

Lab Course Microcontroller Programming

WS2011/12



Preparatory meeting, 25.07.2011

Michael Geisinger

fortiss GmbH

An-Institut der Technischen Universität München

fortiss?

□ "An-Institut" of TU München

"Ein **An-Institut** ist eine organisatorisch sowie rechtlich eigenständige Forschungseinrichtung, die einer deutschen Hochschule **angegliedert** ist. [...] Geleitet wird es oft von einem oder mehreren Professoren [...]." (Source: Wikipedia)



□ Research in the area of software intensive systems

- Embedded and distributed systems, industrial automation
- Information systems

□ Cooperation with TU München

- We offer lab courses and lectures
- Possibility for Bachelor/Master/Diploma theses and Hiwi positions

Lab Course Microcontroller Programming: Important Facts

- Modules: IN2106, IN4083 (“Master-Praktikum”)
→ for Master and Diploma students
- ECTS: 10.0, 6 SWS
- Registration: via TUMonline
- Time: **Thursday, 13:15 – 17:45**
- Room: **MI 03.05.012** (“Praktikumsraum”)
- First issue: Thursday, 20.10.2011, 13:15 – 17:45
- Website:
<http://www6.in.tum.de/Main/TeachingWs2011MikrocontrollerPraktikum>

Lab Course Organization

- Working in **groups with 2 people each**
- Workstation with necessary software and microcontroller equipment is provided
- **Questions may be asked** during normal lab course hours and personal assistance will usually be available
- Possibility to go to lab course room during any time (you have to ask someone to open you the door however)
- Equipment (microcontroller, etc.) **can be lent** if used outside of the normal lab course hours (but you have to sign for it and pay for lost components)
- Please do **not** take lent equipment with you at home

Lab Course Exercises

- Usually **one exercise sheet per week**, but solutions may be delivered at any later point in time
 - not necessary to solve them within the respective week
 - but it's recommended
- Mandatory and optional exercises
 - Optional exercises can be solved if time and motivation permits
- Exercises **build up to top of each other**
 - In general, don't expect to be able to solve a later exercise before solving the previous ones
- Solutions should be sent to me via e-mail
- Full sample solutions available as soon as all groups have delivered their solutions

Lab Course Passing Criteria

- Attendance of lab course sessions
 - Full-time attendance **not** required however, it's fine if you're there for some time
- Functionality and elegance of your **solutions**
- Quality of **documentation**
- If a mark is required instead of just passed/not passed, the solutions will be rated individually (please tell me in advance)
 - Solving optional exercises might give bonus points

