PJ : Cold Brew Machine

조원 : 홍기화

[프로젝트 목적] Cold Brew Coffee Automation System

주 목적

<---- optional

<---- mandatory

1 Ground Coffee Analysis

DSP(OpenCV)

Camera USB 3.0 1920 x 1280

Data 1 : Color(RGB)

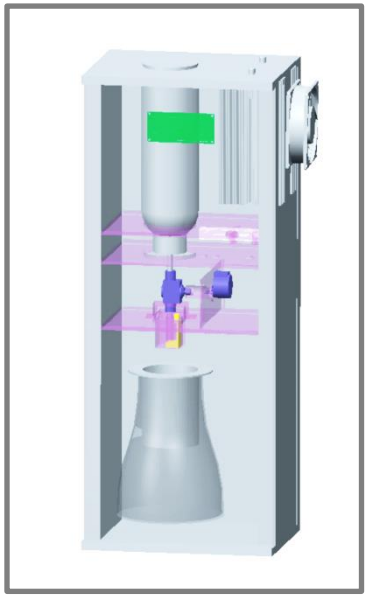
Under Dark Room and LED light

Filter all but the ground coffee
-> Average the color of the dots

Data 2 : Size(mm^2)

Under Dark Room and LED light

Brightness normalization ->
DFT -> range -> size



2 Sensor Data Processing(Digital Filter)

Weight Sensor Data -> ADC(<=3mV Change)

Temperature Sensor Data -> ADC

ADC -> Digital Filter(LPF)

Where 1 : Weight Sensor

Where 2 : Temperature Sensor

[프로젝트 목적] Cold Brew Coffee Automation System

주 목적

<---- optional

<---- mandatory

3 Drop Display On Web

WebGL

Water Drop Visualizatioon

Display Data

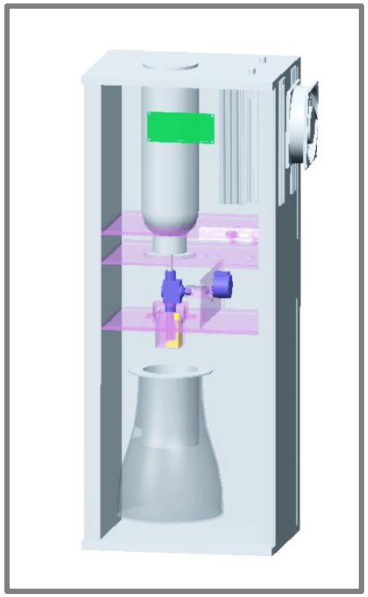
Ground coffee (size)

Ground coffee (color)

IR Remote -> Web

Display data

Select settings



4 Interrupt List(Priority)

1. Remote Control
2. Drop Count
3. Weight Sensor
4. LCD Display

[PJ CBM : BOM]

대분류	소분류	품명	수량(ea)	단위가격(원)	총액(원)
electronic parts	MCU	TI tms570 launchpad	1	37570	37570
	LCD	LC1621 LCD	1	7700	7700
	Weight Sensor	Load cell BND-611N 1kg	2	25300	50600
	Weight Sensor	Load cell BND-611N 2kg	1	14500	14500
	Weight sensor adc IC	HX711 Module (24bit AD)	1	1540	1540
	Drop Sensor	photo interrupter	1	1760	1760
	Temperature sensor	ETH-01DV	1	8910	8910
	UV-LED	uv-c 4545 smd led 5mW	3	5000	15000
	IR receiver + control board	(chinese)	1	2000	2000
	step motor controller	ULN2003 Module	1	1300	1300
	step motor for valve control	28BYJ-48	1	1200	1200
	FAN		1	17500	17500
	TEC Module	TEC-12705	2	5400	10800
	Relay		2	2000	4000
	Camera	usb3.0	1	75000	75000
Mechanical parts	door switch	ramps 1.4 limit switch	3	2400	7200
	펠티어 단열스폰지	펠티어 단열스폰지	1	600	600
	Peltier heatsink	Peltier-Heatsink-Set(협신전자)	1	16500	16500
	LED PCB	smd led 기판	1	1800	1800
	투명 튜브	에어호스 6mm	1	800	800
	electric wire	0.3SQ × 12C 10color 1m	1	1300	1300
	wire mold	wire duct PVC 사각몰드 밤색 1호	3	300	900
	문 경첩	경첩	2	1000	2000
	문고리	문고리	1	1000	1000
	문자석	문 자석	1	1200	1200
	case	플라베니아 5T 회색	1	4950	4950
	단열재	압축스티로폼 20mm	1	2000	2000
	물병	물병_티보틀	1	5000	5000
	실리콘마개	SL.Sto6105 (싸이랩코리아)	1	4500	4500
	Water valve	FSC0600 호스6mm 미세조절	1	2600	2600
	Water tank	daiso 1001333	2	1760	3520
	Li-po 2800mAh 35C	Li-po 2800mAh 35C	1	51900	51900
	3D Printer	Ender 3	1	230000	230000
	3d print 필라멘트	PLA 필라멘트 1kg	2	17500	35000
	볼트너트	m3,m4,m5 볼트 너트 와셔 세트(은색)	1	6100	6100
	더치기구	더치기구	1	19500	19500
합계 총액					647,750

