Eye Gaze Communicator for People with Bed-ridden Conditions

Team members:

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Presented by:

-Dr. Pitchaya Sitthi-amorn

Description:

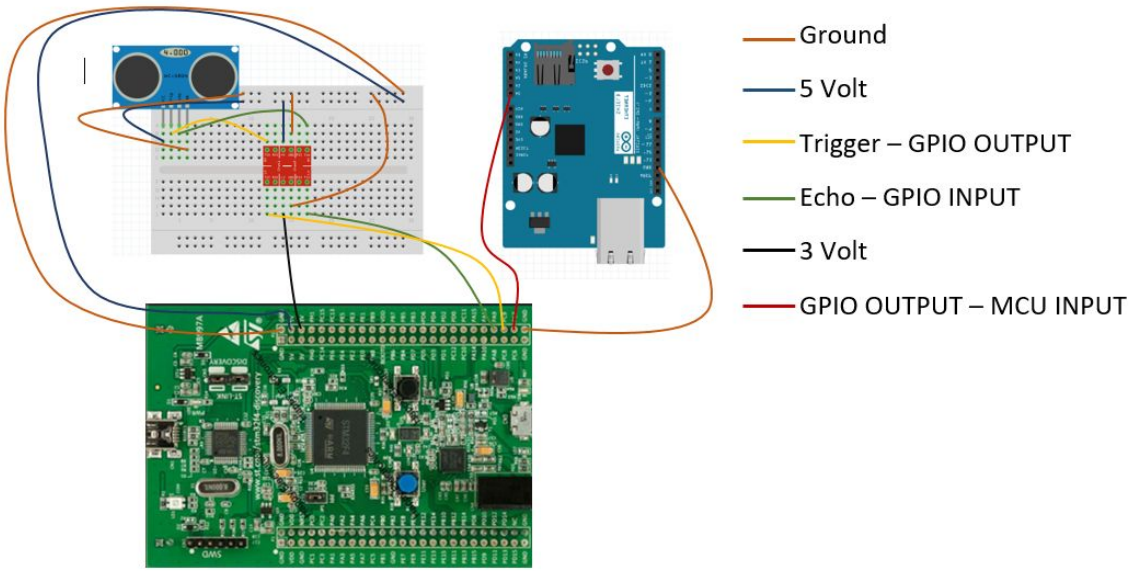
This project is made to support people with bedridden conditions and are unable to communicate well through speech or hand gestures. The purpose is to allow them to send signals to other people that is not in the room via gazing their eyes into specific directions. The camera end can detect three types of gazing : left, right, and upward.

Instructions:

1. Turn on each of 3 components: camera, receiving website, and board
2. Make sure every components are connected via Netpie by checking at the receiving website.
3. The person using the camera have to look directly into the camera until a message “calibrated” pops up. After that they can send signals by gazing left, right, or upward for a moment.
4. While the signal is being sent, the receiving website will check if there is a person on that end using Ultrasonic Sensor. If a person is already there the website will turn on a notification sound for a brief moment, if not, it will turn on a type of alarm specific to the direction of the gaze signal
5. If the person on the receiving end is already there.They can attend to the person on the camera and after that they have to come back to press the reset the button on the website to restart the process.
   It there is noone on the receiving end, the alarm will keep ringing until someone comes to press the receiving button and attends to the person on the camera end.

Kongnut Songwattana

My task is to connect stm32 board to another devices , sensor and mcu
The circuit is the picture bellow.



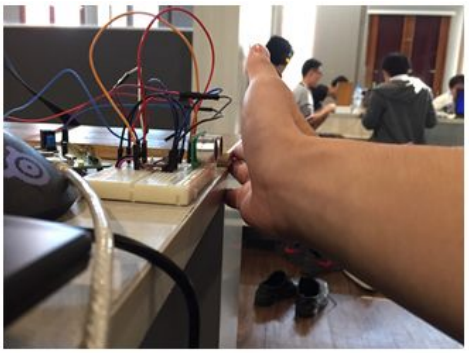
My sensor is ultrasonic sensor. It works when the trig pin of sensor is high it will send the wave to the object and set echo pin high, after that the signal comes back to the sensor and the echo pin will be low.

My implementation is to send the signal to trig pin and count the time that echo pin is high and check if it out of range it's mean there is no people there. When there is no people there the board will send low to the MCU (MCU is active low) else send high to MCU.

