



Infotronic

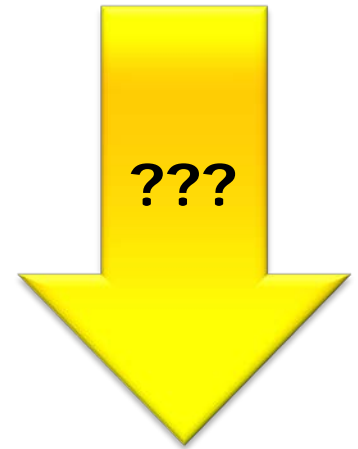
"Welcome! Glad you joined us! Let's build something for fun!"

Prof. Erich Styger
erich.styger@hslu.ch
+41 41 349 33 01

**Scriptum:
Requirements**

Learning Goals

- Your Goal?: Earning 6 ECTS credits?
- Course overview and philosophy
- Exam admission (Attestation/Testat)
- Exam rules
- Lab Hardware/Kits
- Tips and Tricks



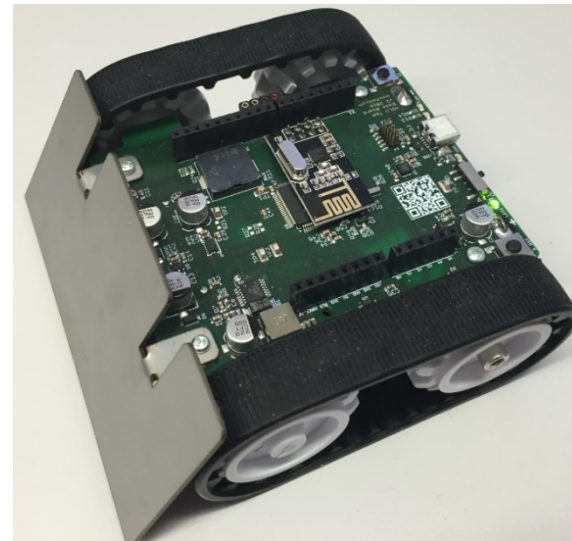
Course Outcome

- Successfully demonstrating the ability to build an **embedded real-time cross-platform application**
- Usage of **hardware/software**, multiple sensors and actuators to control multiple real-time embedded systems
- Software creation with **tools and middleware**, in a **multi-user collaborative environment**

Stick to
copy....

Application Goals

- DC Motor closed loop control + Wireless Controller
- Remote Controller for Robot
- Robot is able to perform autonomous tasks
 - Line Following, Maze Solving, ...
 - Realtime



Exam Admission (Attestation)

- 3 Parts:

1. Recap

- Summary of a topic from previous week

2. Tips

- Tips and Tricks for the next students

3. Functionality

- Defined Robot + Remote task

1. Recap

- Goal: **learning from each other, MEP preparation**
- ~10" short presentation/session for class
 - Group of two
 - Topic/Material from one week ago (Mon→Mon, Tue→Tue)
 - What have you learned a week ago?
 - What is the "Essence"?
- Material
 - Put material 24h before recap on shared Git Repository
 - Material includes 5 quiz questions with solutions
- Acceptance criteria's
 - Recap presented during semester (see time slots)
 - Submitted complete material in advance
 - Usefulness: not a simple repetition, has to present the **essence** of the topic

Bonus: Good recap questions will be in MEP 😊

Recap Schedule

- Team of two
- Register for date (**when** the present Recap)
- Material to cover from one week BEFORE
- Present the core/essence of the material
- Put your material on Git 24h in advance!

Recap Schedule: Register for a date (2 of a group) when to deliver the recap. The recap subject is the lecture and lab material from a week before that date.

		Mo 20.02.20	Tu 21.02.201	Mo 27.02.20	Tu 28.02.201	Mo 06.03.20	Tu 07.03.201	Mo 13.03.20	Tu 14.03.201	Mo 20.03.20	Tu 21.03.201	Mo 27.03.20	Tu 28.03.201	Mo 03.04.20	Tu 04.04.201	Mo 10.04.20	Tu 11.04.201	Mo 17.04.20	Tu 18.04.201	Mo 24.04.20	Tu 25.04.201	Mo 01.05.20	Tu 02.05.201	Mo 08.05.20	Tu 09.05.201	Mo 15.05.20	Tu 16.05.201	Mo 22.05.20	Tu 23.05.201
Brunner	Caroline																												
Brunner	Livio																												
Dankelmann	Frederik																												

Recap
Schedule

2. Tips

- Goal: **pass 'lessons learned' to the next students**
- Submitted individually
- Tips and Tricks (in writing) on shared Git Repository
 - What did you learn?
 - What mistakes to avoid?
 - How to be successful?
- Acceptance criteria's
 - Has to be useful
 - Not simply repeating a tip from someone else
 - Submitted in time on Git (**Deadline: 22.05.17**)

Add here your tips or whatever you want to say to the next students.

Tips & Tricks for the next INTRO students

- what to do
- what not to do
- How to learn effectively
- Anything else which comes to your mind
- Add your name (will be removed before publishing next semester)

- Erich styger: Prepare yourself in advance: read the slides, read the scriptum, don't wait until the exam period.

