Stopping Time (Visually)

By Alain Bellon • August 10, 2006

Recently, Nate True of Cre.ations.net posted a very nice project involving some water, some electronics to provide the illusion of time distortion. (Time fountain)

I have been long since interested in high-speed photography. Many years ago I built a very simple device using some aluminium foil, an air rifle, a couple of ligth triggered Flash units and, of course, a camera.

The basic concept is this: You are in a dark room. If you synchronize a flash of light with the occurance of an event, you will see that event "suspended" in time without th need of highspeed photographic equipment.

In the case of the Time Fountain, as Nate likes to call it, it has been always an interesting and fun phenomenon to watch at museums, or at home if you own a strobe light.
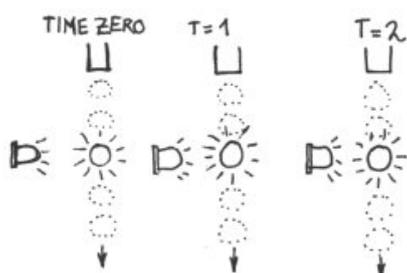
We start with a water stream or constant rate. Imagine we are able to detect drops of water falling, and we trigger a flash of light slightly after each drop is detected. If the drops are coming at a fast enough rate, we will see a shining drop of water suspended in mid air, in an otherwise dark area. We are obviously not seeing the same drop of water, but different drops of water that are "caught" by the flash of light at exactly the same position each time, giving the illusion that it is the same dropplet. Because we are triggering the flash events with the dropplets, the flash rate T_f is equal to the dripping rate T_d, i.e., both will coincide at every time step.

Now, if we want to give the impression of time moving forward but in slow motion, all we have to do is record the time between drops and slightly increase it by a time delay [pmath\delta t[/pmath] for each consecutive drop. The time between flashes is then $T_f = n(1 + \Delta t)$, where n is each time step. That way each flash of light will *show* a droplet at a position slightly further down the path, giving the illusion of it falling down at slow rate.
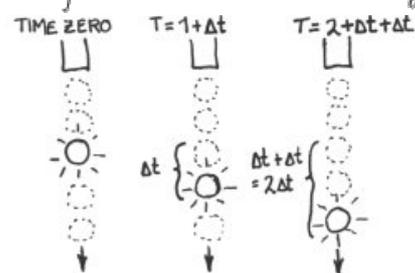
Nate has done this using a trigger mechanism based on an OP AMP comparator circuit and an PIC microcontroller to provide the flash timing. Simply flashing the light in synch with the dripping water will "stop" time. And by altering the pulse frequency linearly (ramp like) will create the slowmotion, or even backward motion effects.

There is a shortcut.

Option #1
Start with a constant water dripping stream. Then blink really really fast. Ok, just kidding (or maybe not).

Option #2

Since we are not after the precise location of a given dropplet of water in space, we can forego the synchronization mechanism and just flash the light (LEDS in this case) at a constant rate. It doesn't matter where in space we catch the dropplet, as long as we catch it consistently.
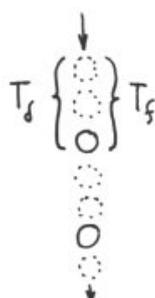
If the dripping rate is a multiple of the flashing rate, the flash of light will catch the droplets at the same position each time.

But what about slowmotion and backwards motion? Well it's easy as too.

Imagine the drop rate is the same as the flash rate. Now we make the flash rate slightly slower, in other words we increase the time between flashes just a little bit: $T_f = T_d + \delta t$. The first drop will be caught at a certain point, but the next drop will be caught a point further down because we had some time left over from the previous flash. By adjusting the delay we can effectively change the rate of *apparent fall*. If the time between pulses is shortened

we will catch the droplet at a higher position each time, giving the illusion of it moving backwards in time.

We have limited the discussion to a single flash of light during the whole length of the falling trajectory, but in practice, due to the periodic nature of the experiment, we will see *at least* two droplets of water along the path if we adjust the flash frequency to something other than the dripping rate. Usually the time it takes for a dropplet to fall all the way down is much larger than the time between drops, therefore we will see several dropplets suspended in mid air along the stream.

Now, how do we do this for real?

The circuit

The simplest way to provide a series of pluses where we can control both the pulse duration and the frequency independently of each other: a 555 Timer chip and some LEDs.
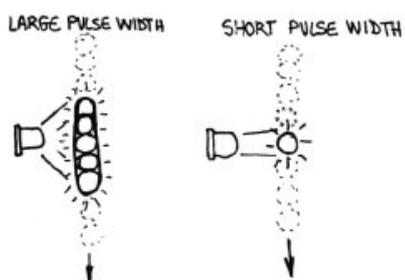

The 555 circuit is used in an astable oscillator configuration but in an non-obvious way. If we just go ahead and build a traditional 555 oscilator circuit and try to adjust the frequency of the pulses, we will find that we will be adjusting the pulse width as well. If the pulse width, or pulse duration, is too long, instead of seeing a single droplet, we will see a streak of water, which is not very interesting since it is very similar to the way we are used to experience water streams.

Instead, we hook up the LEDs to the output and the +V so that we can fix the pulse width to a very short duration, and use the other resistor in the circuit to vary the frequency. Because the LEDs is ON for such a short period of time, we don't even need a current limiting resistor, but I will leave that as optional in case you think you may burn out your LEDs (they do not burn for me, but do a test with 1 LED first).

