AMS Lab exercise 3a
Graphic LCD Display

Purpose
To understand how to interface a typical graphic LCD display module.
A driver is to be implemented for a 320 x 240 pixel color TFT display module.

Literature
- Lesson 3a: “Graphic TFT display”.
- ILI 9341 data sheet.
- “ITDB02 Arduino Mega shield” data sheet.
- “ITDB02 Arduino Mega shield” schematic.

Material
- Arduino Mega2560 board
- ITDB02 Arduino Mega shield.
- ITDB02 TFT display module (version 2).

The relevant documents are available at AMS Blackboard.

Exercise
In this exercise, we will write and test a C driver for the ITDB02 TFT display module.

Start by mounting the Arduino Mega shield and the Display module on the Mega2560 Arduino.

Notice: Do not mount on top of the “Arduino Mega2560 I/O Shield” (PR5824).
Some signals will then interfere.

To avoid damaging the hardware (by shortcuttings), remember to place some nonconduction material (eg. plastic foam) between the display mudule and the Arduino shield!

The position of the power switch (3,3 volt / 5 volt) does not matter.

Using the informations from the lesson and the relevant materiel (in particular the ILI 9341 data sheet), implement a C driver having **at least** the functions in the header file ("TFTdriver.h"):

```
void DisplayInit();
void DisplayOff();
void DisplayOn();
void SleepOut();
void MemoryAccessControl(unsigned char parameter);
void InterfacePixelFormat(unsigned char parameter);
void WritePixel(unsigned char Red, unsigned char Blue, unsigned char Green);
void SetColumnAddress(unsigned int Start, unsigned int End);
void SetPageAddress(unsigned int Start, unsigned int End);
void MemoryWrite();
void FillRectangle(unsigned int StartX, unsigned int StartY, unsigned int Width,
                   unsigned int Height, unsigned char Red, unsigned char Green, unsigned char Blue);
```

DisplayInit( ) will perform the nesessary initializating.
DisplayOff( ) will turn off the display.
DisplayOn( ) will turn on the display.
SleepOut( ) will bring the display out of sleep mode.
MemoryAccessControl( ) will set the right Access mode for the module.
InterfacePixelFormat( ) will select R-G-B = 5-6-5 (16 bits).
WritePixel( ) will send one colour pixel data to the display RAM.
SetColumnAddress( ) will set the specified column adress.
Set PageAddress( ) wil set the specified page address.
MemoryWrite( ) will send the Memory Write command.
FillRectangle( ) will paint a rectangle at the display with the specified colour (R-G-B = 5-6-5).
Origo is at the upper, left corner of the display.

The header file "TFTdriver.h" and a skeleton for "TFTdriver.c" is at Blackboard.

Write your own test program for the driver, or use "TFTtest.c" (available at Blackboard).

Start by implementing the basic, time-critical functions.
The methods used in LAB3 ("Alphanumeric Display") might inspire you.

Extra:
The display controller has no font generator.
Try implementing a method to write text to the display.
Hint: The program "LCDFontMaker" (available at Blackboard) or similar tools might be useful.

Extra-extra:
Try implementing a method to display a picture (for example a bit-map picture) at the display.
The task might involve some Googling.