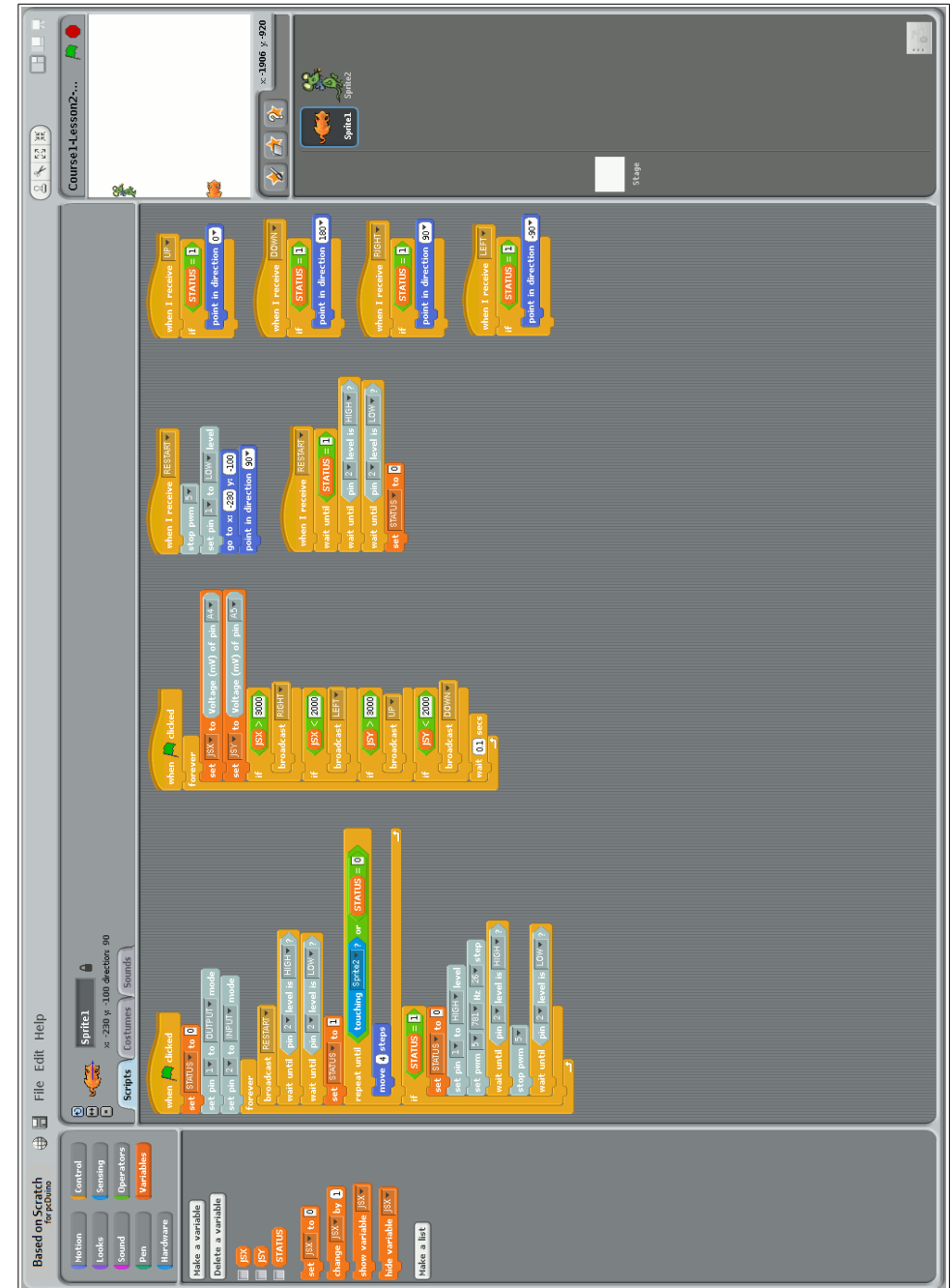


Create the script for Sprite2 as shown below. Test the script by clicking on the Green "Start" flag. When the button is pressed, the Cat should now be able to be controlled by the Joystick. move towards the Wall until it touches at which point the LED should turn on and the buzzer will sound. Pressing the Button will reset the game.