Here is a version of the circuit which I have used and tested. You may want to add a transistor buffer at the output in case you have lots of LEDs. I tried 4 super bright white LEDs and they work fine without the need for a transistor buffer.
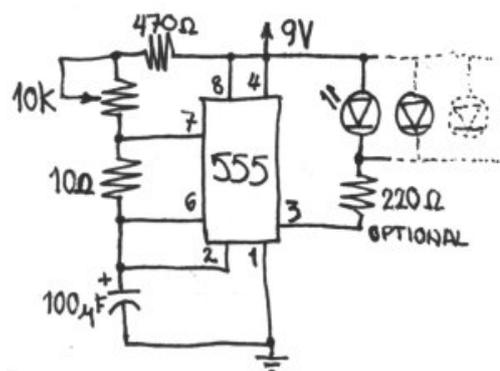
Lighting considerations

Shining light on transparent water has its own subtleties. Nate solved this by the use of UV LEDs and fluorecein, and it works fantastic. Luckily I had some fluorescent green dye stored in my lab. But there are other options.

Vegetable dye (food coloring dyes) work well, so does koolaid. These won't need UV LEDS. Milk on a black background gives fantastic results and it is my favorite so far. Milk is organic so it will spoil and the smell won't leave you any motivation for playing with the fountain. So we either innoculate cows with preservatives, or we can use certain varnishes and resins that look white when mixed with water. Whiteout or white paint is another option, we just need to make sure we add plenty of water to it so that it doesn't clog the system.

If the liquid we use is semi-transparent the best lighting may probably come from either the side or the back, as can be appreciated in those gorgeous glassware product shots we are acustomed to seeing.

Frontal illumination at 45° from each side is probably the dullest (it's the *no shadow* scheme used in TV studios).

Once I have some photos (tonight) I will post what the effect looks like. Also I have an idea for a simple rig with no motors needed.
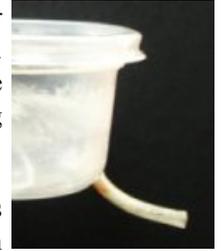
The Drip Source

The best solution is possibly the use of a small fountain pump and some tubing. But if you want to make some quick tests, a simpler device may be used.
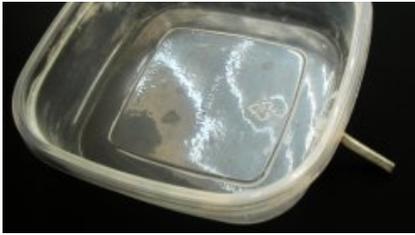
A container with a hole won't work because the dripping will be very chaotic since the water will adhere to the walls of the container in an unpredictable way. This is easily fixed by gluing a piece of aquarium tubing to the container wall.

The best container is one that has a large surface area so that the water level changes slowly enough to be able to synch to the dripping rate. A bottle will not work as well. Also, the hole is better placed on the side wall (vertical wall) instead of on the bottom, and the tubing works best if held somewhat horizontal.
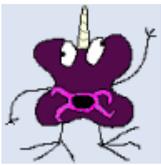
The hole in the container will need to be adjusted until the drip rate is fast but not too fast, so that the drops can be easily separated by the light flashes. I started with a small hole and expanded it with the tip of a pen until I got a good rate.

Categories: Artistica, Empirica, Scientia
Tags:

About the Author

Alain Bellon

87 Responses to " Stopping Time (Visually) "

1. Hurgh Aug 14th, 2006 at 11:05 pm

   Thanks heaps for this, I am gonna try it out soon, I was looking at nat's one but because he has not released the PIC code yet and I do not have a PIC programmer yet, this will be the perfect way to do it instead 😃 .

   Cant wait to see some pics.

   -Hurgh-

2. Jeff Aug 15th, 2006 at 10:42 am

   Could you please give me some insite on your "constant water dripping stream"?

   I invision a pump filling a elevated vessal. The vessal would have an overflow tube so the "water" level would be maintained. Then there would be an output near the bottom with, maybe, a needle vavle to create the drip….

   Jeff

3. admin Aug 15th, 2006 at 11:32 am

   Hurgh, Thanks. I'll try to get pics and video.

Jeff, Yes what you describe is basically what I am doing. No need for the pump, at least not initially. Just get a plastic container, make a tiny hole on one wall near the bottom. Attach a piece of aquarium tubing (or a straw) with hot glue or some other water-proof adhesive. Fill it with water and you will get some good dripping. Make sure you can adjust the hole size (start with a tiny one and enlarge it slowly). If you have an aquarium valve, it will be even easier. In my tests, a drip rate of 10Hz (ten drops per second) looks pretty good. You have to refill the container when it runs out, but it lasts for several minutes (20 min in my case). I will post a picture or two.

4.

Cheeto Aug 15th, 2006 at 3:31 pm

At the end of the writeup you say you are working on a way to eliminate the motor, what is this motor used for ? Are you refering to the pump ? If so it looks like your desing all ready eliminates the pump.


5.

Jeff Aug 15th, 2006 at 3:56 pm

I would think that a vessal just filled (and not maintained) would drip faster at first and then slow down at the "water" level decreases in the vessal. ???

With this "simpe" circuit … I think a constant drip rate is a must.

Jeff

PS I forgot to say "thank you" before…. so I want to thank you for your work of this project. I, as my do, want to recreate Nate Trues' wonderful Time Fountain.
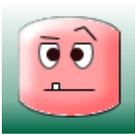
6.