3. Functionality

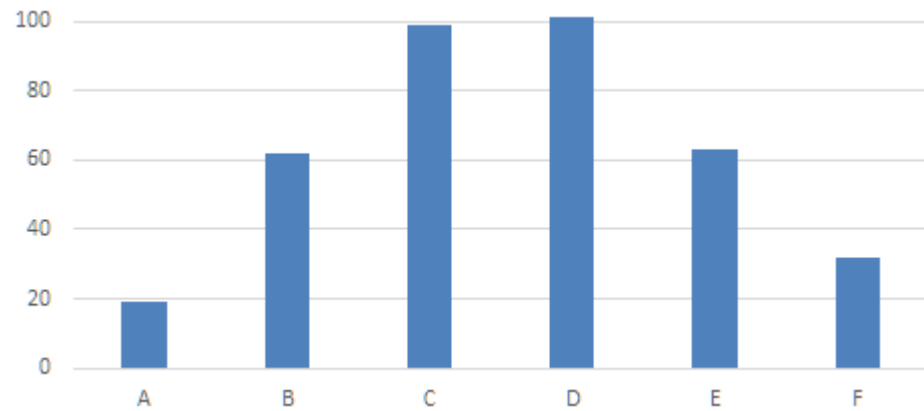
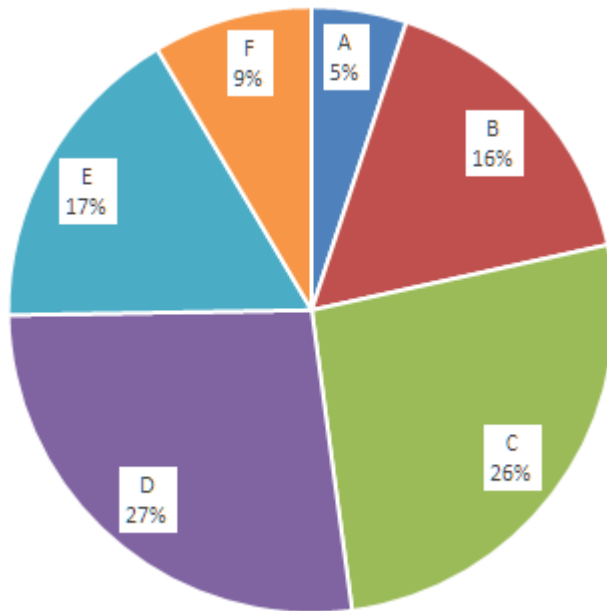
- Goal: show that your robot is able to solve the maze
- Done by group
- Demonstrate requested functionality, e.g.
 - Motor PID
 - Remote Controller
 - Line Following
 - ...
- Acceptance Criteria's
 - Functional demonstration
 - Deadline: **22.05.2017**

MEP / Examination

- 4 hours total, in writing (1h+3h), English
 - 1h, Part A: no supporting material allowed
 - Pocket calculator allowed
 - 3h, Part B+C: summary, up to 16 A4 pages
 - Summary does not have to be handwritten
 - Pocket calculator allowed
- Multiple Choice questions
- Evaluation questions (+/-)
- Programming Quizzes
- Discussion (Pros/Cons) questions
- Bonus Points
- Lab Points (30 pt) (Part C)

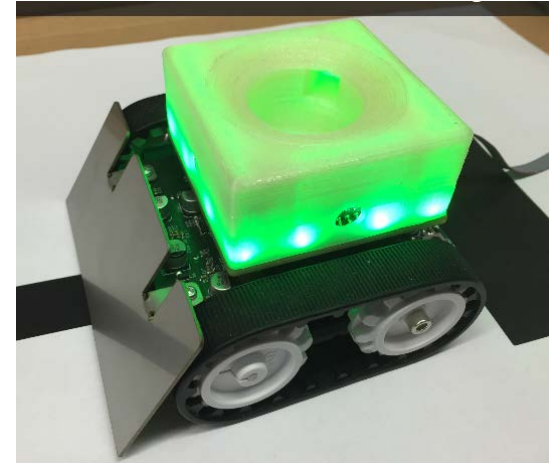
- MEP example(s) provided during the course
- See script/lab assignments for questions, ...

MEP Success Rate (2008-2016)



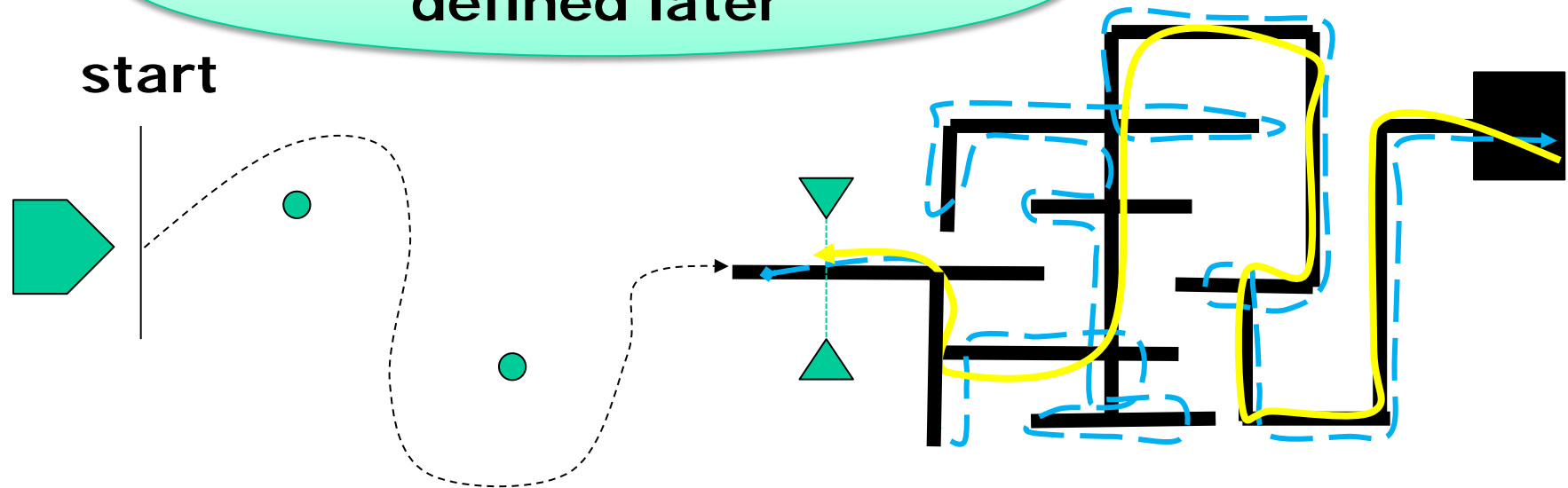
Lab Challenge Points (Max 30 Pt)

