Mango-AM335x 10.4 인치 감압식 LCD display 및 터치 보정하기

http://www.mangoboard.com/

http://cafe.naver.com/embeddedcrazyboys

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Document History

Revision	Date	Change note
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1. 소스 다운로드 및 컴파일

http://crztech.iptime.org:8080/Release/mango-am335x-ST/Linux/
에서 최종 릴리즈 소스를 다운로드 합니다.

```
$ wget http://crztech.iptime.org:8080/Release/mango-am335x-ST/Linux/kernel4.4/20200702/m3358_buildroot_k4419-20200702.tgz
```

이미지도 다운로드 한다.

$wget http://crztech.iptime.org:8080/Release/mango-am335x-ST/Linux/kernel4.4/20200702/m3358_buildroot_k4419-20200702-image.tgz

압축 풀기

$ tar xf m3358_buildroot_k4419-20200702.tgz

$ tar xf m3358_buildroot_k4419-20200702-image.tgz

$ mv m3358_buildroot_k4419-20200702-image m3358_buildroot_k4419-20200702/image

$ ./build_kernel defconfig m3358_audio_defconfig

$ ./build_kernel

2. LCD display Timming 변경

" arch/arm/boot/dts/am335x-evmsk.dts " 수정

```
#if 1 //crazyboys 20210706 10.4inch
                display-timings {
                        800x600 {
                                hactive         = <800>;
                                vactive         = <600>;
                                hback-porch     = <46>;
                                hfront-porch    = <210>;
                                hsync-len       = <1>;
                                vback-porch     = <23>;
                                vfront-porch    = <12>;
                                vsync-len       = <1>;
                                clock-frequency = <40000000>;
                                hsync-active    = <0>;
                                vsync-active    = <0>;
```

```
                        };
                };
#endif
```

3. 터치 드라이버 포팅

회로도에 아래와 같이 정의가 되어 있다.

코드가 아래와 같이 되어 있으므로

```
static int titsc_config_wires(struct titsc *ts_dev)
{
        u32 analog_line[4];
        u32 wire_order[4];
        int i, bit_cfg;

        for (i = 0; i < 4; i++) {
                /*
                 * Get the order in which TSC wires are attached
                 * w.r.t. each of the analog input lines on the EVM.
                 */
                analog_line[i] = (ts_dev->config_inp[i] & 0xF0) >> 4;
                wire_order[i] = ts_dev->config_inp[i] & 0x0F;
                if (WARN_ON(analog_line[i] > 7))
                        return -EINVAL;
                if (WARN_ON(wire_order[i] > ARRAY_SIZE(config_pins)))
                        return -EINVAL;
        }

        for (i = 0; i < 4; i++) {
                int an_line;
                int wi_order;
```

```
                an_line = analog_line[i];
                wi_order = wire_order[i];
                bit_cfg = config_pins[wi_order];
                if (bit_cfg == 0)
                        return -EINVAL;
                switch (wi_order) {
                case 0:

                        ts_dev->bit_xp = bit_cfg;
                        ts_dev->inp_xp = an_line;

                        break;

                case 1:
                        ts_dev->bit_xn = bit_cfg;
                        ts_dev->inp_xn = an_line;

                        break;

                case 2:
                        ts_dev->bit_yp = bit_cfg;
                        ts_dev->inp_yp = an_line;

                        break;
                case 3:
                        ts_dev->bit_yn = bit_cfg;
                        ts_dev->inp_yn = an_line;

                        break;
                }
        }
        return 0;
}
```

" arch/arm/boot/dts/am335x-evmsk.dts "

```
&tscadc {
        status = "okay";
```

```
        tsc {
                ti,wires = <4>;
                ti,x-plate-resistance = <200>;
                ti,coordinate-readouts = <5>;
                ti,wire-config = <0x01 0x10 0x23 0x32>;
                ti,charge-delay = <0x400>;
        };
};
```

CONFIG_TOUCHSCREEN_TI_AM335X_TSC=y

CONFIG_MFD_TI_AM335X_TSCADC=y

4. 커널 이미지 Write하기

커널 컴파일 시 image 디렉토리는 아래와 같이 존재를 해야 합니다.

```
$ ls
app   buildroot-2013.11   image   kernel   mango_build_clean.sh   uboot

$ ls image/
boot-images   boot_tar_make.sh   custom_datafs              custom_datafs_make.sh   rootfs.tar.gz
boot.tar.gz   create-sdcard.sh   custom_datafs.tar.gz   rootfs.tar
```

Kernel 이미지는 custom_datafs/boot 디렉토리에 복사가 된다.

```
$ ./custom_datafs_make.sh
```

실행 후 custom_datafs.tar.gz 파일이 생성이 된다.

