

A Simple way to Teach the new Coding Curriculum

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 **LinkSprite**

A Fun Introduction to Electronics and Software Programming



SCRAATCH!

A Complete Kit for Students of all ages to Learn about the "Internet of Things"

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Introduction

This manual presents some simple Scratch based projects for the **LinkSprite Scratch Linker Kit**. These projects are designed to familiarise the user with Scratch programming. **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 students into programming. It is however, still a fairly powerful programming language and capable of quite complex tasks. All of the projects in this guide will use only the components provided in the kit, (shown in the following image).

This guide and other resources, (such as scratch projects, source code and videos), are available online at the following links:

<http://learning.linksprite.com.au/scratch-linker-kit/documents/projects.pdf>

<http://learning.linksprite.com.au/scratch-linker-kit/>



List of Contents



1 x pcDuino3 Single Board Computer.



1 x Base Shield for Linker Kit.



1 x Acrylic Clear Enclosure for pcDuino3 Single Board Computer.



1 x HDMI Video Cable.



1 x CAT 5E Twisted Pair Network Cable.



1 x Micro-USB Cable.



1 x 4-Port USB Hub.



1 x USB Camera.



1 x Servo Motor.



4 x 20 cm Linker Cable.



3 x 10 mm LED Linker Modules, (Blue, Yellow and Red).



1 x Momentary-ON Push Button Linker Module.



1 x Buzzer Linker Module.



1 x Joystick Linker Module.



1 x Linear Slide Potentiometer Linker Module.



1 x Temperature Sensor Linker Module.



1 x Touch Sensor Linker Module.



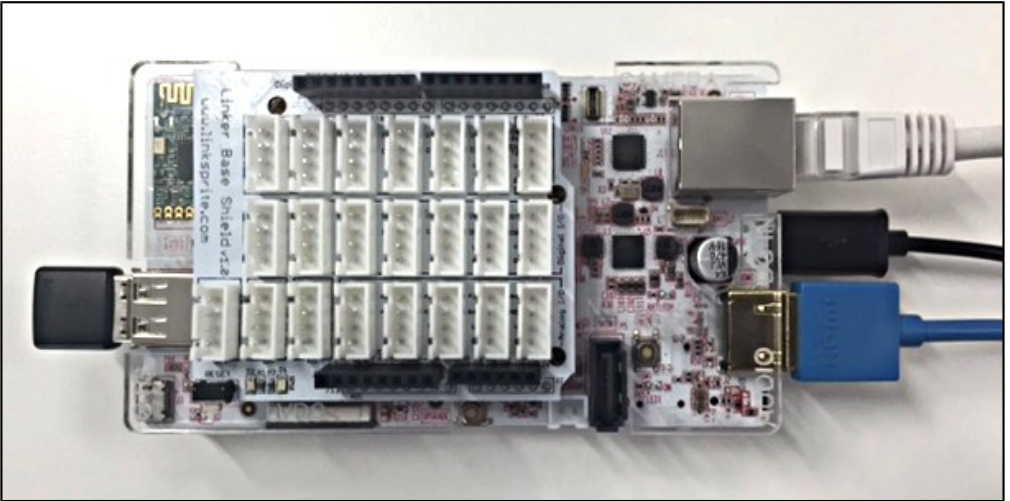
1 x Ambient Light Sensor Linker Module.



2 x Infra-red Distance Sensor Linker Module.

Before You Begin

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 guide.