The problems which I met is

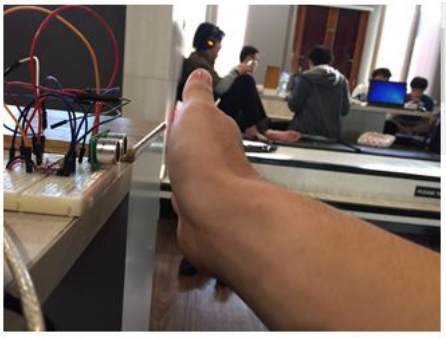
1. First I have no logic level converter so the output from sensor isn't what I expect and according to the manual and some reference from the website the voltage that board send to the trig pin isn't enough the sensor require 5 volt but the board can only send 3 volt.
2. The first time I implement, I toggle the trig pin but it doesn't work because the delay is too long. According to the manual the delay should be around 10 micro second but HAL_Delay() can only be 1 millisecond. So I have to count the amount of cycle and convert it into time.

3. From the detail in manual and many website tell me that the sensor and measure the distance from 2 cm to 400 cm but from I can only measure from 2 cm to around 45 cm and after the value will be very high.



Watched Data

Expression	Value	Location	Size	Refres
use	215	2000 0020	4	2 H



Expression	Value	Location	Size	Refres
use	473	2000 0020	4	2 H

Watched Data

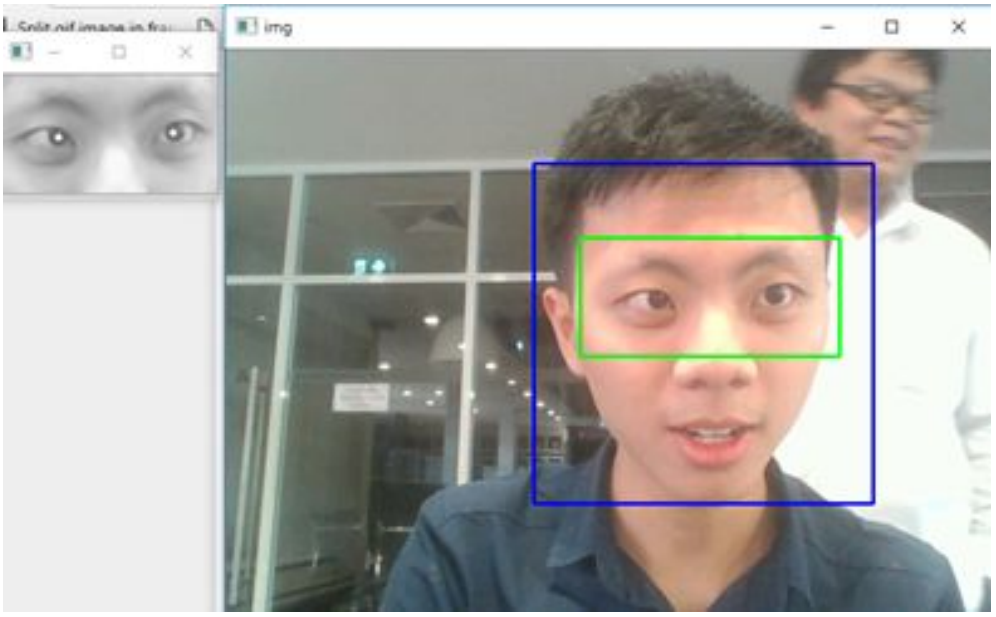
Expression	Value	Location	Size	Refres
use	103 099	2000 0020	4	2 H

The first picture and second picture is in range, when the object is close the value is low else it's high. And the third one is when there is no object or out of range the value will be more than hundred thousand.

