Displaying results is in today’s connected world very important. With small devices, we often use LCD screens, and I covered one of them, the Nextion, in my videos. Today, I will concentrate on bigger and brighter displays and I will build a YouTube subscriber counter (hopefully) just in time. I will also show you, how to get small information pieces from the internet to your microcontroller, even from SSL sites.

Let’s start!

If we want to go brighter than LCD we can use LEDs. The simple representatives are 7 segment displays. The can display numbers, and with some creativity you can even display some letters. The electronic load used in my other project uses such displays.

The next level of LED displays is the dot matrix display. The smaller ones are 32 x 32mm or 1.26 square inches The bigger ones are even 60 x 60mm or 2.36 square inches. As you saw in the intro, they are extremely bright and visible and readable also over a certain distance. And because they have an 8x8 matrix, you can display all numbers and letters, and many things more.

A few years ago, they were very expensive, but today, you get them cheap from china, even with attached controller chips. And if we talk LED controller chips, we have to talk about the MAX7219.

I got a few displays including controllers. They can be easily combined in rows, because each controller does not only have an input, but also an output channel. And they are daisy chain like the Neopixels, just with one more wire. The maximum digits in a row is 8. This is easily visible if I connect 10 in a row. Then, the last two digits repeat the content of first two. Now look, how they are connected: They are electrically in series, but mechanically turned by 90 degrees. So, we need wires to connect them. No big problem, and nobody had a problem with that when we only got single digits.

We get some readymade libraries for the Arduinos and at least one was ported to the ESP8266 by Daniel Eichhorn. Libraries are quite important for this chip, because they contain also the definitions of a font. It is extremely easy to get a scrolling text on such a display. You just enter the number of digits and the pins where the signals are connected. For the ESP the pins are assigned as shown in this table. The chip select or CS can be assigned to any free pin, the DIN and CLK are fixed. For Arduinos, the clock pin is 13, the DIN pin is 11, and the CS pin is 10, like SPI.

Then, you have to initialize the display, define the text you want to display, and the scroll direction. Done. Just one remark: Because they contain lots of bright LEDs, they can draw quite a lot of current. I use mine with 5 volt Vcc and, if all LEDs are on, and this happens regularly during startup, 4 digits consume nearly one ampere. So, your power supply has to be capable to source this current. Do not connect them to the Arduino or even the ESP 5-volt rail. You have to connect them directly to 5 volts. Because in normal operation, not all LEDs are on, the consumption is less, depending on the content displayed. My device uses roughly 300 mA.

Last week, I got a new product which consist of 4 digits connected together. Much easier to assemble, much easier to mount, and even cheaper than the single digits. Cool. We just have to have to connect the first digit.

So, lets replace the last 4 digits with this new module. Now, we discover a problem: Because the digits are 90 degrees rotated, we can hardly read anything! I am not amused. I thought, that I made a bargain, and now, I cannot use it.

I am in contact with Daniel and hope, he will be able to help me. He ordered one of these modules and tries to solve the issue. Anyway, I cannot wait, because, as said before, I have an urgent task, because my subscribers approach 10000. This is very satisfactory for me and I do not want to miss it. So, I tried a trick: I turn the display 90 degree, like a tower, and assign a character width of 8. So, I get a “standing wave” and the display would be ok for now. But I did not like it and I found another library written by Nick Gammon. It is for Arduino only, but supports the needed display orientation. I ported it to the ESP 8266 and you find the link in the comments. So, we are done with the display and can move on to the content.

As a next step, I have to get the number of subscribers from YouTube. As a human, this is simple. You just go to the about page of the channel and you immediately see the number. As a microcontroller, this is a little more complicated, especially, because YouTube does not respond to unsecure http calls. And so far, I did not figure out, how to access YouTube via HTTPS from the ESP or the Arduino.

Fortunately, there is a small trick: You can use Thingspeak as a facilitator. They offer what the call an app called “ThingHTTP”. Let’s create such a thing which gets my subscribers from YouTube. We create a “new thing” and enter the URL string for the about page and give the thing a name. The only other field we have to fill out is the Parse string. This is the string Thingspeak searches in the page to find out, what to return.

So Let’s go back to the about page. We want to get the number of subscribers. So, in Google Chrome there is a useful function support that. It is called X-path. We go to the respective number we are interested in, right click and select “inspect”. Then we go into the html code to the requested number and right click copy and X-path. Now, we can go back to Thingspeak and enter this string into the field “parse string” and save. Now Thingspeak gives us the call URL to get the result. We copy that one, go to a new window, and paste it. If we call now Thingspeak, Thingspeak itself calls YouTube. But, unfortunately, the result is not promising. Thingspeak did not find anything. This is unexpected and I have no clue why this happens. Fortunately, we have the number of subscribers also at other places, and if you try exactly the same thing with another place on the page, it works like a charm. Only Google or Thingspeak know, why.