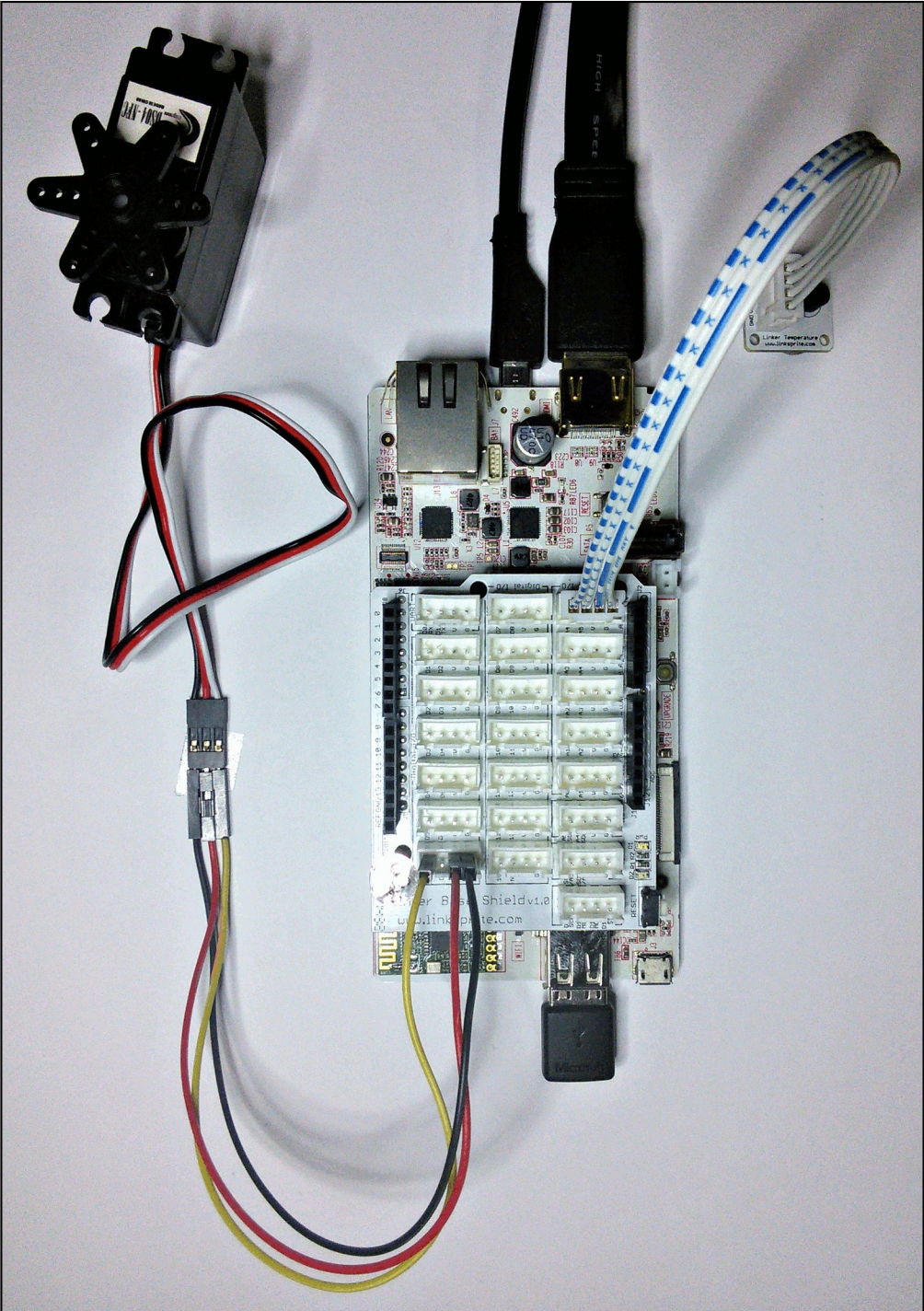


Assemble the printed circuit boards, (PCB's) by plugging your Linker Base Shield into the pcDuino motherboard as shown. Take care to ensure that all pins are correctly aligned and to avoid bending or damaging pins and connectors. If you have a wireless Keyboard-Mouse combo then plug the wireless dongle into the USB port, otherwise you will need to connect a small USB hub first and then connect the mouse and keyboard to it. Plug the HDMI video cable into the HDMI port and plug a network cable into the network port. (WiFi is also available). 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.)

Project 1: “A Temperature Controlled Fan”

This project uses Scratch to control a servo motor based on the ambient temperature. Connect the Temperature Sensor Linker Module to the A4/A5 Port of the Analog I/O on the Linker Base Shield. The Servo Motor module requires the use of the additional cables to connect it's connector to the D6 Port of the Digital I/O. Be careful to ensure that cables are connected to the correct pins. Use the image on the next page as your guide.