[프로젝트 일정]

DSP(Camera)

Sensor fix(고장 수리)

DFT, LPF

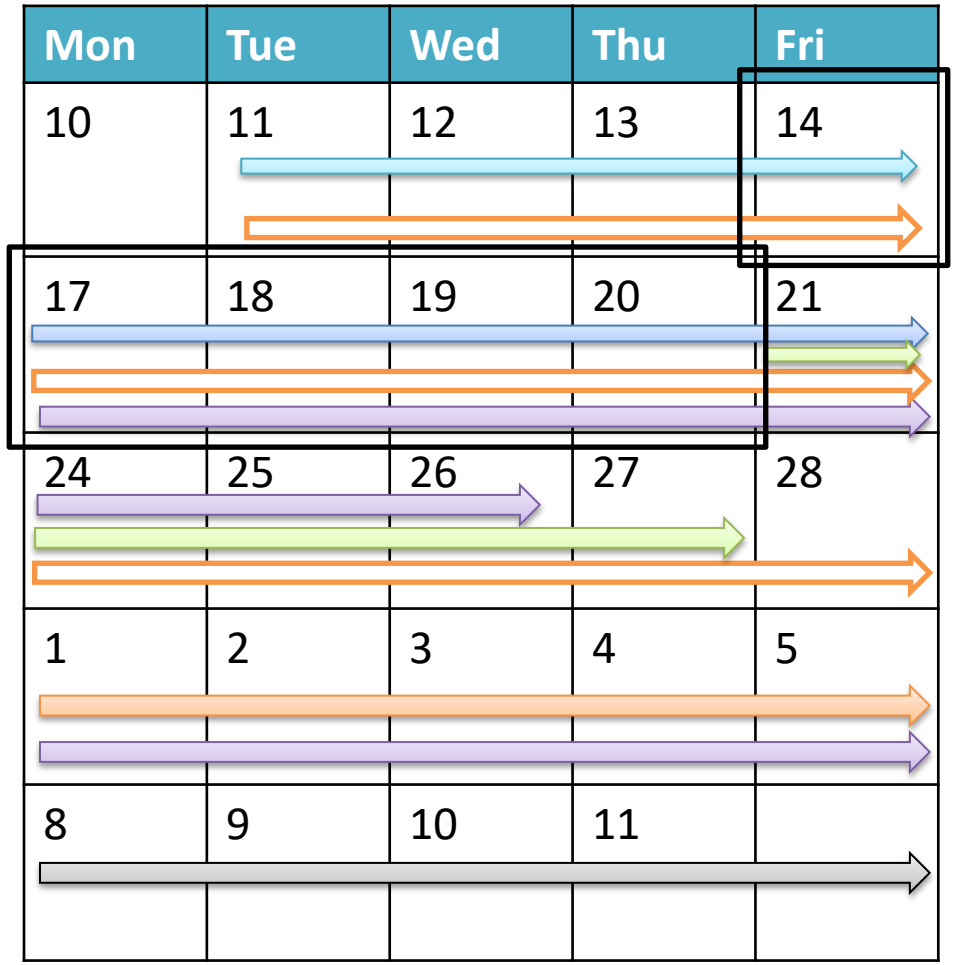
WebGL

Interrupt Priority check

Debug

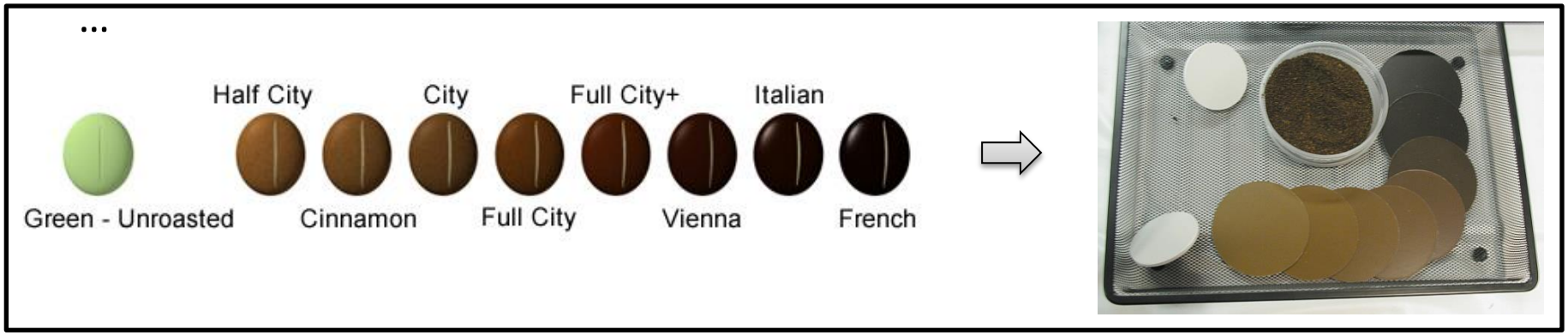
Communication(dsp<->mcu)

6/14~6/20

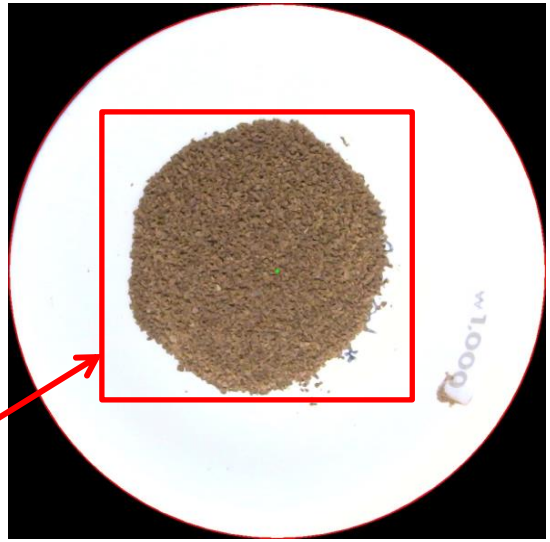


[PJ CBM : 진행 상황]

❑ Coffee Color Palette Standard (RGB) : SCAA, agtron m-basis roami



SCAA 분류법		SCAA
단계	색	R, G, B Value
Very Light	Tile #95	122, 61, 26
Light	Tile #85	108,55,25
Moderately Light	Tile #75	96,49,32
Light Medium	Tile #65	78,44,23
Medium	Tile #55	61,38,26
Moderately Dark	Tile #45	58,43,28
Dark	Tile #35	58,43,28
Very Dark	Tile #25	39,30,28



측정값 : R,G,B (144,105,82)

보정값 : R,G,B (-83,-67,-56)

측정값 + 보정값 = 사용할 Color Data

[PJ CBM : 진행 상황]

❑ Brightness Upscale

```
Mat chk_color(Mat img, int radius)
{
   int rows = img.rows;
   int cols = img.cols;
   int array = rows * cols;
   int count_dots=0, black_dots=0, white_dots=0;
   int i=0,j=0;
   int total_r = 0, total_g = 0, total_b = 0;
   int white_r = 0, white_g = 0, white_b = 0;
```