Project 4: "Cat Chases Mouse"

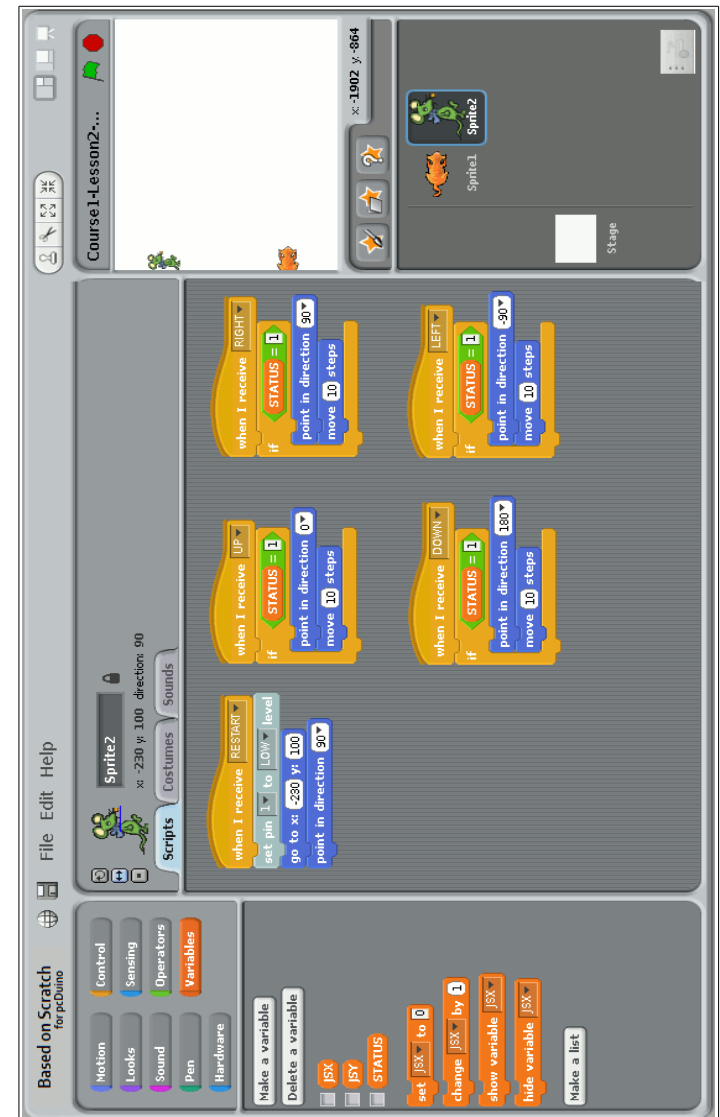
Open and save your previous Scratch project, ("Project3") as "Project4". Create the script for Sprite 1 as shown in the following image. This project adds a new "Restart" event handler which "cleans" up the code structure in order to facilitate later code changes in Project 3. The "Restart" event handler utilises a new "STATUS" global variable to store the current restart state. In addition, a new Mouse sprite is added which has some limited behaviour as well.



Delete Sprite2 and then replace it by clicking on the "Choose new sprite from file" button and then selecting the mouse sprite as shown below. Once the mouse is selected resize it to the same dimensions as the cat sprite using the "Shrink sprite" button.