So, we can go on and create our small sketch to get this number on our ESP. We use the usual code, connect with the Wi-Fi, and initialize the Max7219. Then, we establish a connection to Thingspeak and, if successful, send a GET request containing the URL from Thingspeak. We pass it to the display, and really, the counter works. But something is still wrong! Do you spot it? Of course, at least one digit is missing, because I expect the 10’000st subscriber. Now, the question is, how optimistic I should be. Should I add only one or even 2 digits? For the moment, I think, one digit is more motivating. But it’s up to you to prove that I am wrong and subscribe my channel like hell. There are still only 29% of my viewers subscribed to the channel… And, of course, I would encourage also women to get more interested in technology…

Just to show you the “room for improvement” in “women power”: Look at this statistics of the view times per country and per gender and compare Jamaica with the rest of the world…

Because these dot matrix displays are really good looking, I also printed a nice box for it. And, because the box is closed, I can no more update the code. This is, why I included the support of the IOTappstore presented in episode 78, and to save energy, also deep sleep for the ESP8266 presented in episode #58. Now, the device sleeps for a time, and after wake-up, it checks if a newer code version is available in the IOTappstore, and, if so, updates automatically. Because I do not plan to change the code frequently, I included a counter which only calls the IOTappstore every few hours.

When I switched the light in the lab off, I discovered that the LEDs are way too bright during night. Fortunately, you can select the intensity of the display. So, I built a small sensor with a light dependent resistor and a normal resistor. I found a suitable resistor with a few experiments. This sensor is then connected to the A0 pin of the ESP. Now, the brightness adapts automatically to the ambient light. Cool.

Now, everything is ready for the 10000st subscriber. But wait, I still forgot something: I cannot sit the whole day in front of the display and wait. So, I have to include also a buzzer which alarms me if it happens... So, I already was lucky that I included the IOTappstore functionality to update the code on the fly…

As we all know, the ESP is not able to drive a buzzer at its own. So, again, I created a small board with a 3055 FET driving the buzzer with 5v. I think, you hear the difference.

Summarized, we discovered cheap and good looking LED matrix displays powered by the MAX7219 chip and built a 5 digit YouTube subscriber counter. To get the actual number of subscribers, we used the ThingHTTP app from Thingspeak. And we added also a control which senses the ambient light and adjust the brightness of the display accordingly. And because we can, we added deep sleep functionality and support the device from the IOTappstore.

I hope, this video was useful or at least interesting for you. Bye

Youtube Subscribers

[www.googleapis.com/youtube/v3/channels?part=statistics&id=UCu7\_D0o48KbfhpEohoP7YSQ&key=AIzaSyAdDTdnRnXwTBbo8aKpsQpaWfDFEAgNh2I](http://www.googleapis.com/youtube/v3/channels?part=statistics&id=UCu7_D0o48KbfhpEohoP7YSQ&key=AIzaSyAdDTdnRnXwTBbo8aKpsQpaWfDFEAgNh2I)

Youtube API: <http://tutsnare.com/how-to-get-youtube-subscribers-count-in-php/>

<https://github.com/nickgammon/MAX7219_Dot_Matrix>

<https://www.aliexpress.com/item/MAX7219-Dot-Matrix-Module-For-Arduino-Microcontroller-4-In-One-Display-with-5P-Line/32620800331.html>

https://www.aliexpress.com/item/20PCS-LOT-5MM-8X8-Red-Common-Cathode-60-60-LED-Dot-Matrix-Digital-Tube-Module-2088AS/32474403977.html

//\*[@id="c4-primary-header-contents"]/div/div/div[2]/div/span/span[1]

Falsch //\*[@id="browse-items-primary"]/li/div/div[1]/div/span[1]/b

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//\*[@id="c4-primary-header-contents"]/div/div/div[2]/div/span/span[2]

https://github.com/markruys/arduino-Max72xxPanel

<https://www.youtube.com/channel/UCu7_D0o48KbfhpEohoP7YSQ>

<https://developers.google.com/apps-script/advanced/youtube>

<?php

// Calling api.

$channelId = "UCu7\_D0o48KbfhpEohoP7YSQ";

$googleApiKey = "AIzaSyBPiBcmhwnC0jzMQHgMjZ8k8WV8y7O2ThI";

$subscribers = file\_get\_contents('https://www.googleapis.com/youtube/v3/channels?part=statistics&id='.$channelId.'&key='.$googleApiKey);

// Decoding json response

$response = json\_decode($subscribers, true );

// echoing subscribers count.

echo $count = intval($response['items'][0]['statistics']['subscriberCount']);

?>