Using the Physical Ducky

By Zach Riback

The Digispark microcontroller we are using

Introduction

Now it is time to turn the Digispark board into a properly functioning rubber ducky. This will be done using Arduino. We will convert our ducky scripts (which are simply text files at this point) into Arduino sketches, and those sketches will be uploaded to the ducky to be run on a victim's computer. This means that by just simply inserting the device into the USB port on a computer, we can do almost anything.

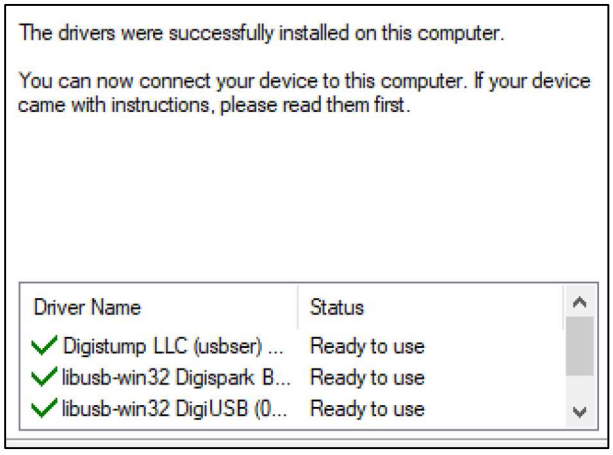
Connecting the Digispark Microcontroller

The first step in turning the microcontroller from the picture above into a proper rubber ducky device is connecting it to our computer. It simply plugs right into a USB port, but connecting it so we can program it takes a little bit more effort. Firstly, we need to download the bootloader drivers from the following link:

https://github.com/digistump/DigistumpArduino/releases

These drivers are needed to use Arduino to program the ducky. Note that they do not need to be installed for the ducky to execute its code on a hypothetical victim's computer. They are only needed for the purpose of programming.

Run the DPinst64.exe executable to install the drivers (or just DPinst.exe for 32-bit machines):

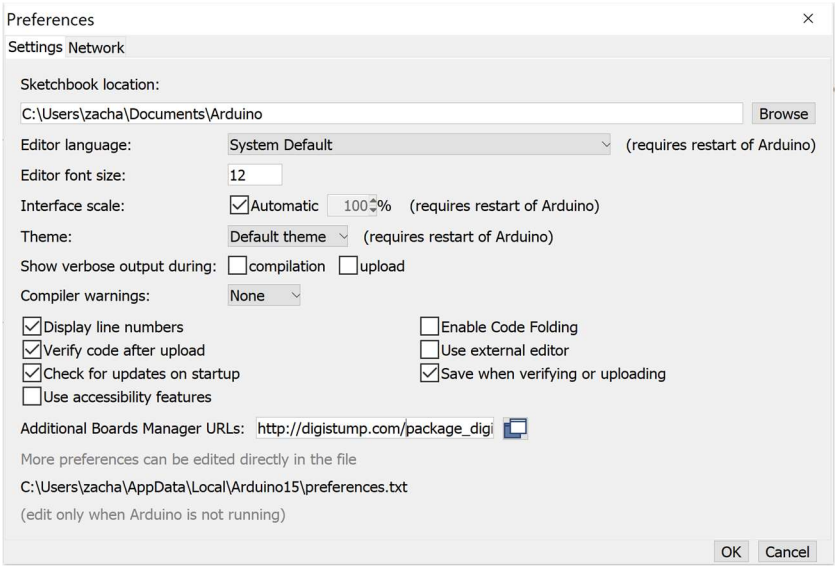


This should be the only thing that needs to be done to get the ducky acquainted with the computer. Now we can go on with setting up Arduino to work with the ducky.

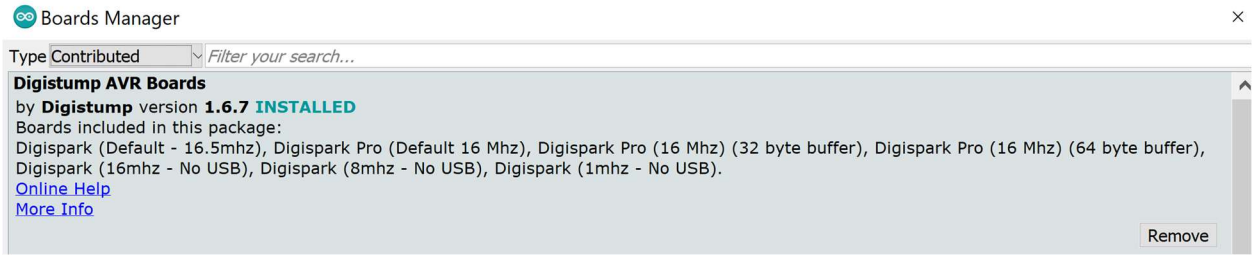
Setting up Arduino

To configure Arduino, there are number of settings that need to be changed. Firstly, we need to add in the board manager so Arduino will be able to communicate with our digispark. To do this, under preferences in the Arduino application, add the following URL under 'Additional Board Manager URLs"