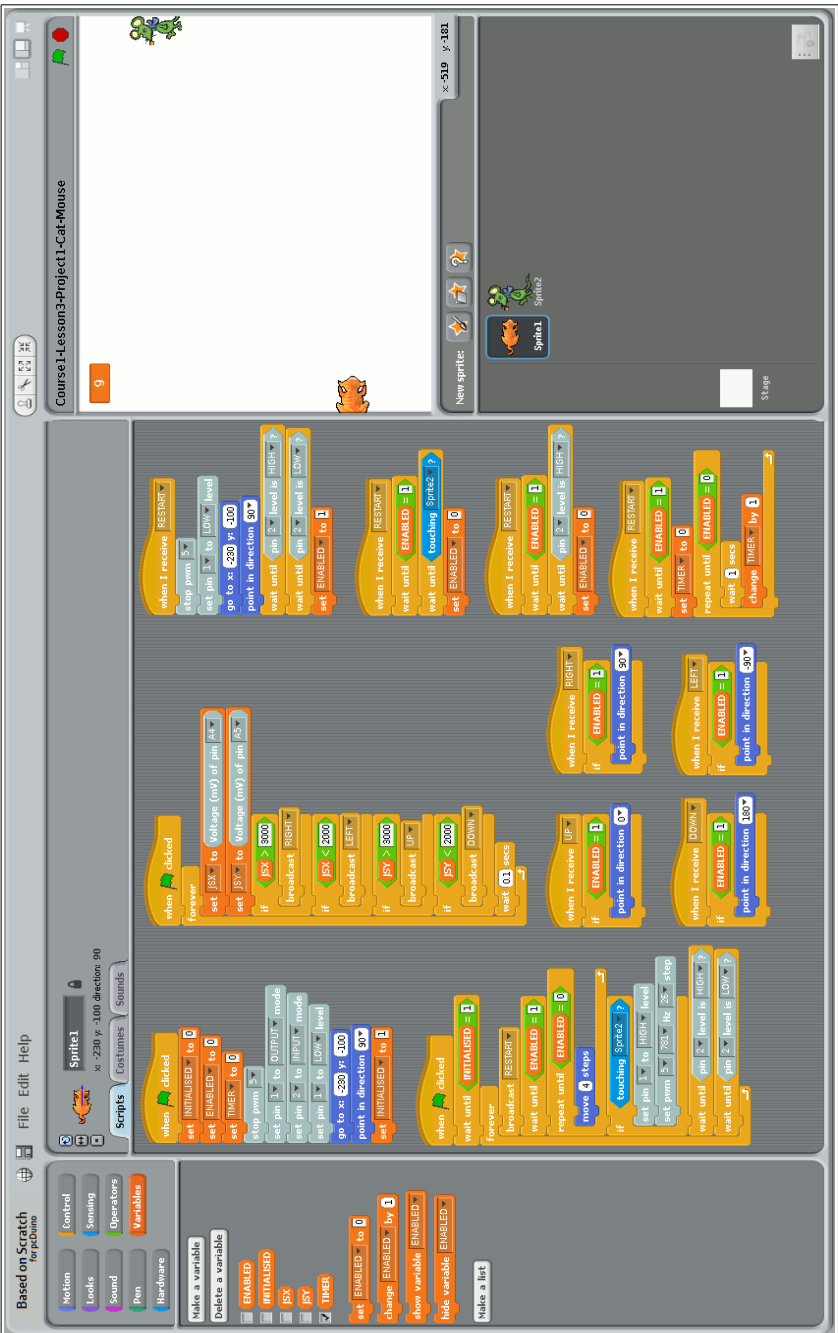


Create the script for Sprite2 as shown below. Test the script by clicking on the Green "Start" flag. When the button is pressed, the Cat should now be able to be controlled by the Joystick. Move the Cat towards the Mouse until it touches at which point the LED should turn on and the buzzer will sound. Pressing the Button will reset the game. Don't forget to save your project as "Project4".

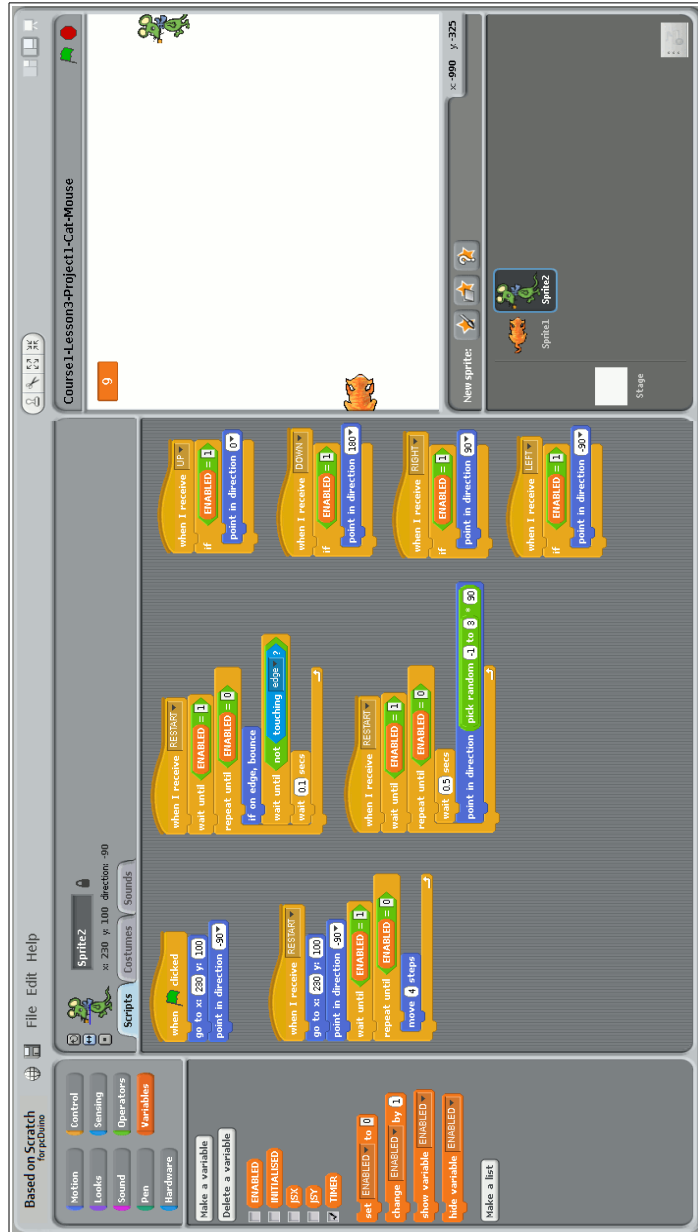


Project 5: "A Smarter Mouse"

