IMAGE PROCESSING ON STM32F429-DISCOVERY BOARD

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Introduction

- We made a device efficient device, which consume less energy.
- Image processing is the one of the most popular technological evaluation. Seeing is the one of the most important human sense. Image processing gives chance to us to transfer it to devices
- Our project implemented on Stm32 microprocessor and OV7670 camera module.
- We show our results on the screen of board.

OV7670 Camera Module

OV7670 Camera Module

The OV7670 camera module build in onboard LDO regulator only single 3.3V power needed.

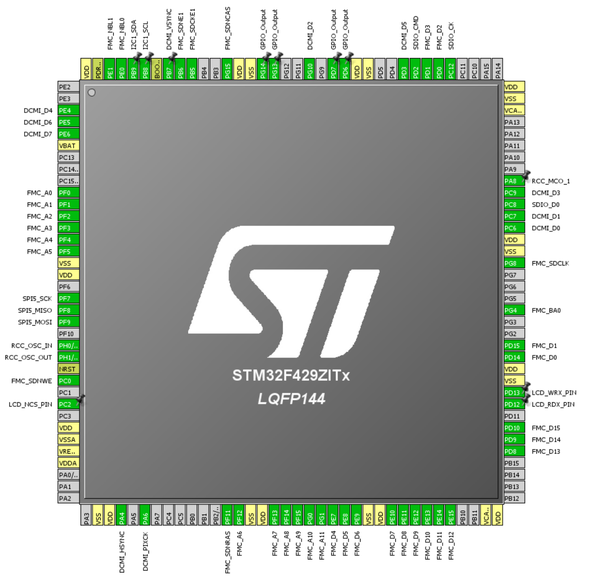
- The camera module is powered from a single +3.3V power supply.
- An external oscillator provide the clock source for camera module XCLK pin. With proper configuration to the camera internal registers via I2C bus, then the camera supply pixel clock (PCLK) and camera data back to the host with synchronize signal like HREF and VSYNC.
- The OV7670 camera module is a low cost 0.3 mega pixel CMOS color camera module, it can output 640x480 VGA resolution image at 30fps.

Stm32f429i-Discovery and Pins

Cortex M4 MCU, up to 168Mhz with floating point unit (FPU), 256 KB external SDRAM with 64 Mbits, 2048 KB Flash.

Front panel of board

Back panel of board

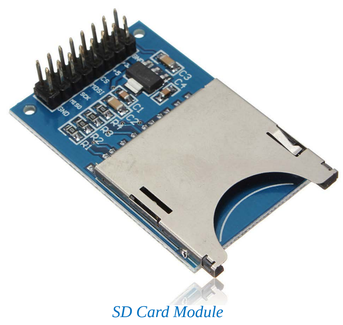


Pin Configuration of Project in CubeMX

Overview

- We took sensor values(pixel values) from camera and create a image, after we used Color Detection and find the intended colors on image.
- After determining colors, we used Edge Detection and find the intended object.
- After finding intended object we are determining the place of this object on real World with using formulas.
- At the end, our vehicle is moving toward to it.

SD Card Module



SD Card Module

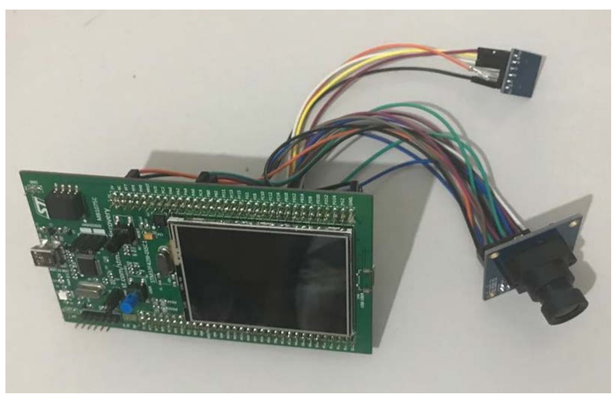
- Input Voltage: 3.3V/5V.
- With all SD SPI Pins out :MOSI, SCK, MISO and CS ,for further connection.

This Micro SD Card is used for transfering data to and from a standard sd card. The pin out is directly compatible with Arduino and also can be used with other microcontrollers. It allow us to add mass storage and data logging to our project.