Tek465m Aug 15th, 2006 at 3:58 pm

This site has a good way to vary both the timing and the Pulse width(Both on and Off). Basically diode steer which Potentiometer to use.

http://home.cogeco.ca/~rpaisley4/LM555.html

Look for the schematic "Independantly Variable Timing for Both portions of the Output Cycle"

Also, this project has lots of potential than just looking at water. Use it to look at speakers vibrating, ceiling fans, Blender Blades, ect…. Anything with a mechanical vibration or rotation. Great science fair material.

The explanation you gave sounds alot like looking at a Lissajous Pattern on an Oscilloscope.

Looks like fun, time to go dust of the breadboard!

7.

admin Aug 15th, 2006 at 4:08 pm

Cheeto, What I meant to say is that you can eliminate the pump.

Jeff, Yes exactly. But rate of change in the dripping speed is the rate of change of the height of the water level. So by using a container with a large surface area, instead of a bottle, you minimize the effect. I am using a Zip brand square shaped container with a surface area of around 25cm sq.

Tek, The circuit I posted already does separate the pulse width and frequency in the desired way. The 10 Ohm resistor provides a tiny pulse width, while the 10k potentiometer serves to adjust the frequency. (Nice URL btw). And yes you are right cyclic phenomena are fun to explore with this type of system. I focused on the water since this topic had specifically started due to Nate's Time fountain.

8.

Jeff Aug 16th, 2006 at 11:04 am

Just wondering… anyone have any thougths on UV….

"Note: As with all UV LEDs do not look directly into the device during operation. Exposure to UV radiation can be harmful to your health even for a brief period. Do no permit children or untrained personnel to operate the device. "

I am guessing that the angle and distance that you are from the UV source makes a huge difference.

Jeff

9.

admin Aug 16th, 2006 at 11:16 am

UV light is dangerous. I have wondered how safe it is to look at a UV LED straight on. The short pulses needed for this experiment will limit the UV exposure, but I don't know. All my UV LED lights come with a long warning, and a warning sticker, to never point it at a person's eyes.

A friend of mine looked at a small UV tube for long enough that later that day he had to go to the Doctor. The Doctor asked if he had been arc welding without a protective mask.

Damage to the cornea feels like you have dust on your eyeballs. It feels horrible when you have to blink.

10.

Puddy Aug 17th, 2006 at 12:04 pm

Thanks alot for the effort you put into this page,greatly appreciated, saved me £££ instead of buying that PIC programmer.

I have built your circuit on breadboard to test, it "seems" to work, I mean, there is definite pulsing of some sort going on and I can control the speed with the potentiometer. It just seems to be mostly on, and the flashes don't seem to turn the LED's on/off, more a slight dimming a few times a second i'm not convinced its going to work with the dripping water.

Is this how the circuit should be working? I expected more of a flashing than a bearly noticable dimming. I guess i'll have to wait for my fluroscein to arrive to test it out with the water.

11.

admin Aug 17th, 2006 at 12:15 pm

Puddy, There should be definite flashing. Check the circuit. It sounds like you have the LEDs connected the other way around hooked to ground instead to +V. If you get them connected from the 555 output (pin 3) to ground, you will get very long pulses and very short off times, which will look as you describe. Instead you should see very short pulses with longer off times.

I double checked the schematic and it works fine. BTW,I have found that using a 22uF capacitor instead of the 100uF one will give you better fine adjustment, but this is just an optimization. It works fine as illustrated.

12.

Jeff Aug 17th, 2006 at 1:41 pm

Funny thing…. I was wondering through http://www.goldmine-elec.com/default.htm and I found this:
http://www.goldmine-elec-products.com/prodinfo.asp?number=C6905
"The Blinder White LED Flasher kit features 5 bright white LEDs that can flash at a rate from about 80 to 300 flashes per minute. In a darkened room, the output is mesmerizing and will definitely be noticed. Operates from one 9V Battery (not included) and features IC Circuit with on board adjustable speed control. Size of PC board: 3 3/8″ x 2 1/4″.

Complete with all parts, PC board, and instructions. Skill Level 2.
C6905
Manufactured by Chaney Electronics "
Unit Price: $9.95

Jeff

13.

admin Aug 17th, 2006 at 1:50 pm

Jeff, that would work if you can rewire the LEDs to work inverted, and change the resistor between pins 6 and 7 to around 10 Ohms. Otherwise the pulses won't be short enough. Also, 80-300Hz may be too fast.

14.

Rish Aug 19th, 2006 at 10:03 pm

Re: Jeff

The link in Jeff's post points to a kit that can make the LEDs flash at a rate of 80-300 flashes PER MINUTE.

That is only 1.3 – 5 Hz, which seems ideal for this project.

15.

Matt Aug 19th, 2006 at 11:51 pm

Thanks for doing this and making the info available to everyone. I threw this together roughly on a breadboard today and it works perfectly. Can't wait to get my fountain and a bunch of LED's.

Also, does "Luckily I had some fluorescent green dye stored in my lab." mean "I found a yellow highlighter in the other room." ? 😃 Just kidding, but for anyone who isnt here by following from natetrue's page, highlighter ink is said to work as well as the dye.

16.

admin Aug 20th, 2006 at 11:32 am

Rish, You are right. I read that wrong. Still, we have the issue of the pulse width. You need a really short pulse for this to work. (BTW, the best results I am getting are around 10-100Hz).

Matt, thank you for your comments. And I really meant that I have some chemical green fluorescent dye from another

project. Highlighter ink sounds like a good solution.

17.