Chanokthorn Uerpairojkit

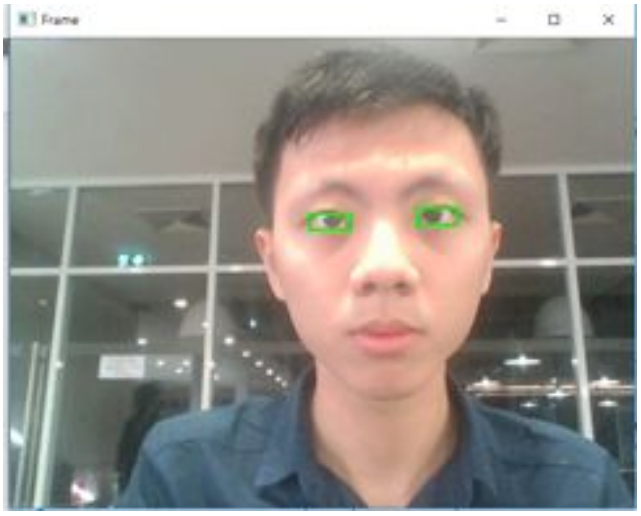
My task is to identify the direction of the user's gaze. At first, we are indecisive on the approach of the task. One of the first approach is to capture the eye image as close to the user's eye as possible and use the image to detect the iris. But it turns out to be impractical, since it will be uncomfortable for the user to have a camera very close to their face.

I then use the "Haar Cascade" along with OpenCV's CascadeClassifier to detect the face of the user, then use the cascade again to select the eyes to find the location of the iris.

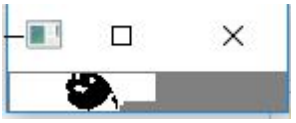


But it turns out that the iris location changes very frequently due to the imprecise detection of the Haar Cascade. Thus, the location of the default location of the iris cannot be referenced to determine the gazing direction accurately

I later found another library that supports face detection called "DLib", which returns the location of each features of the face. This makes it a lot more accurate to determine the location of the eyes. Thus, I am able to detect iris efficiently. Here is an example of the detection.



For ease of detection I use thresholding method to convert the image for better iris detection



Lastly I use the Hough Transformation to detect the location of the circle of iris, which is an average result of the previous 5 frame including the current one. This method can determine left and right gaze.

Note: the red dot in the picture shows the calibrated location of the iris while looking directly at the camera, and the pink dot shows the location of the iris in the current frame.

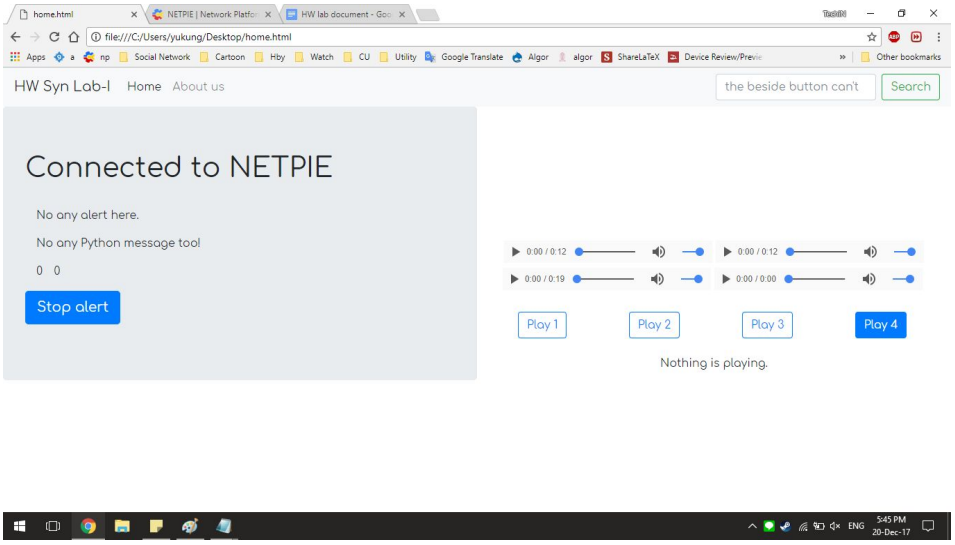
Although this methods works accurately for left and right direction, it cannot detect the iris while gazing upward. So I identify the upward direction by comparing the amount of white pixels in the lower half of the picture, which will increase by a large amount while gazing upward.

Natchaphon Suphatarawanich

My task is about the front-end. I decorated all web components , created other web pages that consist of home page , about-us page. And to write html files, I started from learning about 'how Netpie communicate with (talk to) our website' to make sure that we (our group and our website) receive correct data/signals from nodeMCU (back-end part) and be able to display it correctly.