DCMI and Camera

Pin Connections:

PA8 ----------XCLK
PB6 ----------SIOC
PB7 ----------SIOD
PA4 ----------HREF
PA6 ----------PCLK
PG9----------VSYNC
PC6 ----------D0
PC7 ----------D1
PG10 ----------D2
PC9 ----------D3
PE4 ----------D4
PD3---------- D5
PE5 ----------D6
PE6 ----------D7



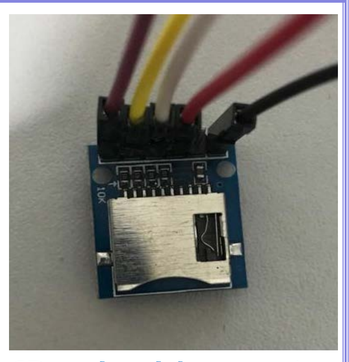
Integrated device with camera and sd card module

This methods provide us to taking an image from OV7670 Camera ,sensor values store in frame_buffer array with size 76800 (320*240 Image Size), and displays image in LCD.If this method put in a infinite while loop, images can taking continuously.

SD Card Writing

Pin Connections:

PD3----------MOSI
PE5----------MISO
PE6 ----------CLK

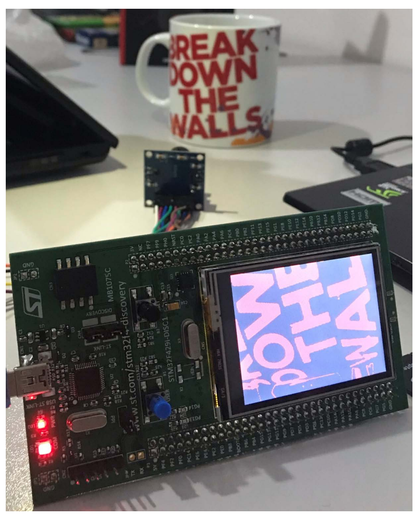


SD card module connection

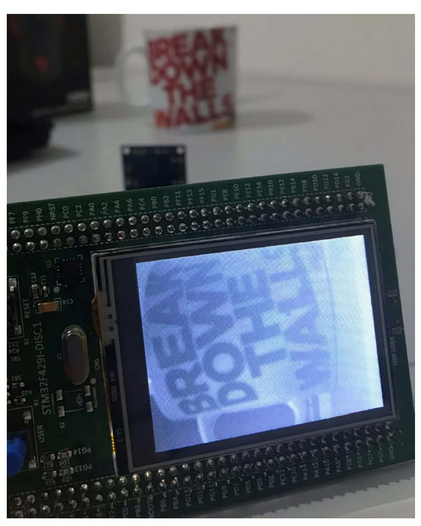
This method provide us to write datas to SD Card. This method is on development process. For now , we can write strings to SD Card with creating a txt file. The next stage , we will take an image from OV7670 camera and the image will be stored on SD Card.

```
res = f_write(&MyFile, image_str, sizeof(image_str)-1,(UINT *) &byteswrite);
```

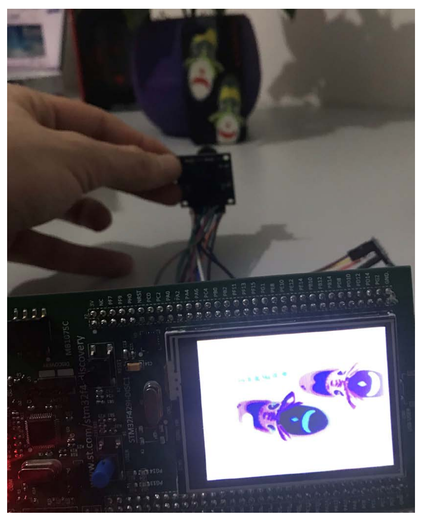
Screens of Image Processing



Color detection applied image



Grey Scale applied image



Inverting Operation applied image

Future Work

We will entegrate this image processor to on a Robot. It can be a four or three tier car or a tank.

What will we gonna add :

- Implementing on a vehicle.
- Implementing a robot arm on the vehicle.
- Writing a code about controlling motors of vehicle with Stm32.
- Writing code for controling robot arm.
- We must determine the exact place of object from image and measure the distance, after we must give the values to motor and go to object. When vehicle is arrived to object, robot arm must take the object.