Puddy Aug 21st, 2006 at 8:38 am

Puddy again, Cheers man, i had forgotten to connect pin 4 to +ve ….(dumbass)
it works a dream, thanks for all your help, no way i would have bought that PIC programmer. 555 SO much cheaper!!!
Puddy

18.

Hurgh Aug 22nd, 2006 at 1:46 am

Thanks again for this, I also had the same problem as Puddy, IE: lights staying on and not going off much at all, and I had connected it to the ground instead of the +V so thanks for the tip 😃

Works great, now to go make a dripper thing….

-Hurgh-

19.

James Aug 24th, 2006 at 11:22 am

Thanks for the circuit 😃 If I wanted to have 10 LEDs running what would be the best transistor to use?
Thanks,
James 😃

20.

Alain Bellon Aug 25th, 2006 at 10:00 am

James, Any transistor should work. If you want to use hundreds of LEDs then you may have to use a power transistor.

I have tried 10 UV LEDs without buffer and they work fine. I think the reason this circuit can work without the buffer is that we are inverting the LED connections, that way the 555 is not providing the current, but just sinking to ground.

21.

Puddy Aug 25th, 2006 at 11:49 am

whats the best way you guys have found to maintain a constant drip rate?
I find it very difficult to sync the lights to keep the drops "frozen in time". I still don't have my fountain, so i'm using an ice cream box with a hole in the bottom, would a tube from the bottom of my container be a good idea?

I'm gonna have the pump sending the water to the container at the top with an overflow like jeff said in a previous post.

22.

Alain Bellon Aug 25th, 2006 at 12:26 pm

Puddy, I have added a few lines and a couple of pictures on the pump-less dripping source. Check it out above.

23. Chris [Aug 25th, 2006 at 8:10 pm](#)

It would be wise to heed the hazards associated with UV exposure, I've flash burned my eyes a couple of times from welding and can attest to the painfulness, feels exactly like your eyes are full of very sharp caustic sand. As a bonus the damage is permanent. While led's are a minute fraction of the intensity of an arc, cummulative exposure can't do anyone any good. Otherwise what a spiffy project! I like the possibilities of other materials and light sources, anybody experiment further along those lines? I keep thinking what a perfect project to introduce kids to science/tech esp. the hands on interactive potential.

24. Alain Bellon [Aug 25th, 2006 at 8:18 pm](#)

Chris, You are very right. I mentioned some of the dangers.

From my testing, you can get fantastic results using white LEDs alone.

On the other hand, the UV LEDs that are available through eBay aren't trully UV, they are violet and a bit of their wavelegth spills into the UV part of the spectrum. That makes them "safer".

I have true UV LED lights (much more expensive than the eBay LEDs) and the difference is huge when you light fluorescein. These lamps do come with a large warning saying to never expose your eyes directly to the light beam.

25. Rod [Aug 28th, 2006 at 12:11 am](#)

Hi,
I'm using a sprinkler type dripper head. There are a few diffent types with adjustable heads for drip rate.
SO I'm pumping up to it and have a constant rate drip coming out. The PIC with do the rest.
Still waiting for my LEDs from Ebay.

Rod

26. Gabe [Aug 29th, 2006 at 3:20 pm](#)

Anyone ever think of using an IV dripper like they have in the hospitals? Cant you adjust the rate of the drip like that?

27. Alain Bellon [Aug 31st, 2006 at 12:39 pm](#)

I think the important part of the IV dripper would be the device that sqweezes the IV tubing to control the rate. I have a spare IV, I'll just dig it out and test it.

28.

Puddy Sep 3rd, 2006 at 9:28 am

I have the whole setup up and running now. I have fluroscein in my water and 30 UV LED's, visibility is still a bit of a problem though so i have a question for all you electronic brains out there:

will the circuit be destroyed if you ran 12V through it instead of 9V?
I have tested my led's with 12v and its a nice brightness (recomended voltage), i'm worried i'll damage the rest of the circuit if i try this though. Alternatively could i simply have another 12V source just for the LED's somehow?
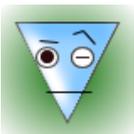(will post pics of mine once its all finished nicely)

29.

Rod Sep 3rd, 2006 at 9:33 pm

Hi,
If you are using the 555 timer circuit Puppy then the 555′s can run upto 15V but check the specs of your chip. eg google it. make sure the capactor is ratted at say 16v and you should be fine.
Rod

30.

Eric Sep 4th, 2006 at 12:55 am

Forgive my inability to read schematics, I've only been looking at electronics at the component level the last few days. Is the resister loop depicted in the drawing between pins 7 & 8 a potentiometer? I want to restrict the timing from 1Hz to 100Hz and be able to dial the frequency between those values as needed.
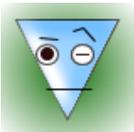
31.

Eric Sep 4th, 2006 at 1:09 am

more thoughts- with my experience in video, it surprizes me that the best results reported are 10hz – 100hz. On film, 24-30 frames per second (fps) are enough for the eyes to percieve smooth motion. I'm guessing that the synchronization of the light to drop positions may require higher frequencies. Another note, for those of you who are mathematically challenged like myself, I found a nice 555 timer calculator here- http://www.doctronics.co.uk/down555.htm

32.

Puddy Sep 4th, 2006 at 7:12 am

thank you rod, that is very helpful, i'll try it out today!

33.

Puddy Sep 4th, 2006 at 8:06 am

damn, tried it out and it broke, the 555 chip got really hot and no longer works 🙁

34.