*** first image is about displaying signal of LED on arduino (nodeMCU)***

Second, I learned about how to add audio to website (at first I tried with video



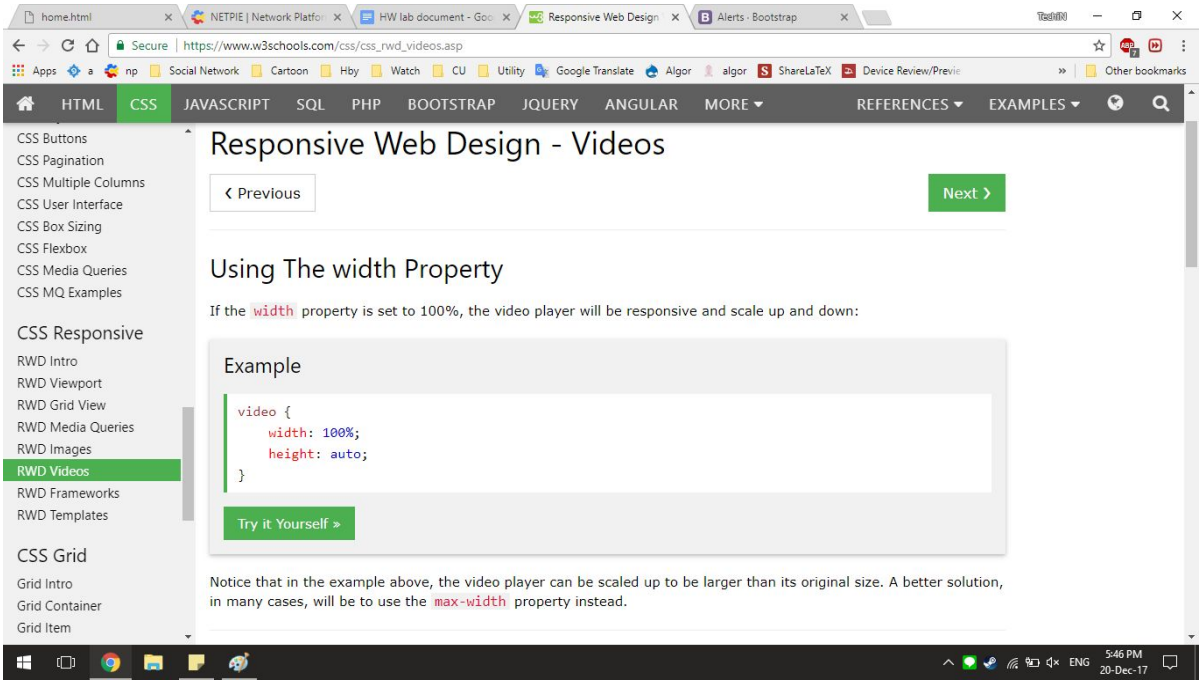
to see cleary result) because our project is about notifying when there is some request from a patient (relevant with assistant). That means we need to sound to alert assistants when they aren't on monitor to response to patient's request.

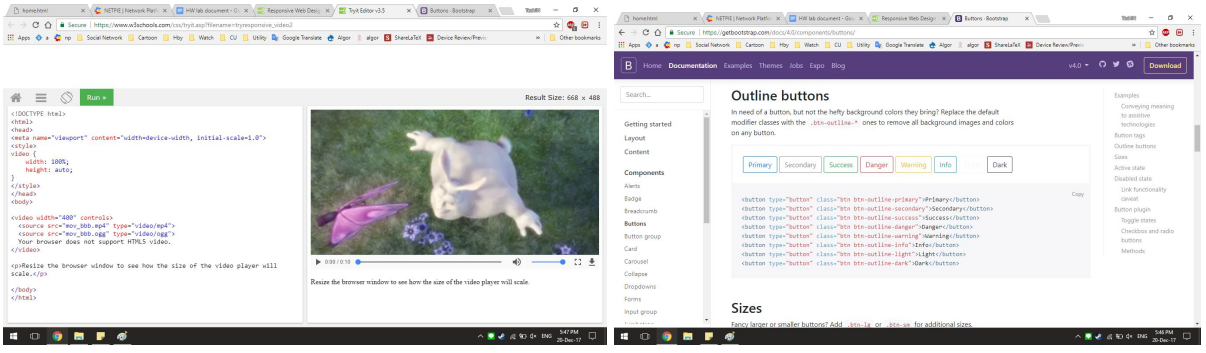
Next one, I talked with my group members about which sound to use and when,how to start notification. Because data/signals from nodeMCU doesn't have a certain format. So we need to design a system in some paper like state machine.

