The Raspberry Pi monitors Twitter to search #TXLA16 tweets for color names, then displays them using LED-lit acrylic.

APA102 (‘Dotstar’) addressable LEDs require four wires: two for control plus voltage and ground. Each LED device in the string is controlled independently.

Special voltage regulation is required to control Raspberry Pi from batteries.

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‘DotStar’ LEDs

The APA102 (marketed as ‘DotStars’ by Adafruit Industries or ‘SuperLEDs’ by other manufacturers) is an integrated LED driver device similar to the WS2812 ‘NeoPixel’. Like the NeoPixel, the DotStar combines a microchip and three LED elements – red, green and blue. By sending an appropriate control signal, the DotStar can produce 24-bit color. While the NeoPixel is a ‘single-wire’ device, DotStars require two-wires for control (plus one for positive voltage and one for ground). Having two-wires for control allows the DotStar to be controlled with relaxed requirements for timing, making them suitable for control from a Raspberry Pi and wide range of other computers and controllers. Like NeoPixels, multiple DotStars can be chained together in long strips, wired sets or matrices, and each device in the chain can be controlled independently.

Raspberry Pi

The Raspberry Pi is a single-board computer which costs $35 in its most common configuration (currently the Raspberry Pi 3). The Raspberry Pi was developed by the Raspberry Pi Foundation as an educational tool. It is usually used with a Linux operating system, and there is a large user-base developing software. In addition to the low cost and support for educators, the Raspberry Pi allows users to easily access the hardware pins. With appropriate circuitry, these pins can be used to control other electronic devices, motors and more – including regular LEDs and the APA102 DotStar.

The Raspberry Pi is usually powered by a micro-USB power cord, but it is possible to power the Raspberry Pi by carefully applying 5 volts to the appropriate header pin. This bypasses the internal power regulation circuitry, so if not done properly this can damage the computer. A regular 6- or 8-pack of AA batteries can be used to supply the Raspberry Pi voltage when used in combination with a ‘step-down converter’ such as a 5-volt ‘universal battery eliminator circuit’ (UBEC) often used in remote-controlled cars and airplanes.

Python Programming Language

The Raspberry Pi supports many programming languages, but Python is widely used for many tasks by hobbyists and professionals across many computing platforms. A Python module (‘DotStar_Pi’) is available from Adafruit for using DotStars on a Raspberry Pi. Because the Raspberry Pi is a full computer, internet access is available through the Linux operating system (via wi-fi or Ethernet). Another Python module (‘Tweepy’) is used to access Twitter. Tweepy can be used to fully control a user’s Twitter activity, but in this example it simply monitors Twitter looking for particular hashtags and controls the DotStar outputs based on the contents of specific Tweets.

Resources

Adafruit: ‘DotStar LEDs’
https://learn.adafruit.com/adafruit-dotstar-leds/overview

RasPi.TV: ‘How to Create a Twitter App on the Raspberry Pi with Python’
http://raspi.tv/2013/how-to-create-a-twitter-app-on-the-raspberry-pi-with-python-tweepy-part-1

MakeUseOf: ‘3 Ways of Powering a Raspberry Pi for Portable Projects’
http://www.makeuseof.com/tag/pi-go-x-ways-powering-raspberry-pi-portable-projects/