- Lab points earned by group (of 2)
 - 1 Remote, 2 Robots
- Competition
 - Robot remote controller
 - Line Following? Maze Solving?
 - ...



**Challenge and Rules
defined later**

start



Tips and Rules

- Maintain your project
- Make backups / use VCS
- Only do small steps
- Plan for self study (in advance) and get prepared
- Maintain a lab journal (discussions, white boarding)
- **Not** everything is provided! (script, slides,...)
- Understand the lab code
- **Read the script, do the labs**
- **Tips from previous Students!**
 - ➔ Exam admission element
- Classroom / Lab Rules
 - Do not disturb
 - Taking out hardware/boards
 - Breaks

Tips from
previous
students

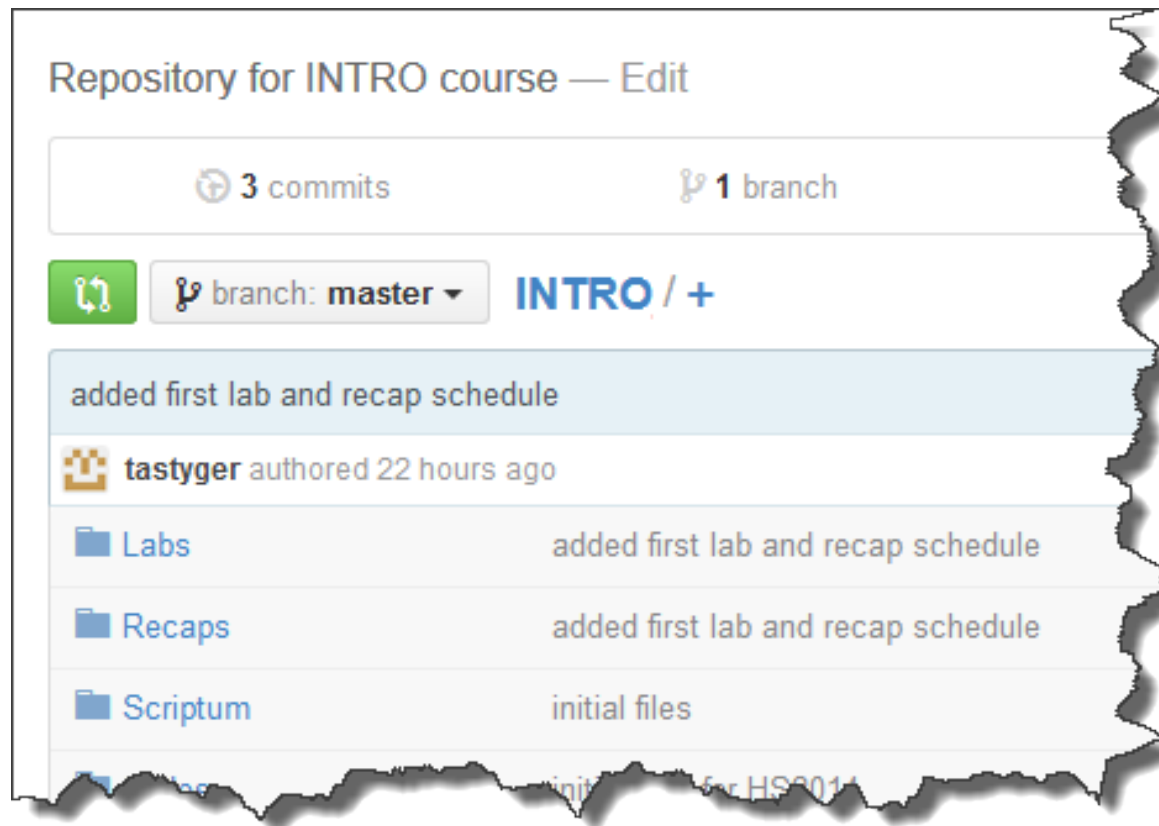


Hardware and Lab Kits

Prof. Erich Styger
erich.styger@hslu.ch
+41 41 349 33 01

Lecture Material on GitHub

- All lecture material shared on GitHub
 - Private Repository, need to be added as user for access
 - You need a (free) GitHub account