Such as, In case that there is a repeat request signals but there isn't a signal that indicate that assistant is stand by at monitor.There is 2 possible case.

> First, He is going to patient's room. In this case we shouldn't repeat alert sound.
> Second, We don't know where he is. So we repeat alert sound .

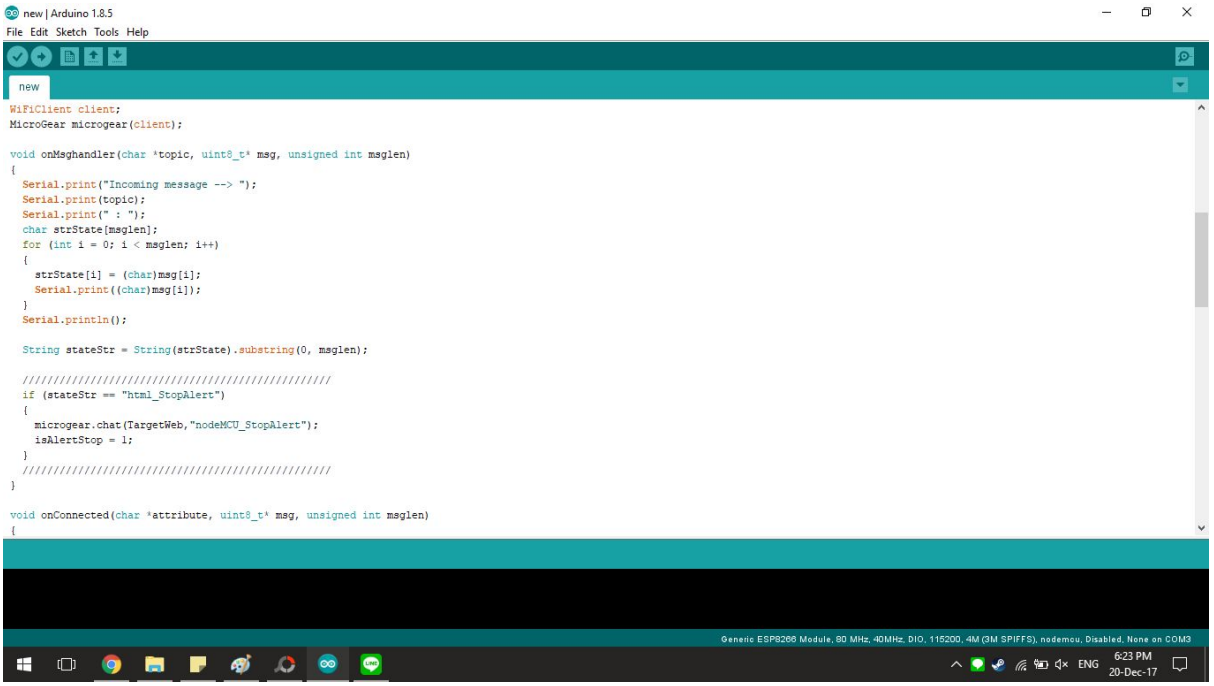
** We won't forget to write 'How to use' on our manual reference that if the assistant acknowledge that and must go to patient's room, He must press a button on website to prevent alert sound from repeating.**