커피, 흰색, 검정색(배경) 구분

```
   /*
      src.at(i,j) is using (i,j) as (row,column)
    but Point(x,y) is using (x,y) as (column,row)
   */
   /*  680*480*256 = 83558400
   int limit = 2111111111;
   printf("limit = %d\n", limit);
   */

   for(i=0; i<rows; i++){
      for(j=0;j<cols;j++)
      {
         if((img.at<Vec3b>(i,j)[0] == 0) && (img.at<Vec3b>(i,j)[1] == 0) && (img.at<Vec3b>(i,j)[2]== 0))
         {
            black_dots++;
            continue;
         }

         else if((img.at<Vec3b>(i,j)[0] >=140 ) && (img.at<Vec3b>(i,j)[1] >= 140) && (img.at<Vec3b>(i,j)[2]>=140)){
            white_r += img.at<Vec3b>(i,j)[2];
            white_g += img.at<Vec3b>(i,j)[1];
            white_b += img.at<Vec3b>(i,j)[0];
            white_dots++;
            continue;
         }

         total_r += img.at<Vec3b>(i,j)[2];
         total_g += img.at<Vec3b>(i,j)[1];
         total_b += img.at<Vec3b>(i,j)[0];
         count_dots++;
      }
   }
```

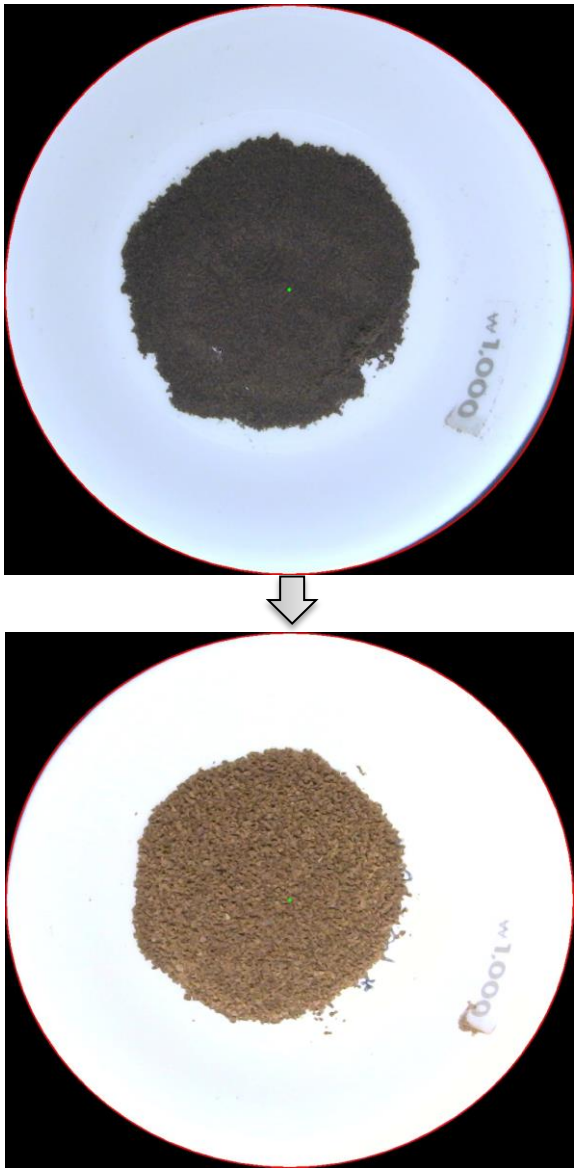
흰색 기준으로 upscale

```
for(i=0; i<rows; i++){
      for(j=0;j<cols;j++)
      {
         if((img.at<Vec3b>(i,j)[2]==0)&&(img.at<Vec3b>(i,j)[1]==0)&&(img.at<Vec3b>(i,j)[0]==0))
            continue;
         else{
            if( (int)(img.at<Vec3b>(i,j)[2] + (255 - (white_r/white_dots)))>255)
            img.at<Vec3b>(i,j)[2]=255;
            else
               img.at<Vec3b>(i,j)[2] += (255 - (white_r/white_dots));

            if( (int)(img.at<Vec3b>(i,j)[1] + (255 - (white_g/white_dots)))>255)
            img.at<Vec3b>(i,j)[1]=255;
            else
               img.at<Vec3b>(i,j)[1] += (255 - (white_g/white_dots));

            if( (int)(img.at<Vec3b>(i,j)[0] + (255 - (white_b/white_dots)))>255)
            img.at<Vec3b>(i,j)[0]=255;
            else
               img.at<Vec3b>(i,j)[0] += (255 - (white_b/white_dots));

         }
      }
   }
   imwrite("a_colorcheck_img_brighter.jpg", img);
```