Open and save your previous Scratch project, ("Project4") as "Project5". Create the script for Sprite 1 as shown in the following image. This project includes a new global "Enabled" variable which is set in a separate event handler when Sprite1 touches Sprite2. In addition, a new Timer module has been added to indicate the number of seconds passed since the game commenced. All initialisation is now done in separate event handlers triggered by the "RESTART" message. Sprite 2 now has a new random walk functionality added to make its behaviour more unpredictable, (and thus harder to catch).

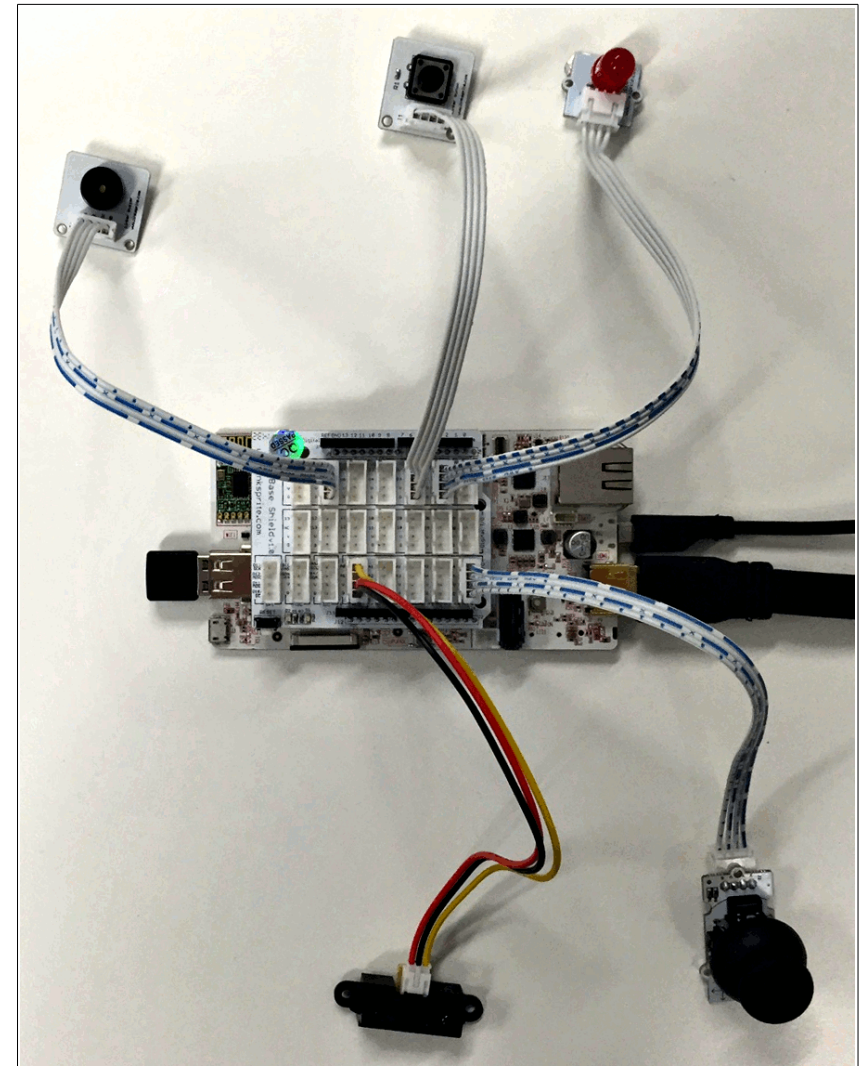


Create the script for Sprite2 as shown below. Test the script by clicking on the Green "Start" flag. When the button is pressed, control the Cat with the Joystick and move towards the Mouse. The Mouse is a little smarter now and will run away. When they touch, the LED should turn on and the buzzer will sound. Pressing the Button will reset the game. Don't forget to save your project as "Project5".