Git Provider for your Repository

- GitHub (recommended)
 - github.com



- Bitbucket
 - bitbucket.org

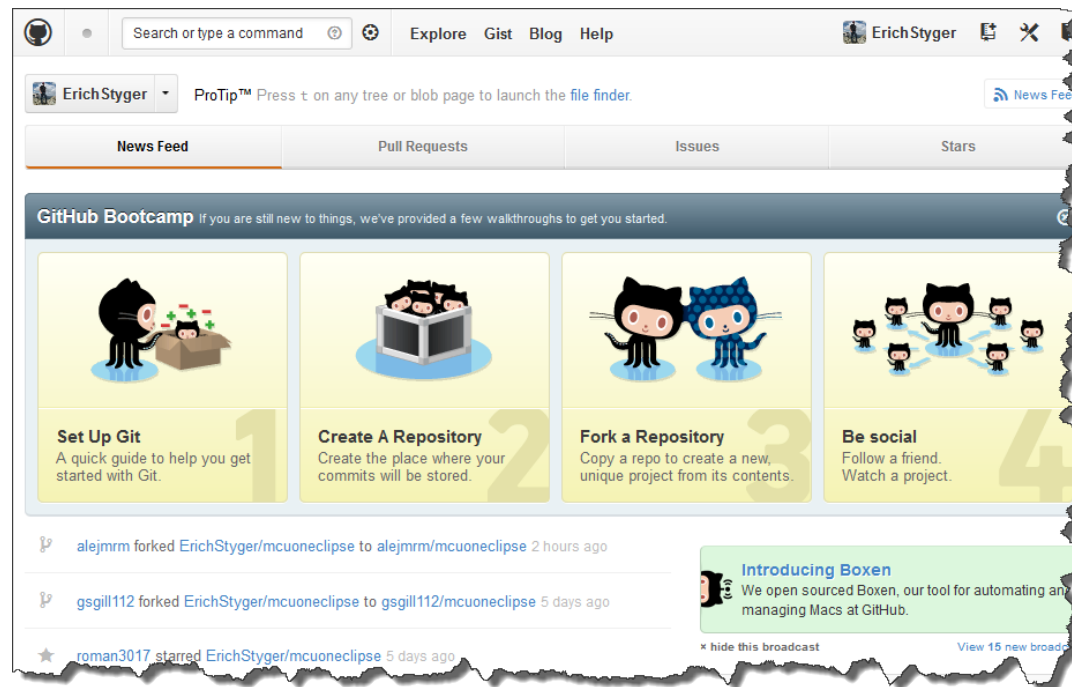


- HSLU Enterprise Lab
 - <https://www.enterpriselab.ch/>



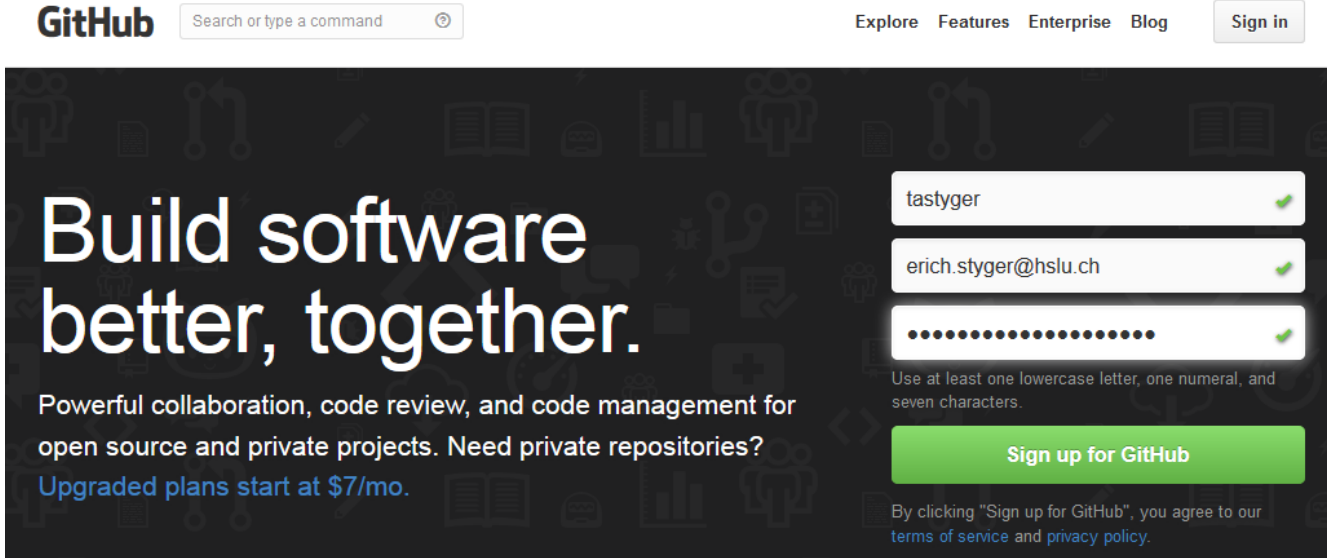
GitHub (<https://github.com/>)

- Open Source Collaboration Platform
- Free for ,public' projects
- Wiki, Bug Tracking, Statistics, ...
- Example: <https://github.com/ErichStyger/mcuoneclipse>



Creating GitHub Account

- Create new GitHub Account if you do not have one
- <https://github.com/>
- Provide user name, email address and password
- Use 'Free' plan and 'Finish sign up'
- Send your GitHub User Name to erich.styger@hslu.ch



The screenshot shows the GitHub homepage with a dark background and various icons. The main heading is "Build software better, together." Below it, a subheading reads: "Powerful collaboration, code review, and code management for open source and private projects. Need private repositories? Upgraded plans start at \$7/mo." On the right side, there is a sign-up form with three input fields: a username field containing "tastyger", an email field containing "erich.styger@hslu.ch", and a password field with masked characters. Each field has a green checkmark on the right. Below the password field, a note states: "Use at least one lowercase letter, one numeral, and seven characters." A green button labeled "Sign up for GitHub" is positioned below the form. At the bottom right, a small text line says: "By clicking 'Sign up for GitHub', you agree to our terms of service and privacy policy."