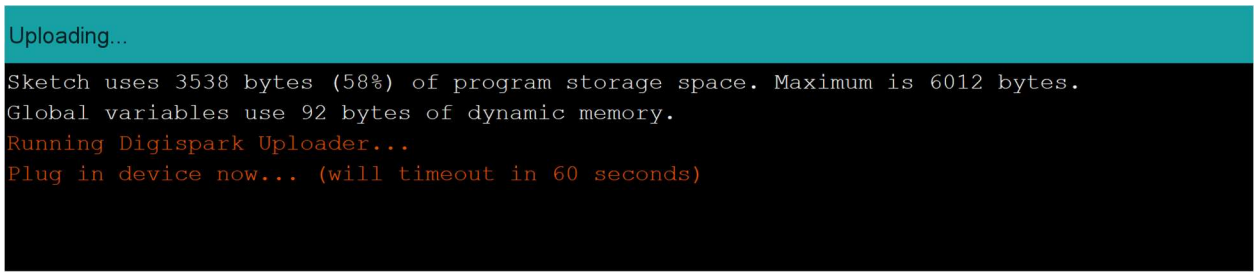
http://digistump.com/package_digistump_index.json



Then, go to tools, Board, Board Manager, change the option at the top to 'contributed', then select 'Digistump AVR Boards' and click install.



Now the Digispark microcontroller that we have is able to have Arduino sketches downloaded onto it. Once our sketch is done, we click upload, plug the ducky it, and once it connects the script we wrote will be automatically downloaded onto the ducky. If the ducky already has code on it, it will wait about five seconds before executing its script to wait to see if it is trying to have scripts put onto it.



Screenshot of the uploading process

Converting Ducky Scripts

To get our ducky scripts to work with Arduino and on our physical ducky, they first need to be converted into Arduino sketches. Arduino natively, of course, does not know how to interpret the ducky language, but there is a way to translate our ducky script into code for the Arduino application. It is a two-step process:

First, we use the java encoder from the following public GitHub repository:

https://github.com/hak5darren/USB-Rubber-Ducky

The file, duckencoder.jar, is used to make a raw payload out of our ducky script. It is used via the command line like so, where the '-i' option is for the input file and the '-o' option is for the output file, which should have the .bin file extension:

```
C:\Users\zacha\Desktop\Ducky>duckencoder.jar -i DuckyPrint.txt -o DuckyPrintRaw.bin
```

Use of the duckencoder.jar file to encode the ducky script text file into a BIN file.

This makes a file called 'DuckyPrintRaw.bin" that is an executable file created from our ducky script. To turn this BIN file into something that Arduino will be able to read, we use the 'duck2spark.py' python program from this public GitHub repository.

https://github.com/mame82/duck2spark

This program is run using the command line, and it is very easy to use. the ‘-i’ option is used for the ducky script text input file and the ‘-o’ option is used for the output file, which should have the .ino file extension for Arduino sketches. In the below screenshot it is shown how this program is used.

```
C:\Users\zacha\Desktop\Ducky>python duck2spark_fixed.py -i DuckyPrintRaw.bin -o DuckyPrintSketch.ino
```

Use of the duck2spark.py file. Note the ‘fixed’ marker on the file used in this screenshot, as the original had a small but unpatched issue, perhaps due to the original being designed for Python 2. The small fix used here is located at the end of this document.

Conclusion

Overall, the process for programming our ducky is quite simple. First, a script is written in the ducky script language in a basic text file. Then, a python program is used to convert script into an Arduino sketch. Finally, assuming the ducky has been set up to be programmed on the given computer, it is as simple as using the Arduino application to download the program onto the ducky. Now, the ducky will automatically run that given code when ever it is plugged into any computer.

Resources

https://medium.com/hackernoon/low-cost-usb-rubber-ducky-pen-test-tool-for-3-using-digispark-and-duck2spark-5d59afc1910

https://github.com/mame82/duck2spark

https://www.youtube.com/watch?v=A3cB9BDE6XM&ab_channel=NullByte

Duck2Spark.py Fix

The original duck2spark.py file from the GitHub repository gives the following error when used:

```
C:\Users\zacha\Desktop\Ducky>duck2spark.py -i FlipScreenDuckyScript.txt -o FlipScreenDuckySketch.ino
Traceback (most recent call last):
  File "C:\Users\zacha\Desktop\Ducky\duck2spark.py", line 155, in <module>
    main(sys.argv[1:])
  File "C:\Users\zacha\Desktop\Ducky\duck2spark.py", line 140, in main
    result = generate_source(payload, init_delay=init_delay, loop_count=loop_count, loop_delay=loop_delay, blink=blink)
  File "C:\Users\zacha\Desktop\Ducky\duck2spark.py", line 65, in generate_source
    declare += str(hex(ord(payload[c]))) + ", "
TypeError: ord() expected string of length 1, but int found

C:\Users\zacha\Desktop\Ducky>
```

To fix this issue, these lines:

```
64      for c in range(l - 1):
65          declare += str(hex(ord(payload[c]))) + ", "
66      declare += str(hex(ord(payload[l - 1]))) + "\n};\nint i = %d; //how many times the payload should run (-1 for endless loop)\n" % loop
```

should be changed to this:

```
64      for c in range(l - 1):
65          declare += str(payload[c]) + ", "
66      declare += str(payload[l - 1]) + "\n};\nint i = %d; //how many times the payload should run (-1 for endless loop)\n" % loo
```