기존 밝기 수준

수정후 밝기 수준

[PJ CBM : 진행 상황]

- Brightness Upscale -> DCT Test

mean : [-9.848960512195825]
stddev :[827.6144785028674]

mean : [-9.794771350184202]
stddev :[841.8923988885016]

mean : [-9.726895776497841]
stddev :[823.6670048330741]

mean : [-9.486063139658093]
stddev :[807.4953496042172]

mean : [-9.367362561205923]
stddev :[810.6738272124364]

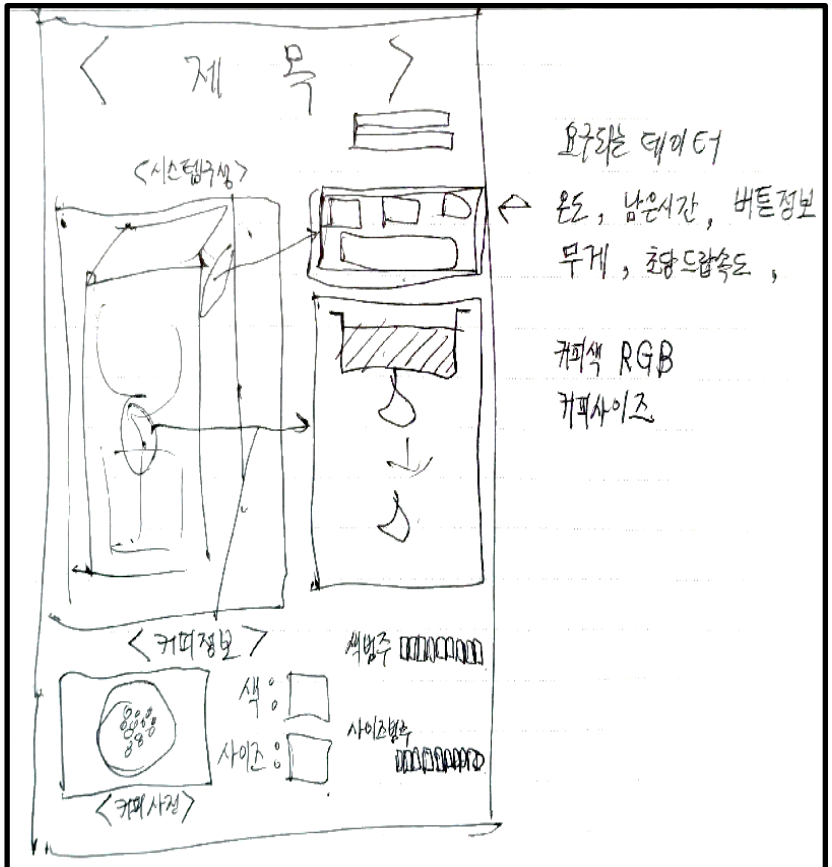
[PJ CBM : 진행 상황]

- DSP Multi thread
  1.Web Server 2.communication
  -> 완료
- Web design(html)
  -> 진행중