PC에 Micro SD를 삽입 후 Write를 한다. 디바이스 노드를 확인 한다.

```
$ sudo ./create-sdcard-ubuntu16.0.6.sh /dev/sdc
```

전체 이미지가 Write된다.

커널 이미지만 Write하기

```
$ cd image
$ mkdir fs
$ sudo mount /dev/sdc2 fs
$ sudo cp custom_datafs/boot/* fs/boot/
$ sudo umount fs
```

5. QT 어플 example 테스트

```
[root@localhost ~]#   cat /proc/bus/input/devices
I: Bus=0000 Vendor=0000 Product=0000 Version=0000
N: Name="ti-tsc"
P: Phys=
S: Sysfs=/devices/platform/ocp/44e0d000.tscadc/TI-am335x-tsc/input/input0
U: Uniq=
H: Handlers=mouse0 event0
B: PROP=0
B: EV=b
B: KEY=400 0 0 0 0 0 0 0 0 0 0
B: ABS=1000003
```

```
export QWS_MOUSE_PROTO="tslib:/dev/input/event0"
export TSLIB_TSEVENTTYPE=INPUT
export TSLIB_TSDEVICE=/dev/input/event0
export TSLIB_CALIBFILE=/etc/pointercal
export TSLIB_CONFFILE=/etc/ts.conf
export TSLIB_PLUGINDIR=/usr/lib/ts
export LD_LIBRARY_PATH=/usr/lib:/lib
export QWS_SIZE=800*600
export QWS_DISPLAY=Transformed:Rot270:VNC:LinuxFb
```

6. 터치 및 display 테스트 방법

<터치 테스트>

```
# ts_calibrate
xres = 800, yres = 600
[    43.868857] random: nonblocking pool is initialized
Took 62 samples...
Top left : X = 3815 Y = 3686
Took 66 samples...
Top right : X =  357 Y = 3657
Took 46 samples...
Bot right : X =  341 Y =  437
Took 61 samples...
Bot left : X = 3766 Y =  419
```