Open the Scratch development environment and open the “temp-controlled-fan” project file from the “More Projects” folder. (This is also on the USB Resource Stick if your kit version contains one). This should contain a script for Sprite1 as shown in the last image. Test the script by clicking on the Green “Start” flag. The Servo motor should switch on when the temperature exceeds the threshold value.

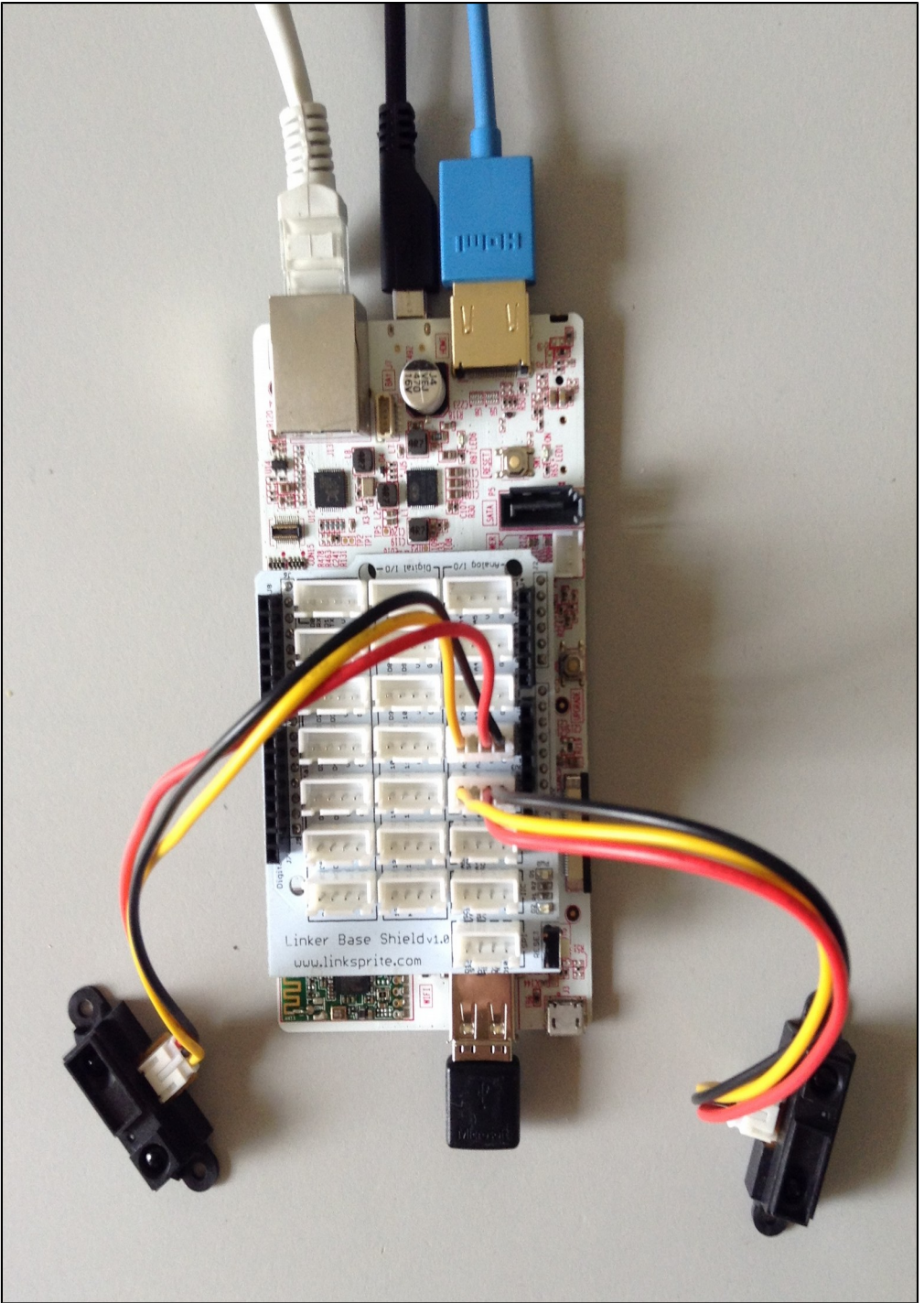


X: -894 Y: -289

Project 2: “Infrared Pong”