GitHub Search or type a command

Explore Features Enterprise Blog Sign in

Build software better, together.

Powerful collaboration, code review, and code management for open source and private projects. Need private repositories? Upgraded plans start at \$7/mo.

tastyger ✓

erich.styger@hslu.ch ✓

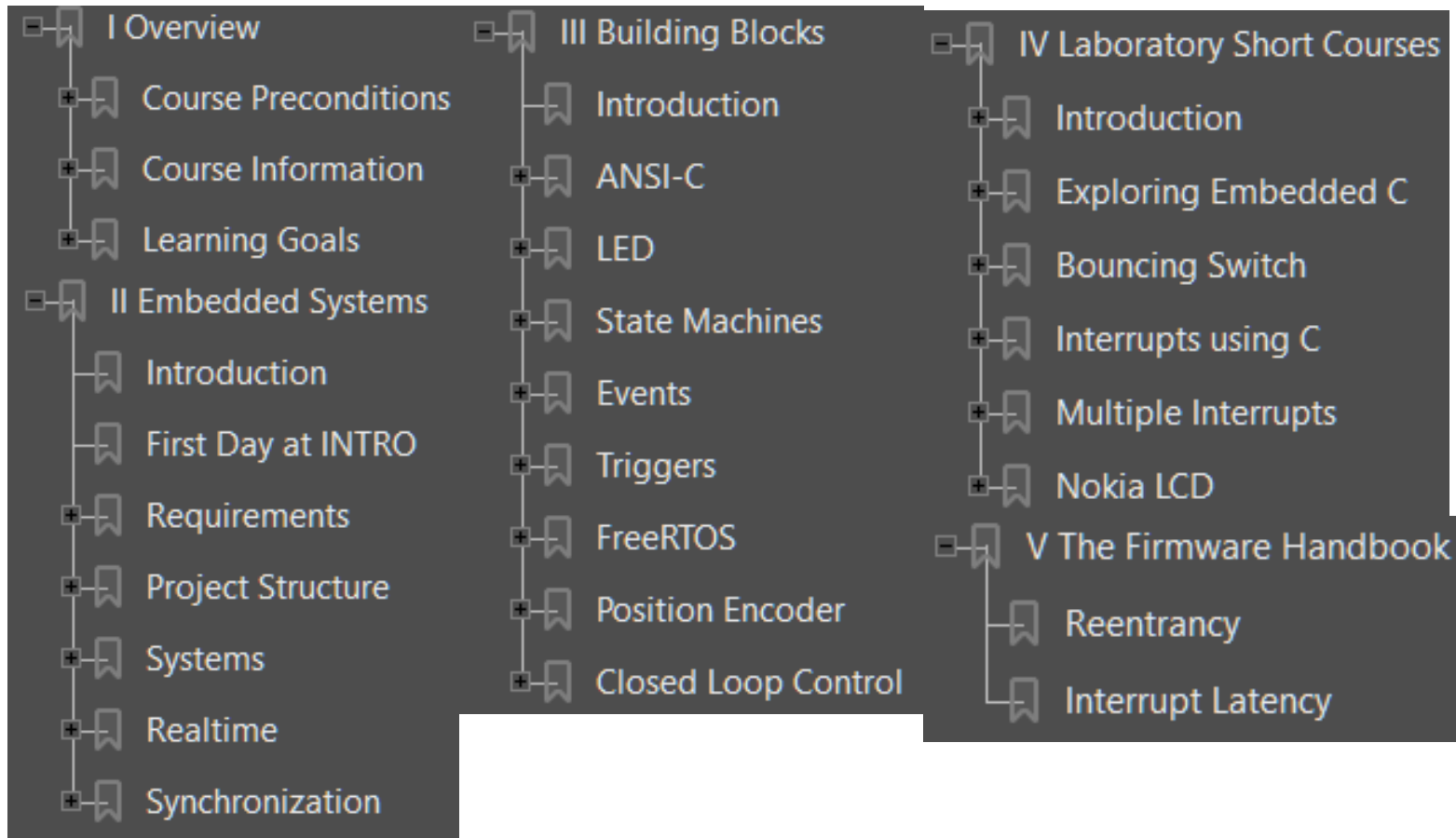
..... ✓

Use at least one lowercase letter, one numeral, and seven characters.

Sign up for GitHub

By clicking "Sign up for GitHub", you agree to our terms of service and privacy policy.

Script



Schedule (subject of change)

Week	Date	Topic (SUBJECT of CHANGE!)
1	Mo 20.02.2017	Intro Build & Debug
	Tu 21.02.2017	VCS Git and Clients
2	Mo 27.02.2017	CARNEVAL
	Tu 28.02.2017	Systems and Realtime Processor Expert
		Project Structure LED
3	Mo 06.03.2017	Preprocessor Includes Synchronization
	Tu 07.03.2017	Interrupts ARM Cortex Robo Assembly
4	Mo 13.03.2017	***SELF STUDY*** (Robots)
	Tu 14.03.2017	***SELF STUDY*** (Robots)
5	Mo 20.03.2017	Events Statemachine Clock & Timer
	Tu 21.03.2017	Keys Console
6	Mo 27.03.2017	Trigger, Buzzer Debounce
	Tu 28.03.2017	RTOS Kernel Awareness
7	Mo 03.04.2017	FreeRTOS, Architecture Kernel Control