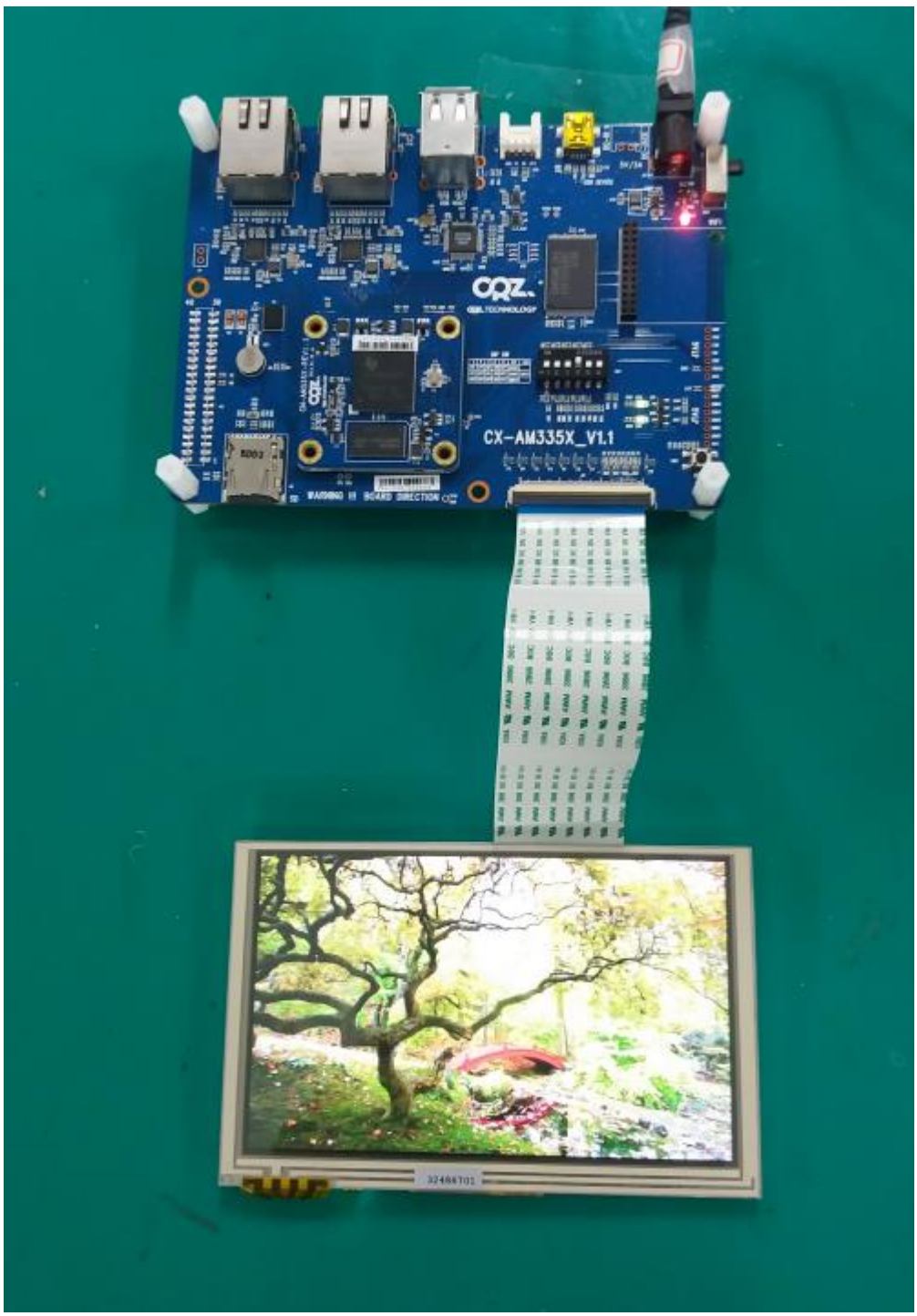
```
Took 60 samples...
Center : X = 2059 Y = 2062
816.349548 -0.203397 0.002043
615.823853 0.000250 -0.154147
Calibration constants: 53500284 -13329 133 40358632 16 -10102 65536
```

```
[root@localhost ~]# ts_test
```

```
[root@localhost ~]# fb-test
fb-test 1.0.0 (tablet_rosa)
fb res 800x600 virtual 800x600, line_len 3200
dim -1mm x -1mm
```

이미지를 삽입해서 fbv명령을 이용하여 이미지를 display 할 수 있다.

```
#fbv   1.jpg
```



사용법은 아래와 같습니다.

```
[root@localhost ~]# fbv
```

Usage: fbv [options] image1 image2 image3 ...

Available options:
--help | -h : Show this help
--alpha | -a : Use the alpha channel (if applicable)
--dontclear | -c : Do not clear the screen before and after displaying the image
--donthide | -u : Do not hide the cursor before and after displaying the image
--noinfo | -i : Supress image information
--stretch | -f : Strech (using a simple resizing routine) the image to fit onto screen if necessary
--colorstretch| -k : Strech (using a 'color average' resizing routine) the image to fit onto screen if necessary
--enlarge | -e : Enlarge the image to fit the whole screen if necessary
--ignore-aspect| -r : Ignore the image aspect while resizing
--delay <d> | -s <delay> : Slideshow, 'delay' is the slideshow delay in tenths of seconds.

Keys:
r : Redraw the image
a, d, w, x : Pan the image
f : Toggle resizing on/off
k : Toggle resizing quality
e : Toggle enlarging on/off
i : Toggle respecting the image aspect on/off
n : Rotate the image 90 degrees left
m : Rotate the image 90 degrees right
p : Disable all transformations