Alain Bellon Sep 4th, 2006 at 12:52 pm

Eric, Yeah the resistor you refer to is a potentiometer. But also there is a 470 Ohm resistor in series. This is to avoid hitting 0 Hz on the timer which will drive the LEDs for too long, risking to burn them out if you have no current limiting resistor (the one marked as optional).

Regarding video rates. Many cartoons—especially Japanese Anime—are done at 12 fps, while for video games, it is common to have at least 60 fps for a comfortable experience. In general, the higher the frame rate the smoother the motion. This is why movies (24 fps) look less fluid than video (traditionally 60 fields per second). The synchronization of the light with the drops happens at all frequency ranges, but it is much easier to adjust (synch) at lower frequencies, say 10-30 Hz.

Puddy, There are different versions of the 555, some are even CMOS types. The maximum voltage is usually 15V (some even 18V). But you have to verify this on your 555 spec sheet. You can type out the part number on google and you should be able to find a PDF with the specific data for your chip.

35.

Eric Sep 4th, 2006 at 10:37 pm

Thanks for the clarifications Alain!
BTW, found some decent prices 60cents on UV LEDs-
http://www.lsdiodes.com/shop/index.php?main_page=product_info&products_id=15

36.

Rod Sep 5th, 2006 at 12:07 am

lol. Like I said check the specs on the chip.
Like Alain said use the cmos version. If you are driving the LED's directly from the 555 then you are upping the current output when you up the voltage.
You need to use a transistor to drive them.

Rod

37.

Puddy Sep 13th, 2006 at 2:12 pm

here is the (pretty much) finished fountain I built.

http://puddyman.co.uk/timef1.JPG

I encountered a few problems on the way, so anyone who needs a hand i'd be happy to give advice: puddyman@gmail.com

thanks for everyones help.
(i'd post a video but VERY hard to film!)

38.

Alain Bellon Sep 13th, 2006 at 2:22 pm

Thank you for the picture Puddy. I have been meaning to post both images and video for a while but I haven't had the time to set it up.

I love the dripper hand! Very evil.

39. Dug Sep 14th, 2006 at 9:40 pm

Looks great! Been trying to build on of these myself but had trouble getting the circuit onto veroboard/stripboard. I'm still trying to get one together, will post it up when its working but does anyone have a working schematic?

Thanks!!

40. Alain Bellon Sep 15th, 2006 at 12:59 pm

The schematic shown above in this page is a working one, which I use with 10 UV or 10 White LEDs.

41. Dug Stokes Sep 15th, 2006 at 1:31 pm

Thanks Alain – I realise that! I've just had nothing but trouble trying to build it onto veroboard! Its one of my first projects built onto stripboard and I can't figure out a good way to lay it out.

My first attempt (using Ambyr StripboardMagic software) didn't work at all – the light just came on once and trying to lay it out by hand is a total nightmare 😃

I'm gunna document it when I finally figure it out though! Does anyone have a nice stripboard layout for the schematic?

Thanks!

42. Eric Sep 17th, 2006 at 11:30 am

I feel really stupid asking this, I'm very new to reading component values, and playing with component level circuitry. If anyone feels froggy, would someone please provide a shopping list for Alain's schematic? (cringe) When I go to RadioShack and look for the parts, I'm not quite finding exact matches- especially for the reccomended potentiometer.
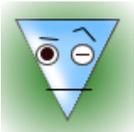
43. Eric Sep 17th, 2006 at 8:13 pm

Doh! Nevermind, I have a working circuit layout on a breadboard. I used a 100-0Ohm potentiometer. I couldn't get my hands on a 100uf capacitor, so I used a 4.7uf. Seems to work well, starting at around 2Hz on the low end and dials up smoothly to solid on! I wish it were brighter tho, I only had 4 2.5volt green leds to work with. If I bump up the capacitor to 100uf will that brighten it up?

44.

Alain Bellon Sep 18th, 2006 at 11:19 am

Hi Eric,

The 100uF capacitor is actually a timing capacitor. Changing the value will affect the timing on the system.

The issue with the brightness has to do with the brief time the LEDs are actually on. They have to be on a very short time for this to work. So to increase the brightness 2 things can be done:

1) Add more LEDs 😬
2) Adjust to a higher frequency

You may have noticed that as you increase the frequency on the Pot, the LEDs get brighter. The only problem is that as you increase the frequency, it gets harder to adjust. One solution to this is to add another Pot of 1K (or 5K) in series with the 100K Pot. This will give you a finer tuning capability. Set the 1K to the middle position, then adjust the 100K to the best of your ability trying to match the frequency of your drops, and then fine adjust with the 1K.

45.

RobCool Sep 18th, 2006 at 3:16 pm

Has anyone else suffered from nausea while using strobing LEDs?

46.

Alain Bellon Sep 18th, 2006 at 3:54 pm

RobCool, I am glad you brought up that topic.

Flashing lights (strobing lights) have been associated with a set of discomforts and even more serious conditions.

The most important one to be aware of is the possibility of triggering an epileptic seizure. Some people have photosensitive epilepsia and will have a convulsive attack when exposed to intense flashing lights.

On the less "serious" category, there is evidence that shows that flashing lights at a low frequency can produce nausea and vomiting if the person is exposed to it for too long.

Just be aware of these possibilities when experimenting with strobes.

(One more reason to go to higher than 30Hz in frequency.)

47.

I hate banks Sep 20th, 2006 at 2:37 pm

Hello there,

In case anyone is interested, I've got a stripboard layout that works for this circuit. Just leave a message here if you want it and I'll put a link to it.