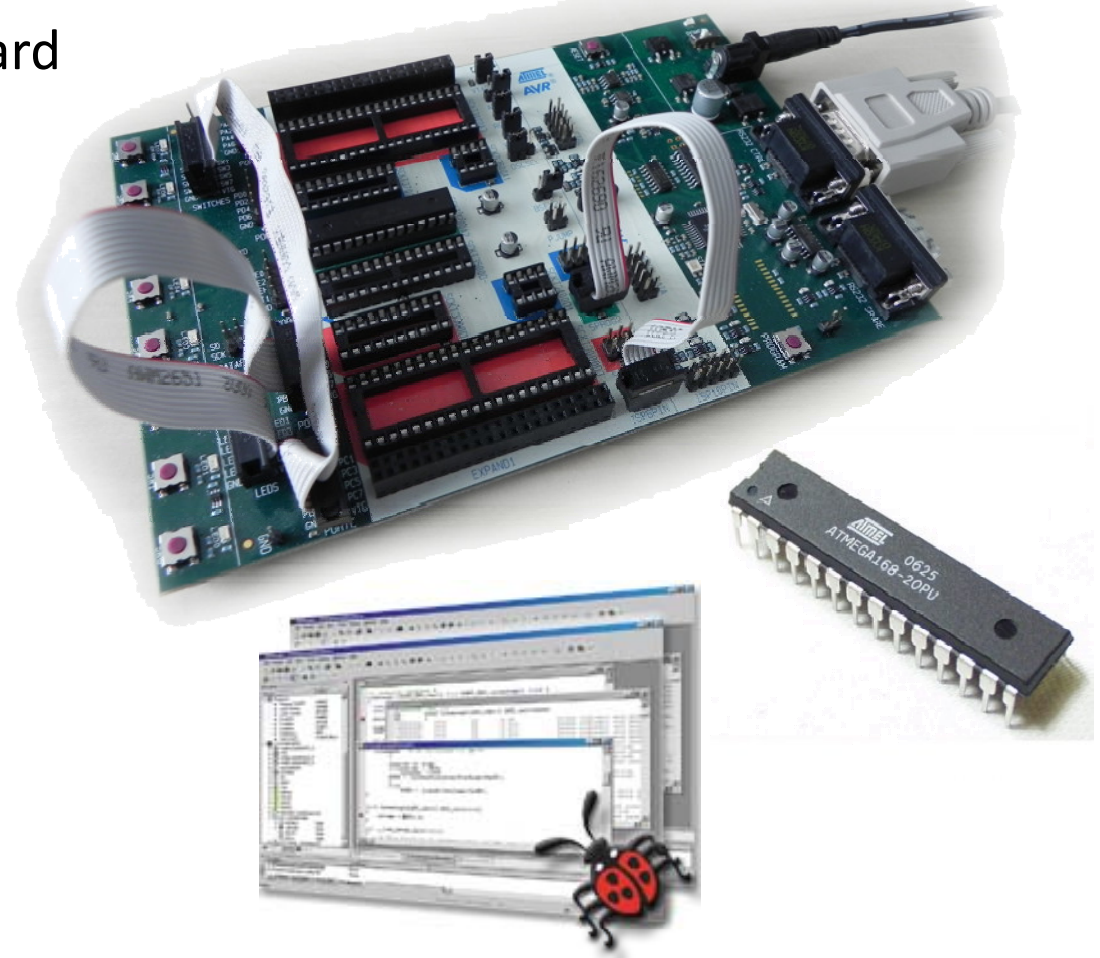
Hardware and Software

□ Hardware:

- ATMEL AVR Atmega168 microcontroller (8bit, 16MHz)
- ATMEL STK500 development board
- Various sensors and actuators

□ Software:

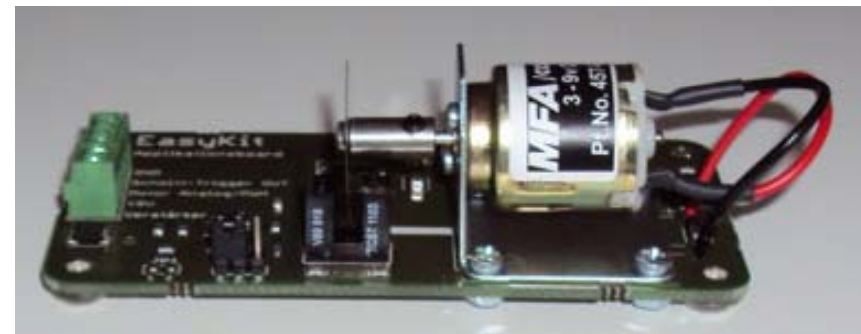
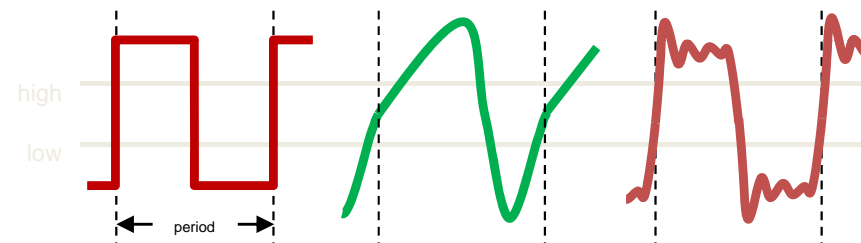
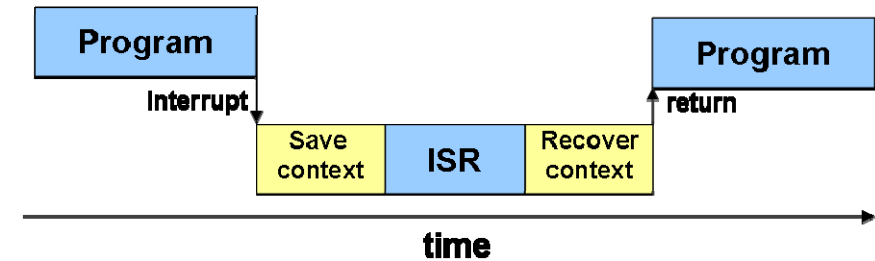
- ATMEL AVRStudio 4
- WinAVR compiler (avr-gcc)
- Serial programming