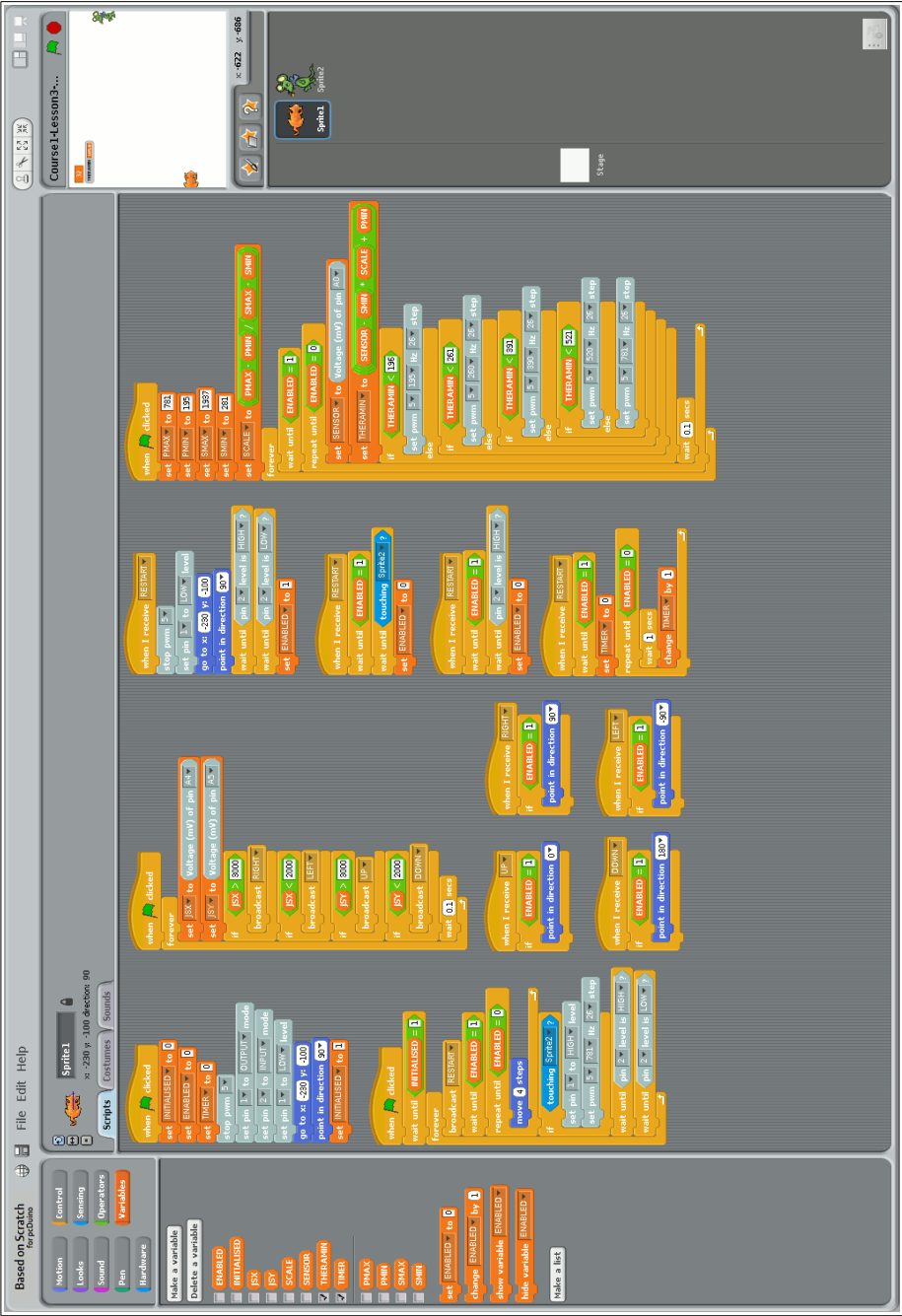


Project 6: "Add an Infrared Theremin"

Every Cat and Mouse game needs an Infrared Theremin, (or perhaps that's just me). In this lesson we will extend the project we completed in Project 5 adding an Infrared Distance sensor Linker module which can be played while you chase the mouse. The image below shows the additional Infrared Distance sensor module plugged into the A0 Port of the Analog I/O section on the Linker Base Shield.



Open and save your previous Scratch project, ("Project5") as "Project6".
Modify the script for Sprite1 as shown below.



Create the script for Sprite2 as shown below. Test the script by clicking on the Green "Start" flag. When the button is pressed, the Cat should now be able to be controlled by the Joystick. Move the Cat towards the Mouse until it touches at which point the LED should turn on and the buzzer will sound. While you're doing this take a break and play the Infrared Theremin by moving your hand up and down above the Infrared Distance sensor. Pressing the Button will reset the game. Don't forget to save your project as "Project6".