This project uses Scratch to create the famous “Pong” game controlled by two Infrared Distance sensors. Connect the Infrared Distance Sensor Linker Modules to the A0 and A1 Ports of the Analog I/O on the Linker Base Shield. Be careful to ensure that cables are connected to the correct ports. Use the image on the next page as your guide.

Open the Scratch development environment and open the “pong” project file from the “More Projects” folder. (This may also be found on the USB Resource Stick if your kit version contains one). Test the script by clicking on the Green “Start” flag. You will need a colleague to control one paddle whilst you control the other... Enjoy your Pong Game!



Based on Scratch for pCduino

File

Edit

Help

Control

Looks

Sound

Pen

Hardware

set pin 18 to INPUT mode

set pin 18 to LOW level

pin 8 level is HIGH?

Voltage (mV) of pin 40

set pwm 5 781 Hz 1 step

stop pwm 5

Sprite2

x: 149 y: 24 direction: 88

Scripts

Costumes

Sounds

when clicked

set Score Red to 0

set Score Black to 0

point in direction pick random -135 to 135

forever

move 15 steps

if touching Black board? or touching Red Board?

point in direction direction * -1

if touching Red Goal? or touching Black Goal?

if touching Red Goal?

change Score Black by 1

if touching Black Goal?

change Score Red by 1

if on edge, bounce

wait 0.1 secs

pong

Score Black 0

Score Red 1

Sensor 1 312

Sensor 2 1781

New sprite:

Sprite2

Red Bos... Black bo... Red Goa... black Go...

Stage

Based on Scratch for pcDuino

File Edit Help

Control

Looks

Sound

Pen

Hardware

Sensing

Operators

Variables

Red Board

x: 210 y: 214 direction: 90

Scripts

Costumes

Sounds

when clicked

go to x: 210 y: 10

forever

set Sensor 1 to voltage (mV) of pin A0

set y to 500 - Sensor 1 / 8

wait 0.1 secs

pong

Score Black 0

Score Red 1

Sensor 1 312

Sensor 2 1781

New sprite:

Sprite2 Red Boa... Black bo... Red Goan... black Go...

Stage

set pin 18 to INPUT mode

set pin 18 to LOW level

pin 3 level is HIGH ?

voltage (mV) of pin A0

set pwm 5 781 Hz 1 step

stop pwm 5

Based on Scratch for pcDuino

Control

Looks

Sound

Pen

Hardware

File

Edit

Help

Black board

x: -210 y: -94 direction: 90

Scripts

Costumes

Sounds

when clicked

go to x: 210 y: 10

forever

set Sensor 2 to Voltage (mv) of pin A1

set y to 500 - Sensor 2 / 3

wait 0.1 secs

set pin 18 to INPUT mode

set pin 18 to LOW level

pin 3 level is HIGH ?

Voltage (mv) of pin A0

set pwm 5 781 Hz 1 step

stop pwm 5

pong

Score Black 0

Score Red 1

Sensor 1 312

Sensor 2 1781

x: -279 y: -236

New sprite:

Sprite2 Red Boas... Black bo... Red Gua... black Go...