Also I found that even with plastic tubing, my drips where irregular blobs. The solution? A cocktail stick inside the tubing, with the point emerging a little bit proud of the tube at the end.

Finally thank you for this brilliant project!

48.

Niksun Sep 21st, 2006 at 4:08 pm

I hate banks,

I would love a link to the layout! I'm going to build one for my Halloween party.

Thanks.

49.

Aditya Oct 6th, 2006 at 4:19 am

Thanks for all the info! When I first glanced at the original time fountain, I assumed he had a constant drip rate with varying strobe frequency… and then I found out he made it oh so much more complicated. I'm glad I found this site that sets it up the way I thought it worked.

I didn't know anything about 555s, and I've read a bit into them, but I can't seem to find the info I need to answer this question myself, so I'll ask it here:

I think it would be cool to set it up so that once it's strobing properly, there can be a separate knob to adjust the pulse width, so you can see a small stream at a time, or shorten it back down so you just get a drop at a time. So what I want to know is where can I put a pot (and what value should this pot be) so that I can adjust the pulse width? As to what I've understood so far, the pot in series with the 470ohm resistor will adjust the frequency, and a second pot can be added in series with the 100ohm resistor for further fine tuning. Where would a pulse WIDTH-adjusting pot go?

Thanks.

50.

Alain Bellon Oct 6th, 2006 at 12:05 pm

Aditya,

The way this setup works will not allow you to independently change the pulse width. If you switched the 10 Ohm resistor for a POT, you would be changing the frequency as you change the pulse width.

A possible solution is to put a diode in parallel with the 10 Ohm resistor, and change that resistor to a POT. If you cannot find a POT of low resistance, then change the resistor to say 100 Ohms and add a 1k POT in parallel so that you can vary the resistance of that segment of the circuit from 0 to 100 Ohms.

Not sure if that will do what you intend.

51.

Mike Oct 8th, 2006 at 12:48 pm

Hey, I'm trying to build one of my own, and I am going to use a PIC to control the strobe rate, along with a drip detector.

I only have two problems. I started building mine today, and found that the water coming out of the pump was laminar. I had a steady stream, rather than a series of drops. How do I get the fountain to drip rather than flow? I tried lowering the flow rate but that just made a smaller stream. Im using 1/4 inch copper piping for the fountain. Secondly, I havent made a drip detector circuit yet, and I'm not sure how to do it. I was thinking two metal contacts and have the drip go through them, completing a circuit every time the drop goes through it. I guess I could just have a steady strobe rate and make it adjustable, but I would rather not have to calibrate the pump every time I turn it on.
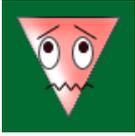
52.

friend Oct 26th, 2006 at 8:56 pm

Mike,

You need to build a PWM for the motor to control how much it pumps. You'll want a potentiometer to control the duty cycle. When the duty cycle is just right, you should have a series of drops and not a stream. The problem is the drops are not at perfect intervals, this is what causes the flicker of the drops in Nate's video.

There is no way around this, a drip detection circuit will only solve the problem for a single drop (depending on how you configure the delay to reset the strobe when a drop is detected, probably the uppermost drop). All the other drops will jitter when the frequency of the drip changes.

Hope this helps.

53.

Scotty Nov 3rd, 2006 at 12:10 am

Kudos to everyone who has contributed to this fantastic idea. I'm flabbergasted. Another source for something that will glow under UV is an ink that is used at a printing press. Some older presses may have some concentrate lying around with their other chemicals. I think they used to use it to mark the paper at the beginning of a press run to mark the "setup" impressions, which would be discarded. By using uv ink, it wasn't a big drama if any got through the QA process.
When exposed to UV, it glows a striking blue colour. It looks a bit like olive oil in it's concentrated form, I put 5 drop to a litre of water, and it doesn't discolour anything at all. You don't even know it's in the water until you shine UV on it.

I have about 100ml in a bottle around here somewhere, but if anyone is interested, I'll find out the name of it from my printing buddy.

54.

lewis Nov 30th, 2006 at 1:18 pm

first of all thanks for everyones help on this site, the 555 method is so much easyer to get off the ground. i have biult a ountain that works pretty dam well but is there a way with the obove circuit to make the pulse lenght any shorter? my fountain is still slightly streaky

55.

lewis Dec 1st, 2006 at 6:35 am

hi guys i did leave a meesage but it seems to have gone, not sure if i did something wrong. what i wanted to know is if anyone had any ideas to make the pulse lenght any shorter, my fountain is slightly streaky and it looks like i need to flash the leds for a shorter time. anyone got an idea how this could be done using the above circuit?

56.

mike Dec 1st, 2006 at 4:59 pm

Eric,
You said that video at 24-30 fps appears smooth, but its not true for repetitive motion like what we have here. The classic example is how wheels usually don't look like they are rolling properly on cars in movies. Usually they end up looking like

they are rolling in reverse.

57.

Traxs Dec 4th, 2006 at 8:34 pm

I have created the 555 timer as listed on the page and it works great with leds.. But now im tring to use bulbs:

http://christmas.howstuffworks.com/christmas-lights2.htm

When I add the mini-light – the 555 timer stops working.
I am just wondering if I would need a relay or maybe some other component

I had another project that pulsed a relay but it did not last long

Is there another option?

58.

Bjan Dec 8th, 2006 at 11:24 am

I'm sort of confused as to how this works.