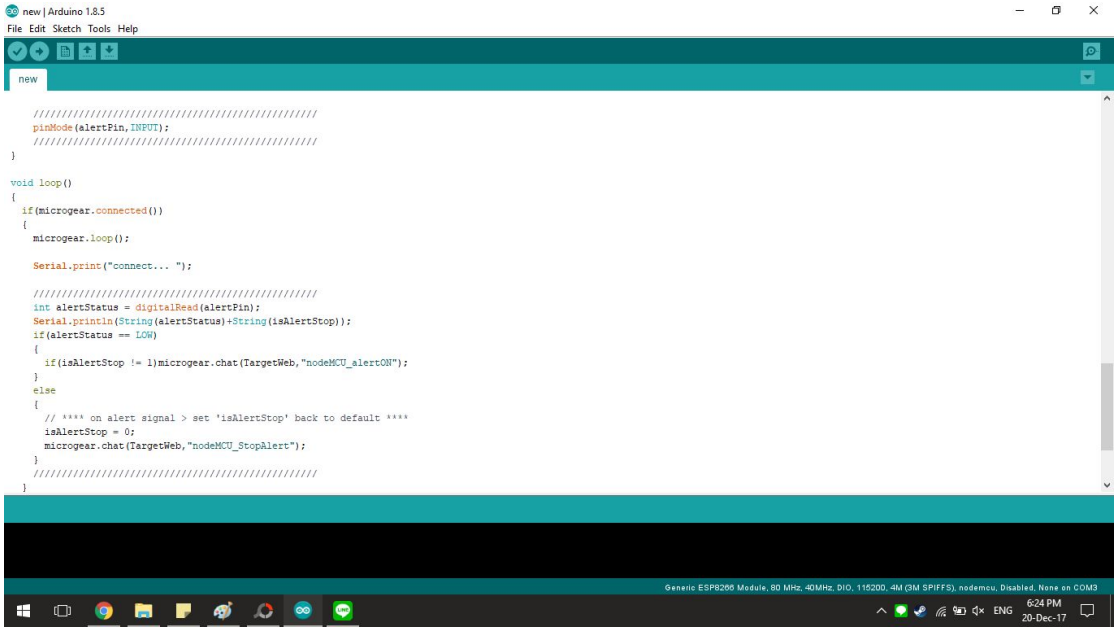


*** Full image at https://goo.gl/s9VV7z ***

Techin Philardluck



I made nodeMCU receive signals from STM32 board and turn it into data (alert mode) then send ‘alert-mode’ to website by using Netpie as an intermediary. And made nodeMCU send response to verify/confirm that sending signal is correct.



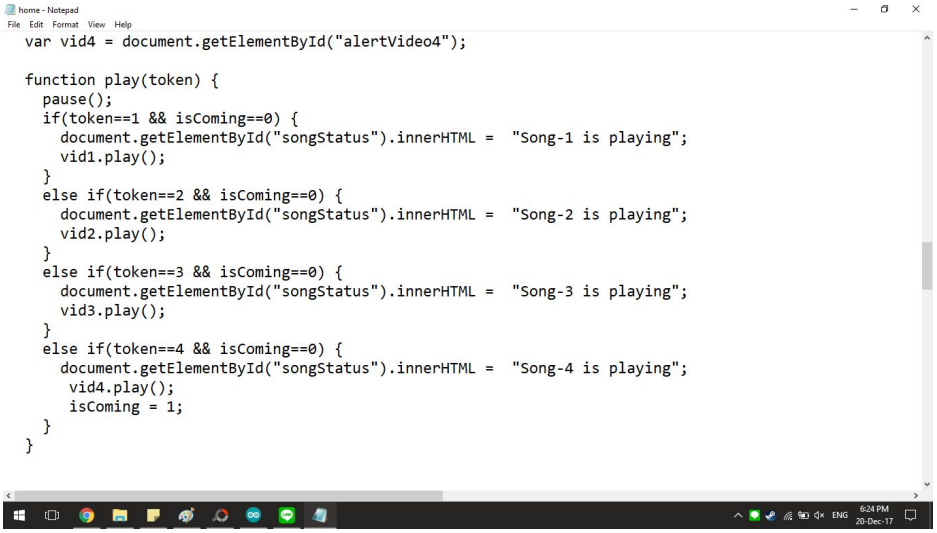
I started my job with learning Netpie on ‘Get start’ page on Netpie.And find more example how Netpie communicate with arduino. I found a website that show us how to use DHT11(humidity and temperature sensor). So I learn how they work

and try to open and close LED on arduino from website by using Netpie as an intermediary.

After that I started trying to receive easiest request/input (0 or 1) from STM32. (at first we program STM32 to send 1 if someone push blue-push button on board)

Further, I consult with my group member to handle with input and display logic part on website. Such as make a button to test and act like request or make variables to store state of some data.

And when it absolutely works, we use ultrasonic sensor to measure distance and compute it (is anyone at front of sensor?) on STM32 then send (0 or 1) to arduino and display on website. So we find some conclusion about alert state and notification again then I transform our conclusion into apart of website code.



**** Full image at https://goo.gl/6sPZFb ****