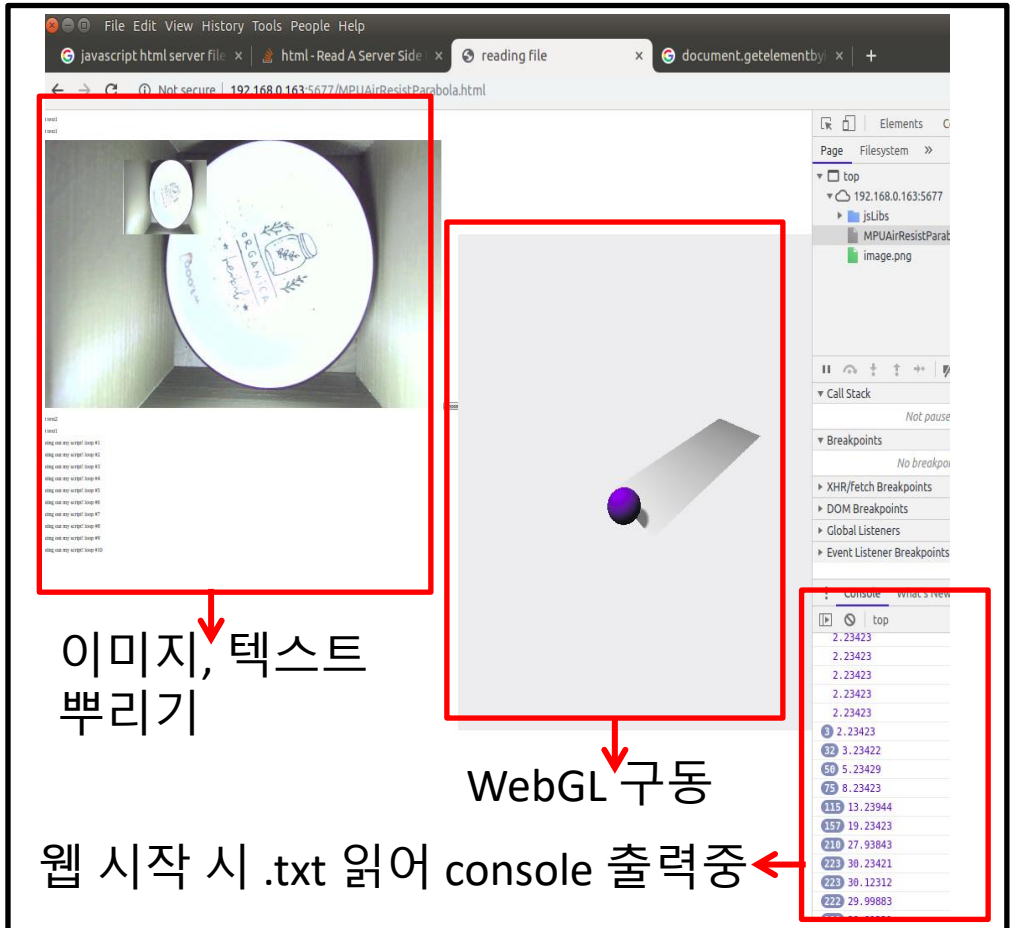
DSP Multi thread

-> thread1: printf
thread2:server

```
root@am57xx-evm:~/gihwahong/web_physics# ./a.out
init done
Using Wayland-EGL
wlpvr: PVR Services Initialised
Serving HTTP on 0.0.0.0 port 5677 ...
192.168.0.128 - - [26/Mar/2018 16:00:24] "GET /freefall.html HTTP/1.1" 200 -
192.168.0.128 - - [26/Mar/2018 16:00:24] "GET /jsLibs/three.js HTTP/1.1" 200 -
192.168.0.128 - - [26/Mar/2018 16:00:24] "GET /jsLibs/stats.js HTTP/1.1" 200 -
192.168.0.128 - - [26/Mar/2018 16:00:24] code 404, message File not found
192.168.0.128 - - [26/Mar/2018 16:00:24] "GET /favicon.ico HTTP/1.1" 404 -
thread1 print
thread1 print
thread2 print
^C '2 : ctrl + c' int initiated
(signal)status: 0x2
```



목표 웹 디자인



현재까지 진행 사항

[프로젝트 일정]

6/10~7/11

DSP(Camera)

Sensor fix(고장 수리)

DFT, LPF

WebGL

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Debug

Communication(dsp<->mcu)