Week	Date	Topic
	Tu 04.04.2017	Tasks Kernel Awareness, SystemView
8	Mo 10.04.2017	Hooks Heap
	Tu 11.04.2017	Shell Queues
9	Mo 17.04.2017	***EASTER***
	Tu 18.04.2017	***EASTER***
10	Mo 24.04.2017	Sem & Mutex
	Tu 25.04.2017	Reflectance, NVMC
11	Mo 01.05.2017	Reentrancy, CS, Mutex, Sem Motor Signals
	Tu 02.05.2017	Position Encoder Quadrature Encoder
12	Mo 08.05.2017	Tacho Closed Loop Control
	Tu 09.05.2017	Line Following, Turning
12	Mo 15.05.2017	Radio, Remote Control
	Tu 16.05.2017	LCD, Menus
13	Mo 22.05.2017	Working on Bots >>> LAST DAY FOR ADMISSION
	Tu 23.05.2017	Working on Bots
14	Mo 29.05.2017	Q&A Working on Bots
	Tu 30.05.2017	***Competition*** Return Lab material

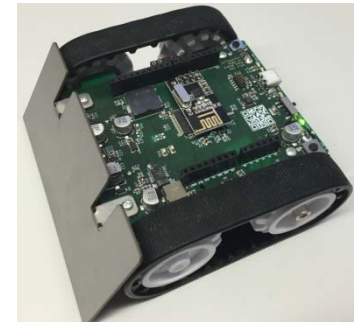


Lab Material

Prof. Erich Styger
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+41 41 349 33 01

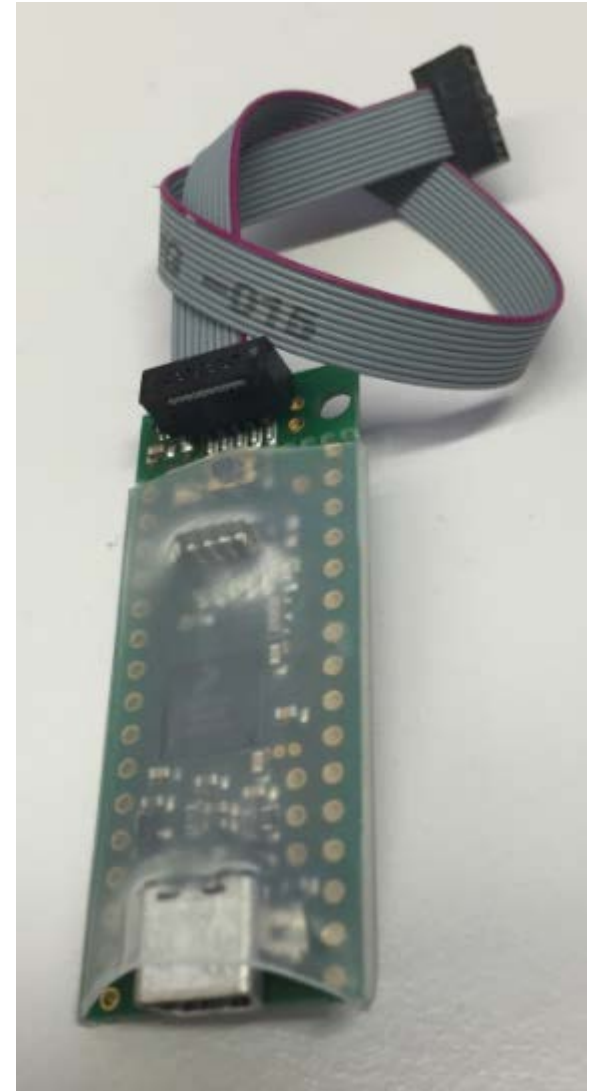
Lab Material Overview

- Each Group:
 - 1 Robo Kit (Remote + V1/V2 robot)
 - includes SWD debug device (tinyK20)
 - 2 Power Kit (Cables, Charger, Batteries)
 - 1 DIY Kit (2nd Power Kit provided later)
 - Return material at end of course
- Optional: Buy DIY kit (V2)/keep DIY
- Support
 - Instructor assisted (orders, ...)
 - 'Trial' hardware available



tinyK20

- Programmer/Debug Probe
- General purpose Board
- Breadboard friendly
- USB & SWD cable
- Used to program robot and remote with LCD
- Optional: SD card, 32kHz clock
 - <http://mcuoneclipse.com/2015/11/22/data-logger-with-tinyk20-board/>