So lets say the drip rate is 10 drops per second…that means that when the LEDs flash, there will be more than one drop of water in the air at one time, which means that multiple drops of water will be visible. Yet, in the videos and photographs I've seen, only one drop is visible.

Would anyone mind clearing this up for me?

59.

Bjan Dec 8th, 2006 at 11:27 am

…Nevermind. I was wrong. Ignore that last post.

60.

Chip Ford Dec 24th, 2006 at 9:47 pm

Hello. Someone posted a link to the time fountain video on the pupman tesla page. I followed it. Man, this is the neatest little project I have seen in a while. I am just starting to get back into some electronics. Just bought an osilloscope. Ain't here yet but..this is perfect to start with…I have included a link to a drawing I made tonight to share. It is a little different version of what we are trying to do here. Don't know if it is better or worse or the same..Check it out and let me know….Chip

chipford(at)roadrunner(dot)com

http://www.flickr.com/photos/11814425@N00/332367765/

61.

Jared Jan 6th, 2007 at 10:35 pm

I just built the above circuit and for some reason when I turn it on the LEDs only flash once…

Does anybody have any suggestions?

Thanks.

62.

Jared Jan 7th, 2007 at 12:32 pm

Nevermind, the circuit is up and running, now all that's left is to build the fountain.

63.

Chip Ford Jan 14th, 2007 at 5:06 pm

If anyone is interested. I have, with the help of others, constructed a pretty nice 555 timer circuit with Frequancy and Duty Cycle adjustments. It uses (2) 2N3904 or equal NPN transistors. I have some pictures up on flickr. It shows ocsilliscope trace, breadboard prototype and I have also included a pcboard layout that can be printed out in MS Paint. This thing really works great. Use it as much as you like.

http://www.flickr.com/photos/11814425@N00/357483951/in/photostream/

64.

Chip Ford Jan 14th, 2007 at 5:07 pm

^^^…Sorry about the Spelling…Frequency I meant…^^^

65.

Jared Jan 17th, 2007 at 2:23 pm

Hey Chip,

Would it be possible for you to upload a photograph of the completed PCB + components?

66.

Chip Ford Jan 24th, 2007 at 11:57 pm

I have uploaded (3) pictures of the completed circuit as requested. Here is the link. You may have to copy and paste or simply "type" it into your address bar????

http://www.flickr.com/photos/11814425@N00/

Few Notes:

1) I noticed that with this circuit, if you turn the duty cycle down really low, the pot will heat up and burn out so, avoid that. You have to turn it almost all the way down for this to occur. Keep an eye on it(or a finger).

2) In the circuit pictures, there is only one LED attached. To run an array of series'ed LED's, I would simply de-solder the existing LED leads and solder the array leads in their place.

Chip Ford

67.

Chip Ford Jan 25th, 2007 at 12:04 am

One other Note:

3) There is not a spot on the circuit board for a series resistor to protect your LED's. You can not see it in the pictures but, there is a series resistor underneath the board between the LED's anode and pin #3 of the 555. Have fun…

Chip…

68.

Jared Feb 13th, 2007 at 1:51 am

Hi.

I built a PWM for the motor to control how much it pumps. I can use a potentiometer to control the duty cycle. When the duty cycle is just right, I have a series of drops and not a stream. The problem is the drops do not drip periodically, but are chaotic.

Does anybody have a suggestion for having drops fall at more regular intervals?

69.

Antonio Feb 22nd, 2007 at 12:49 am

Are these LEDs supposed to be parallel or in series? If I recall correctly, diodes aren't supposed to be placed in parallel because slight differences in the turn on voltages will cause some diodes to conduct more current than the others. I noticed this when I tested the circuit with green and red LEDs – the green LEDs and one red LED were much dimmer than the others. Putting the LEDs in series fixed that, though.

70.

kurt Feb 28th, 2007 at 11:19 pm

hey, i hav built the circut but my led go constantley can any1 help with this problem my 555 timer is a tad different to the one above as it has 4 pins down the 2 longer sides but im 99% sure i have conected it to the right pins.
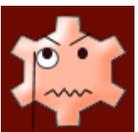
71.

deadwhale Mar 30th, 2007 at 9:06 pm

ummm…I don't know if this will help, but instead of trying to regulate the number of drops of water, why not try it the other way, try to regulate bubbles in water. Using an aquarium pump with regular aquarium valves it might be easier to regulate. Don't know how well they'll show in the light, but it might be worth a try.
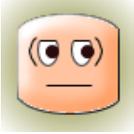
72.

nitroburn Apr 1st, 2007 at 10:40 pm

YAY! I made one! First working circuit I've made in ages, and from a actual diagram at that!

Just need to get a 10k pot rather then 100k so I can get finer control.

Drove 25 LEDs just fine. Time to go experiment!

73.

David Apr 3rd, 2007 at 5:05 pm

Antonio,

Putting diodes either parallel or serie is no problem, the only thing you'll have to worry about is the current that flows through them. You have a dimmed effect because red and green led's have different work voltages (because of the chemical structure) and thus you'll need to put the red and green led's parallel and recalculate your resistor…

74.

Mike Scott Apr 3rd, 2007 at 9:44 pm

Unless I'm missing something, the drops are formed by allowing air to seperate the stream of water (breaking the surface tension of the water). Two ways to acheive this:

#1 make sure your tube is small enough to not allow a steady stream of air to enter the resevoir, or.

#2 allow your water to collect on something just before it falls.. like a needle tip or something. The water will cling to the tip and gather until it becomes too heavy and fall as a drop.

