Universität Stuttgart
Institut für Steuerungstechnik der Werkzeugmaschinen und Fertigungseinrichtungen

MEDIS – Module 2

Microcontroller based systems for controlling industrial processes

Lab 1.1: Introduction to microcontrollers - First steps

M. Seyfarth, Version 0.1

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Aims of the lab

- Use of the Development Environment
- Connect the Microcontroller to the Personal Computer /Laptop
- Program and transfer Applications

Microcontroller Board

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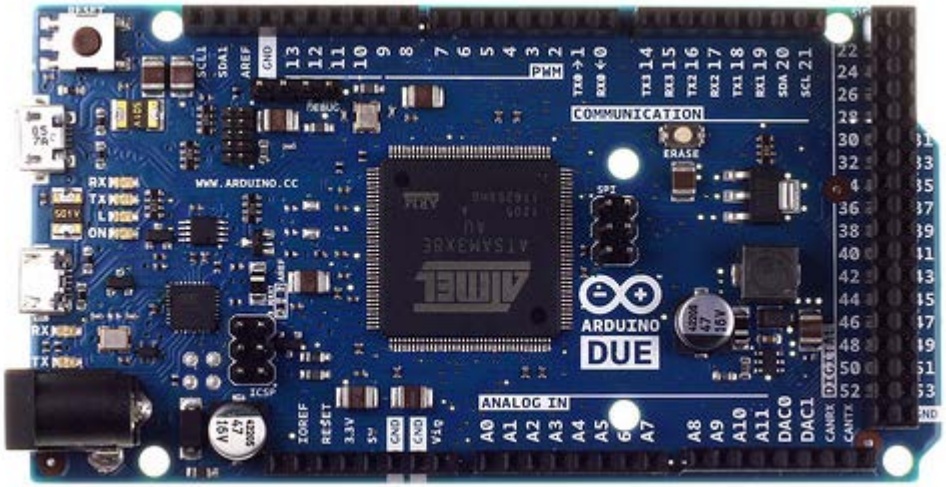
- Arduino DUE Microcontroller Board



  - Atmel SAM3X8E ARM Cortex-M3 CPU (at 3.3 volts)
  - 84 MHz Clock
  - 512 Kbytes of Flash memory
  - USB programming port

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Connecting Microcontroller to PC (1)

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1. Download Arduino Environment: http://arduino.cc/en/Main/Software (version 1.57!)
2. Unzip the downloaded file
3. Connect the Microcontroller with the USB cable to the PC (use the USB-port next to the DC power jack)
4. Install the drivers (located in “Drivers” folder of the Arduino Environment
5. Launch the Arduino Environment

Connecting Microcontroller to PC (2)

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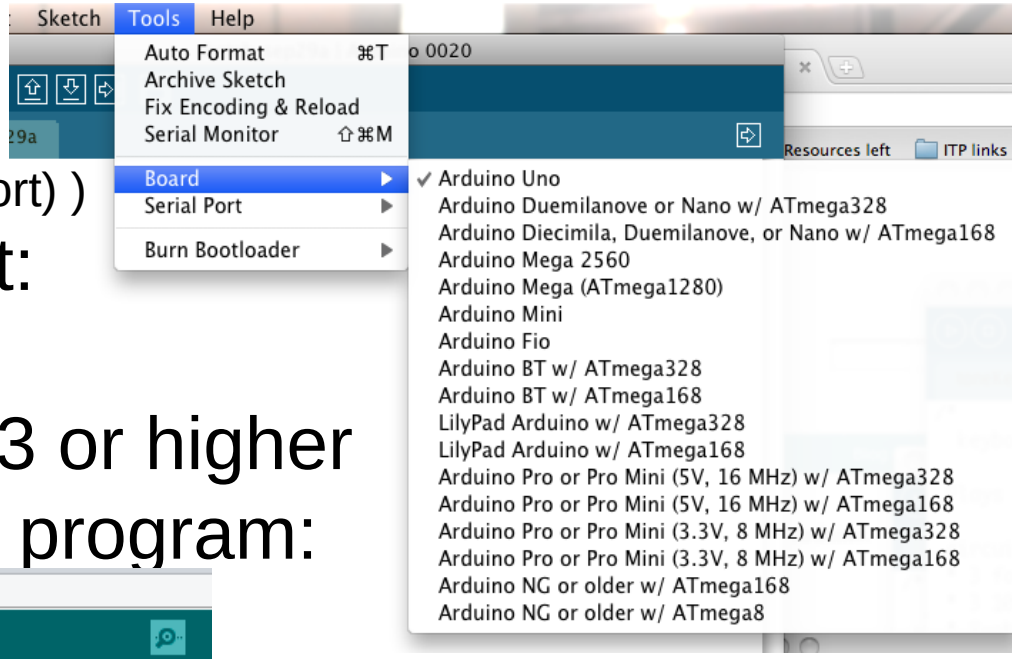
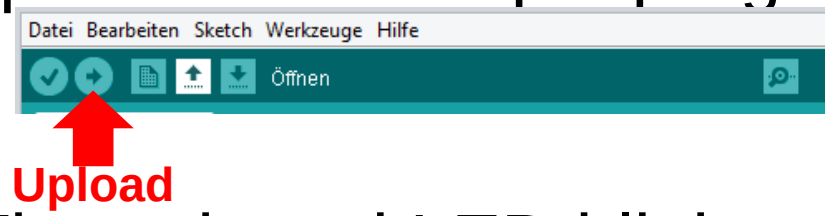
6. Open the LED blink example sketch:
   File > Examples > 1.Basics > Blink
7. Select the board:
   Tools > Board
   (Arduino DUE (Programming port))
8. Select the serial port:
   Tools > Serial Port
   It's likely to be COM3 or higher
9. Upload the example program:





10. The onboard LED blinks with 1 Hertz

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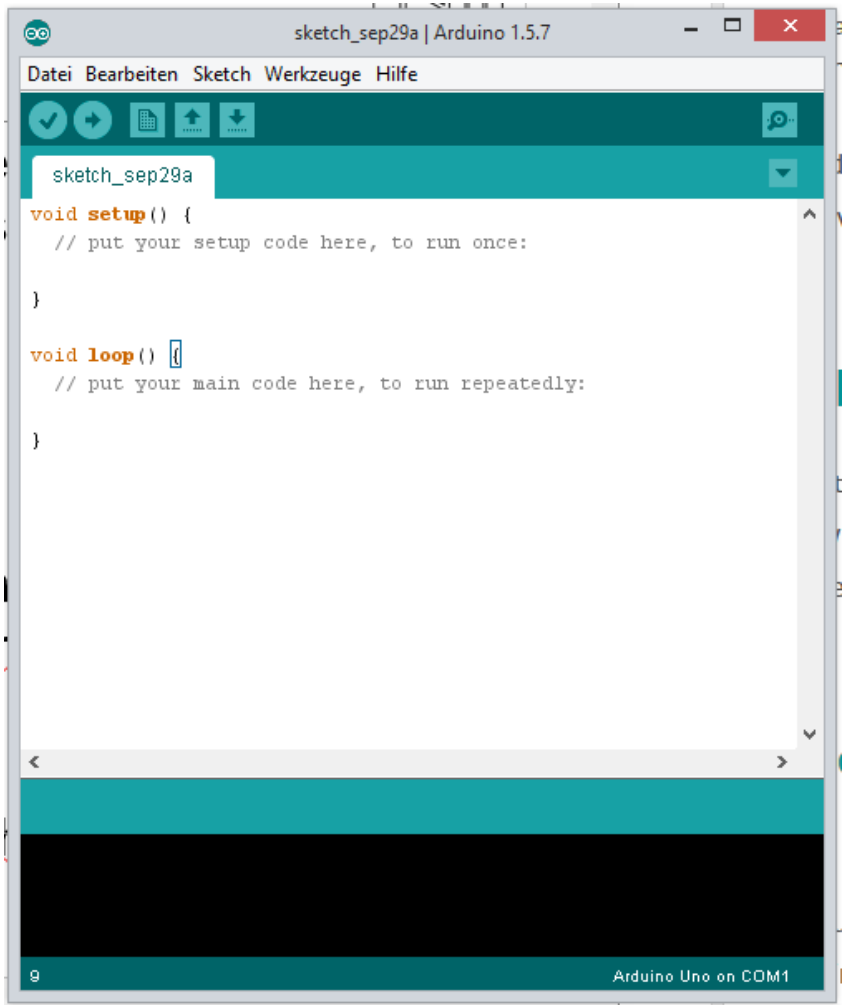
Framework for applications

A sketch is built up by two functions

- *Function* `setup()`
  no return value; no calling parameters; called once, when microcontroller is powered up; for initialization purposes;
- *Function* `loop()`
  no return value; no calling parameters; called repeatedly, after setup is ready; for main functionality of the application;



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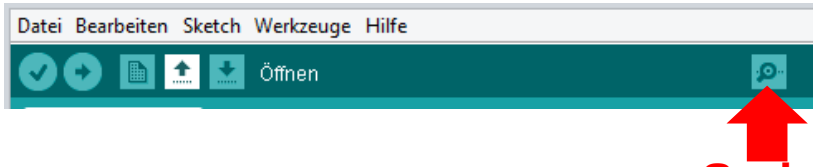
Work orders

1. Write a sketch that prints „Hello World“ to the serial monitor.



   A language reference
   can be found on www.arduino.cc (Serial Communication)
2. Write a sketch that prints an integer number in decimal, binary and hexadecimal format to the serial monitor.
3. Write a sketch that parses characters from the PC-keyboard. For example:
   I 123.45 ; the value 123 is stored in an integer variable
   F 123.45 ; the value 123.45 is stored in a float variable
   Use print-statements for debugging purposes. Only I (integer) and F (float) must be supported.

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Conclusion

1. Know the connection of microcontroller to PC
2. Know the basic concepts of the use of the ARDUINO Environment
3. Know how to program, transfer, start and monitor applications on the microcontroller
4. Know Serial library for communication