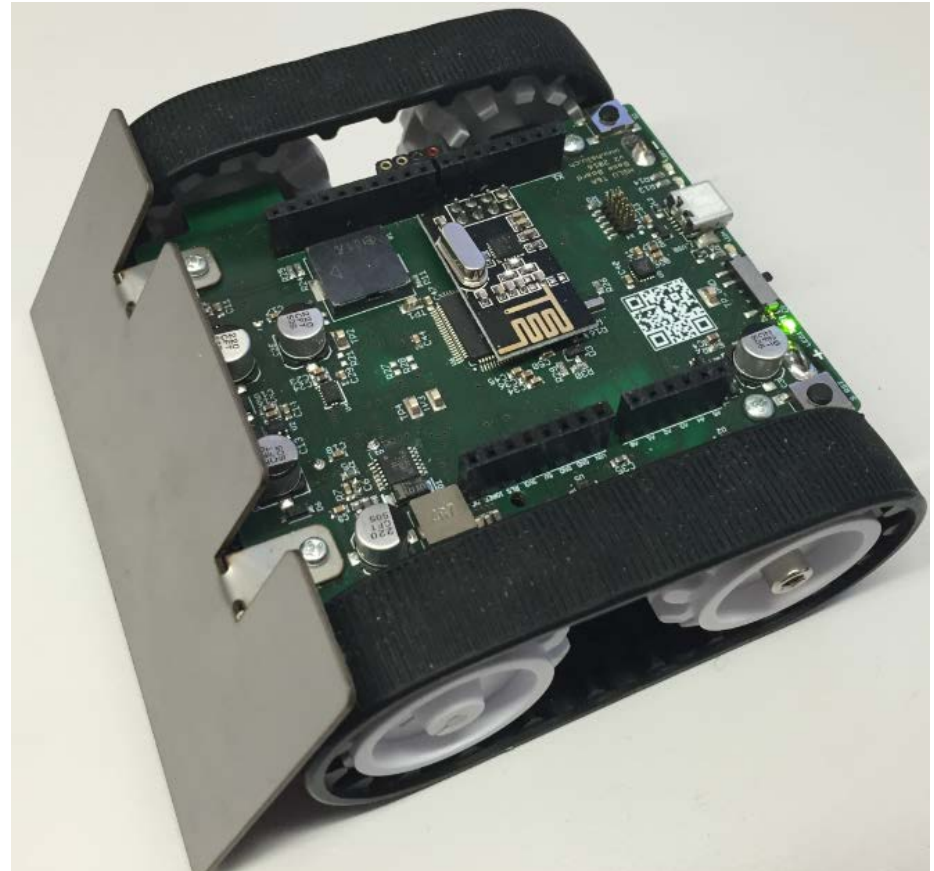
K22 Zumo Robot (V1 2014): 10 Lab Robots

- ARM Cortex-M4F
- 120 MHz
- 512 Kbyte of FLASH
- 64 Kbyte of RAM
- USB
- I²C Accelerometer + Magnetometer
- 2 LEDs, Buzzer
- Reset + user button
- 1:75 DC Motors
- **Optical** Quadrature Encoder
- IR Line Sensor
- Arduino Headers



K22 Zumo Robot (V2 2016)

- ARM Cortex-M4F
- 120 MHz
- 512 Kbyte of FLASH
- 64 Kbyte of RAM
- USB
- I²C Accelerometer + Magnetometer
- 2 LEDs, Buzzer
- Reset + user button
- 1:75 DC Motors
- **Magnetic** Quadrature Encoder
- IR Line Sensor
- Arduino Headers



INTRO Remote

- tinyK20: ARM Cortex-M4, 50 MHz, 128 Kbyte FLASH, 16 Kbyte RAM
- nRF24L01+ 2.4 GHz Transceiver
- Nokia 64x48 BW LCD
- Joystick Buttons (4way + center)
- 2 side buttons
- 260 mA LiPo Battery
- I_{Charging} : 195mA



Lab Material: Power Kit

- 3 Mini USB Cables
- 1 Battery Charger
 - Do ***not*** change power adapter!
- 4 NiMh Batteries