Also, stated here is an observation regarding the way a tire appears to roll backwards on film. I just wanted to point-out that you don't need film to see this effect, due to what's referred to as "persistance of vision" (google it.. it's interesting).

Perhaps, rather than try to use UV lights, you should use something like milk and white lights with a black background. It would reduce the risk to your eyes. Granted, it's not as cool as "light-up" water, but it's at least safer.

Also I wish I had a clue about electronics, but I don't, so I'll have to wait until these things are availible at CVS or something to actually get to play with one. I have a question though.. does your system take into account that the speed of the drip increases during it's fall? (gravity)

It would seem that a light near the top of the system would have to blink slower than one near the bottom, if a "true" freezing were to occur… or am I missing something here?

Thanks to all that have come forward to discuss this project, it's given me some ideas to wrap my brain around, even without a clue as to the electronics in play.

75.

Pedro Almeida Apr 7th, 2007 at 8:01 am

This circuit is exaclty what came to my mind when I saw the original project (Nate's, I think) with the UV leds and the fluorescent dye…

I thought to myself "why using a PIC?" and came to me the 555.

I'll try doing something like this!! I liked your milk / white water idea, it seems pretty simple!

I am a photography lover, so I've tried lots of experiment with strobe and splashes. This will be fantastic

76.

Angus May 11th, 2007 at 9:30 am

I was wondering if someone could descibe in detail how to wire a 9v battery into the curcuit (positive and negative terminals) and i cant seem to find the pin numbers on my NE555P
If anyone can help, Thanks

77.

full metal May 13th, 2007 at 12:41 am

its a really nice and cool project.iam planning to built one for my self.but before starting some doubts in my mind.

have a look at the picture first.(sorry for such bad pic.i used MSpaint).i hop the circuit connections are right.
http://img156.imageshack.us/img156/4050/untitledoz5.jpg
after going through all the material,this is what i had in my mind.is it ok.
1.if i want to make the droplets flowing backward what shld i do with the circuit?
2.can i use white LED's instead of UV light? with the same solution.
3.why this circuit does not uses drop sensor?

and one more time thanks for providing th simple design.

78.

zorif May 29th, 2007 at 8:20 pm

the 555 circuit is good.i built it on bread board it seems to be working when i turn the pot(flickering can be seen clearly).but the the issue is with brightness of LEDs.even i use 12v input iam not getting much brightness.so any ideas to get some more brightness?
and to add more LEDs author said transistor is required.so the base of transistor goes to pin3,emitter to ground and LED's will fit between supply and collector.am i right?

79.

Jared Jun 5th, 2007 at 9:19 pm

I just presented my time fountain in AP physics, but I couldn't get the lights to strobe fast enough or the on period low enough, the result, broken fountain. I will make it work, I've got >14 hours in it.

80.

Vladislav Aug 12th, 2007 at 4:21 am

What duration of an impulse (flash) should be (in micro seconds)? I think, that approximately 50 micro seconds. And what time between flashes?
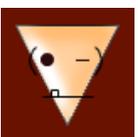
81.

Gerry Moore Mar 13th, 2008 at 2:11 am

No one has posted for a long while so I hope someone is still out there! I plan to build a fountain but have a couple of questions …..does it only work in dimmed light, ie nightime?? Anyone think it would be possible/feasable to build a big one for use out in the garden?? I live in Spain and I'm looking for a project for the garden…this would be ideal!! My alternative is a 'fake' perpetual motion machine!!

82.

Alain Bellon Mar 13th, 2008 at 11:52 am

Vladislav,

The pulse and the delay are controlled through the POT. By adjusting the timing you get different effects, like time suspension and time going backwards. But it all depends on the rate of your water drops.

Gerry,

This phenomenon works because of the specific drops that the light lets you see in sequence. So if the ambient light is strong enough you will not see the effect because you will be able to see other drops at the same time.

It would be feasable to do one in large scale, but in that case look to use Stobe lights (the ones they use for dancing places), which can be regulated, instead of using LEDs.
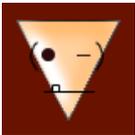
83.

Gerry Moore Mar 14th, 2008 at 1:43 am

Thanks for the quick reply Alain….I was thinking of using the little LED torches…I think they have around 6-10 leds with a reflector….I realise it won't work during daylight but would look good in the garden evening time…I was more concerned with the question of getting much bigger 'drops' ??? What size do you think would be possible…there must be a limit to the maximum size of a possible water drop due to surface tension?? I even wondered about dropping golf balls or similar!!

84.

Brendan Apr 14th, 2010 at 10:08 pm

I was curious, do you have suggestions on beefing up this circuit as far as a higher input voltage to run more LED's? My circuit keeps over heating and burning out the 555 IC timer…
Thanks so much, this project was so much fun!

85.

Alain Bellon Aug 1st, 2010 at 10:23 am

Use transistors to get a larger current for the LEDs.

Example: http://www.sbprojects.com/knowledge/ir/irdriver.gif

86.

George Sep 27th, 2010 at 8:25 pm

Hello
I am looking for help to build a unit 48 inches wide by 7 feet tall.

Can anybody spare a little time to help out?
Thankyou very much
George

87.
Eric Nov 13th, 2010 at 1:32 pm

I'm also curious if anyone has tried this outside and concluded it's possible or not due to ambient light. it seems with bright strobe flashes your eye would focus on the illuminated drop moments and mentally blur out the in-between dimmer, naturally illuminated, intervals. but perhaps it would look crap without at the very least a dark background…