Content (1)

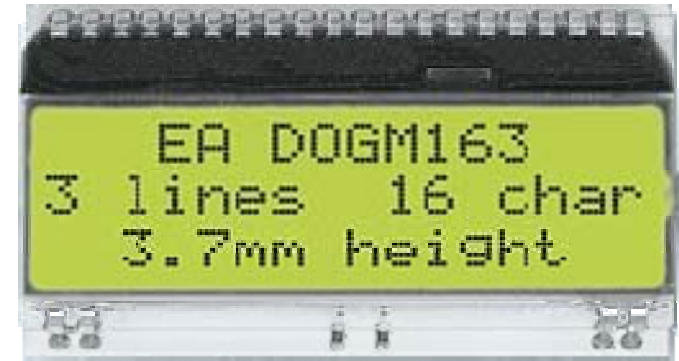
□ Introduction

1. Digital I/O
2. UART Communication
3. Interrupt Handling
4. Timers and PWM
5. Motor Speed Control

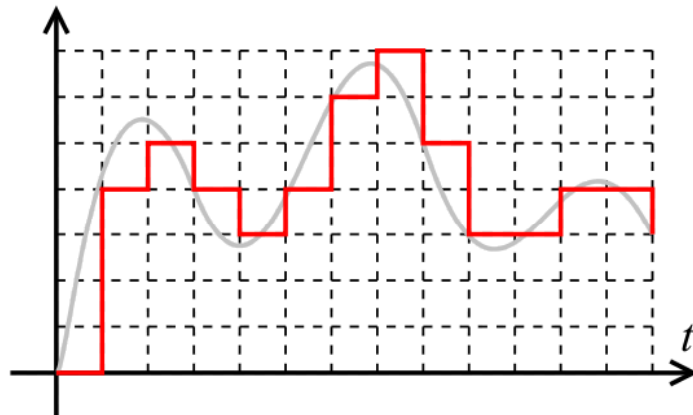


Content (2)

- 6. DCF77 Time Signal
- 7. Digital Sensors
- 8. Liquid Crystal Displays
- 9. Communication Protocols
- 10. Analog Signal Acquisition
- 11. Microcontroller Periphery



| Slave Address | Function Code | Data | CRC |
|---------------|---------------|---------------------|---------------------------|
| 1 byte | 1 byte | 0 up to 252 byte(s) | 2 bytes CRC Low CRC Hi |



Lab Course Dates

- 20.10.2011 ✓ Ex.01
- 27.10.2011 ✓ Ex.02
- 03.11.2011 ✓ Ex.03
- 10.11.2011 ✓ Ex.04
- 17.11.2011 ✓ Ex.05
- 24.11.2011 ✓ Ex.06
- 01.12.2011 ✓ Ex.07
- 08.12.2011 ✗ Dies Academicus
- 15.12.2011 ✓ Ex.08
- 22.12.2011 ? almost Christmas 😊
- 12.01.2012 ✓ Ex.09 (1)
- 19.01.2012 ✓ Ex.09 (2)
- 26.01.2012 ✓ Ex.10
- 02.02.2012 ✓ Ex.11 (1)
- 09.02.2012 ✓ Ex.11 (2)

Things to Prepare

- Think about grouping
- Introduce yourself to the basics of microcontroller programming in C, for example at (German only):
<http://www.mikrocontroller.net/articles/AVR-Tutorial>
- Invite your friends to join the lab course
(12 participants max however)

Kontakt



Michael Geisinger

fortiss GmbH – An-Institut der Technischen Universität München
Guerickestr. 25 | 80805 München | Germany
Tel. +49 89 289 – 18111 | Fax +49 89 289 – 18107
geisinger@fortiss.org | www.fortiss.org