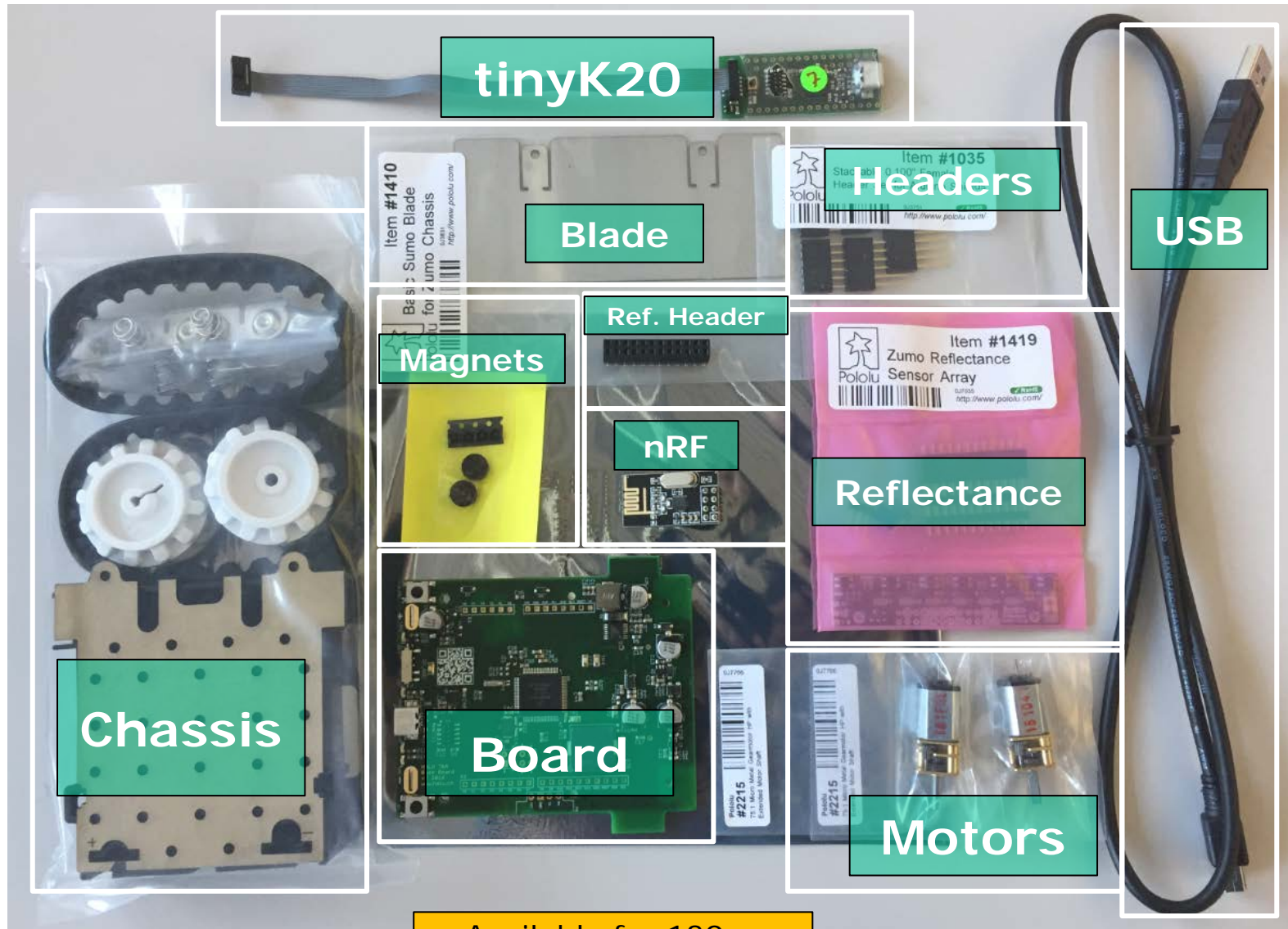


Lab Material: Robo Kit

- 1 Pre-Built Robot
 - V1 with Shield and nRF
 - V1 with nRF on-board
 - V2 with nRF on-board
- 1 Remote controller
- 2 tinyK20 Debug Interface



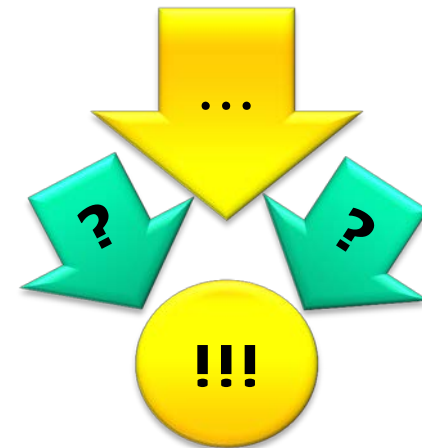
Robot Assembly Kit: One DIY/Group



Available for 130.--

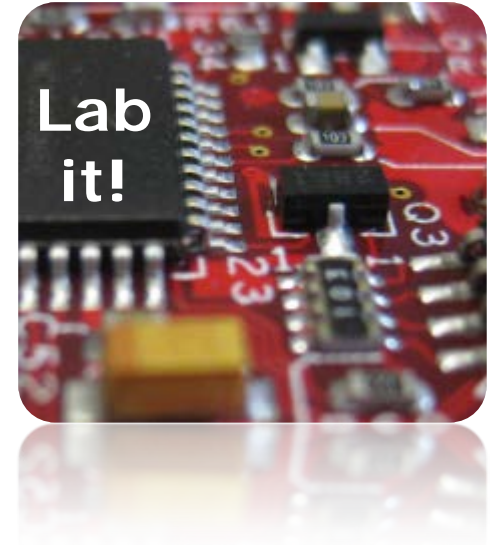
Summary

- Lab and lecture organization
- Exam and admission rules
- Overview hardware
- Hardware options



Lab 1: Start

- Build Teams
- Fill out Team form
- Get Kits for each team
 - 1 Power Kit Box
 - 1 Robo Kit Box
 - 1 DIY Kit
- Mem Stick
 - KDS Windows
 - KDS Linux (Ubuntu, RHE, Centos), RPM/DEB
 - Mac OS X
 - Software/Datasheets

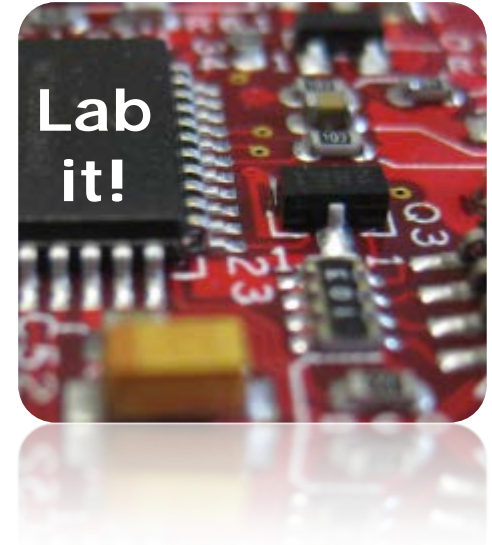


Lab #1

INTRO TEAM

Lab 2: Recap Instructions

- Register for Recap Slot
 - Paper form (for now)
 - Updated on GitHub
- Read Tips from previous students

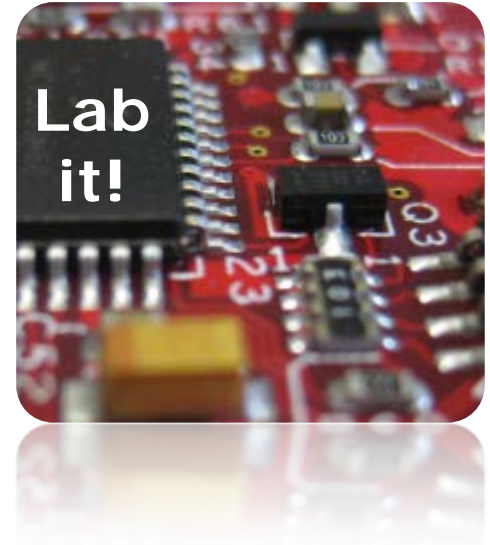


Lab #2

Tips

Lab 3: GitHub

- Create your GitHub Account
- Send GitHub User name to Erich Styger
(if not already done)
- Verify Login/Account
- Browse INTRO GitHub repository content



Lab #3