Stage

Based on Scratch for pcDuino

File Edit Help

Motion Looks Sound Pen Hardware

Control Sensing Operators Variables

Scripts Costumes Sounds

Red Goal
 x: 230 y: 0 direction: 90

when clicked
 go to x: 230 y: 0

set pin 18 to INPUT mode
 set pin 18 to LOW level
 pin 3 level is HIGH ?
 Voltage (mV) of pin A0
 set pwm 5 781 Hz 1 step
 stop pwm 5

pong

Score Black 0

Score Red 1

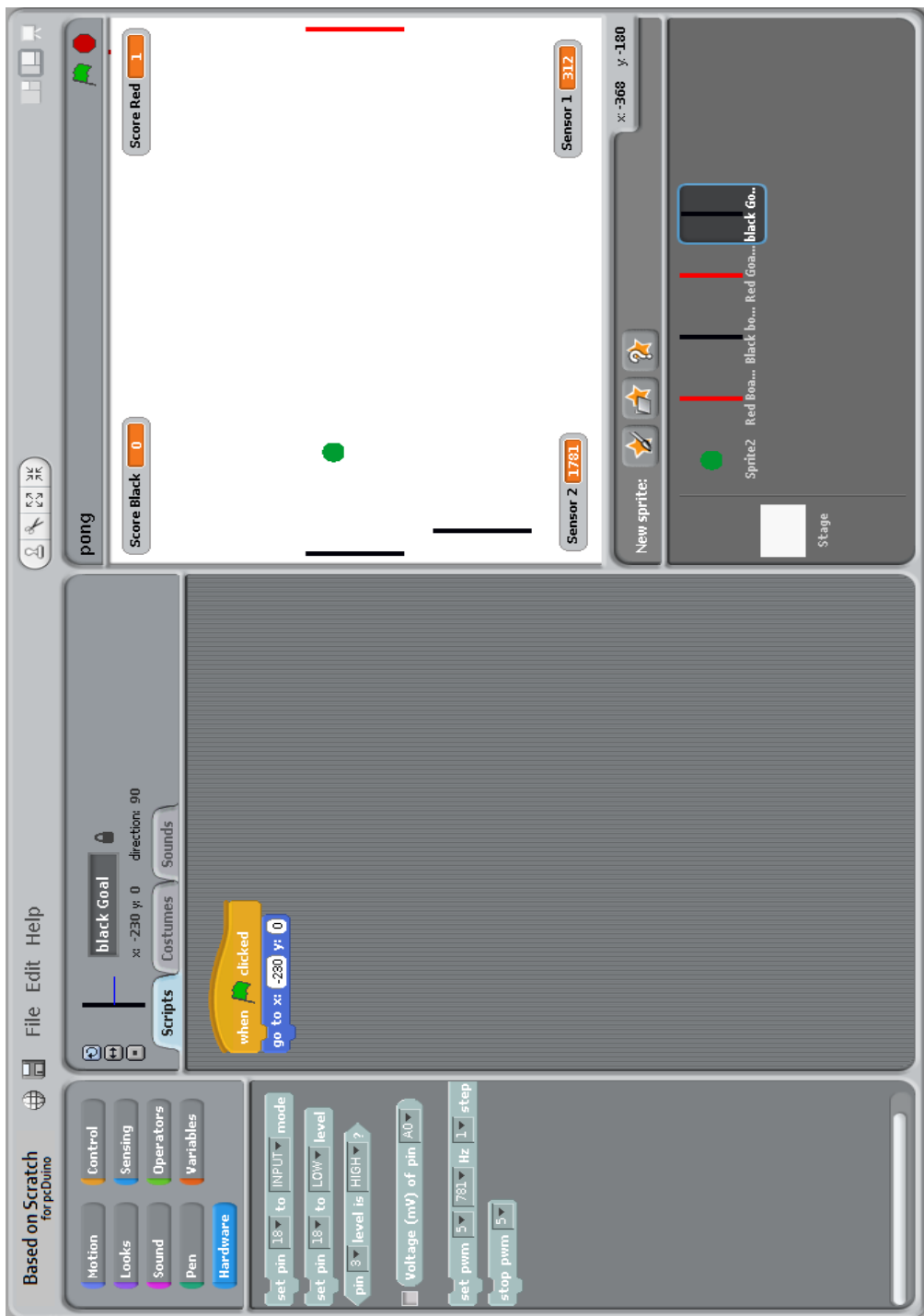
Sensor 2 1781

Sensor 1 312

x: -420 y: -197

New sprite:

Sprite2 Red Boa... Black bo... Red Goa... black Go...
 Stage



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