

Miniarvutid ja mikrokontrollerid



TALLINNA TEHNIKAÜLIKOOL
TALLINN UNIVERSITY OF TECHNOLOGY



HITSA
Hariduse Infotehnoloogia
Sihtasutus

KAVA



Mis on mis

Miniarvutid

- Miniarvutite rakendused

- Programmeerimine

- Sisend-väljund viigud

Mikrokontrollerid

- Arduino tooteperekond

- Robotika Kodulabor

- Robotiehitus

Näited

Mis on mis?



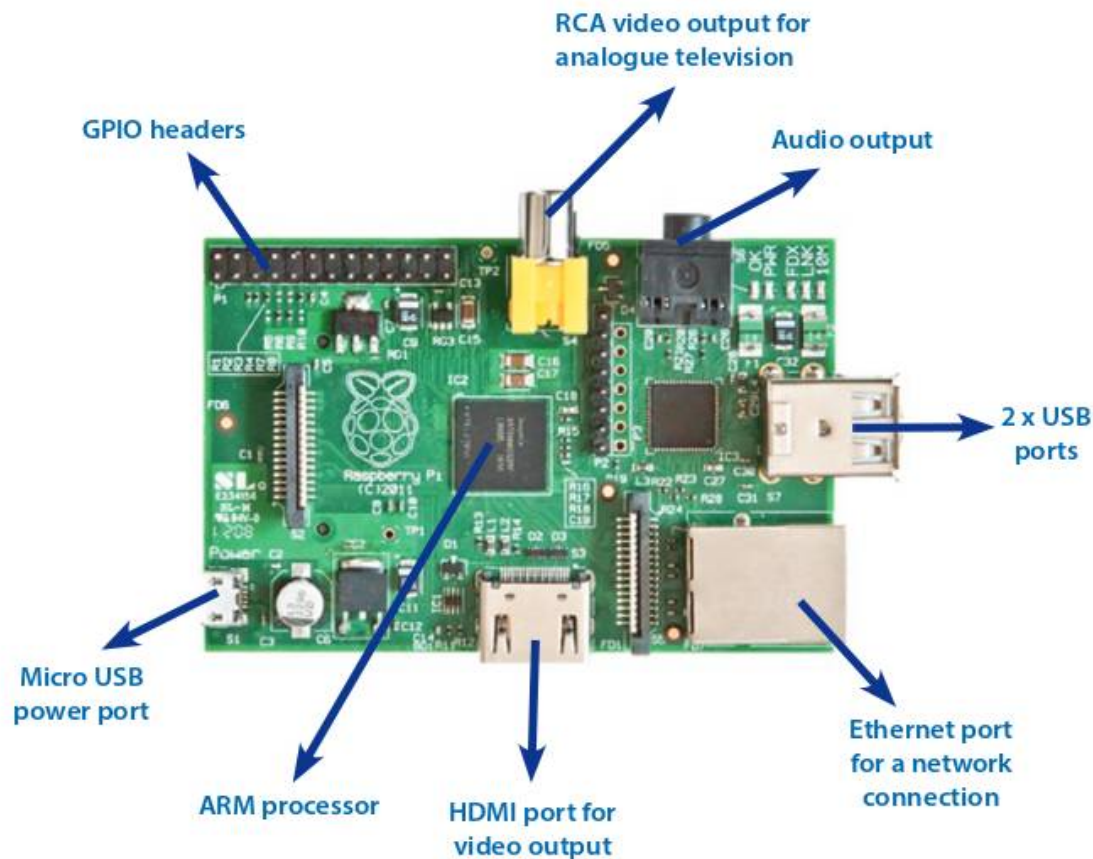
- ? Mikrokontroller
- ? Mikroprotsessor
- ? Arvuti
- ? Miniarvuti

Miniarvutid



Keskne protsessor on ARM11,
mis sisaldab integreeritud
CPU ja GPU funktsionaalsust.

Raspberry Pi liidised



Model A vs Model B

256 MB

Ethernet/Internet
2x USB
512 MB

laiendatud i/o
4x USB
3,5 mm audio-video
nurkades kinnitusavad

Model A



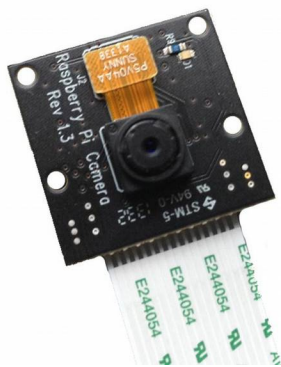
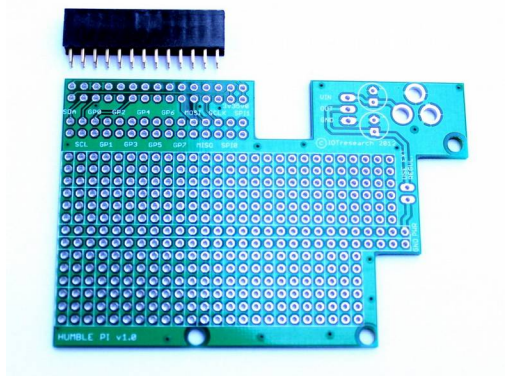
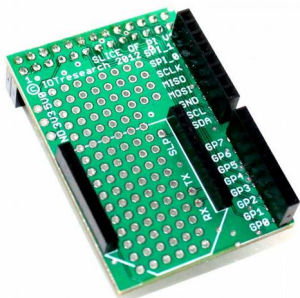
Model B



Lisakomponendid



Laiendusplaadid



Ergutusülesanne



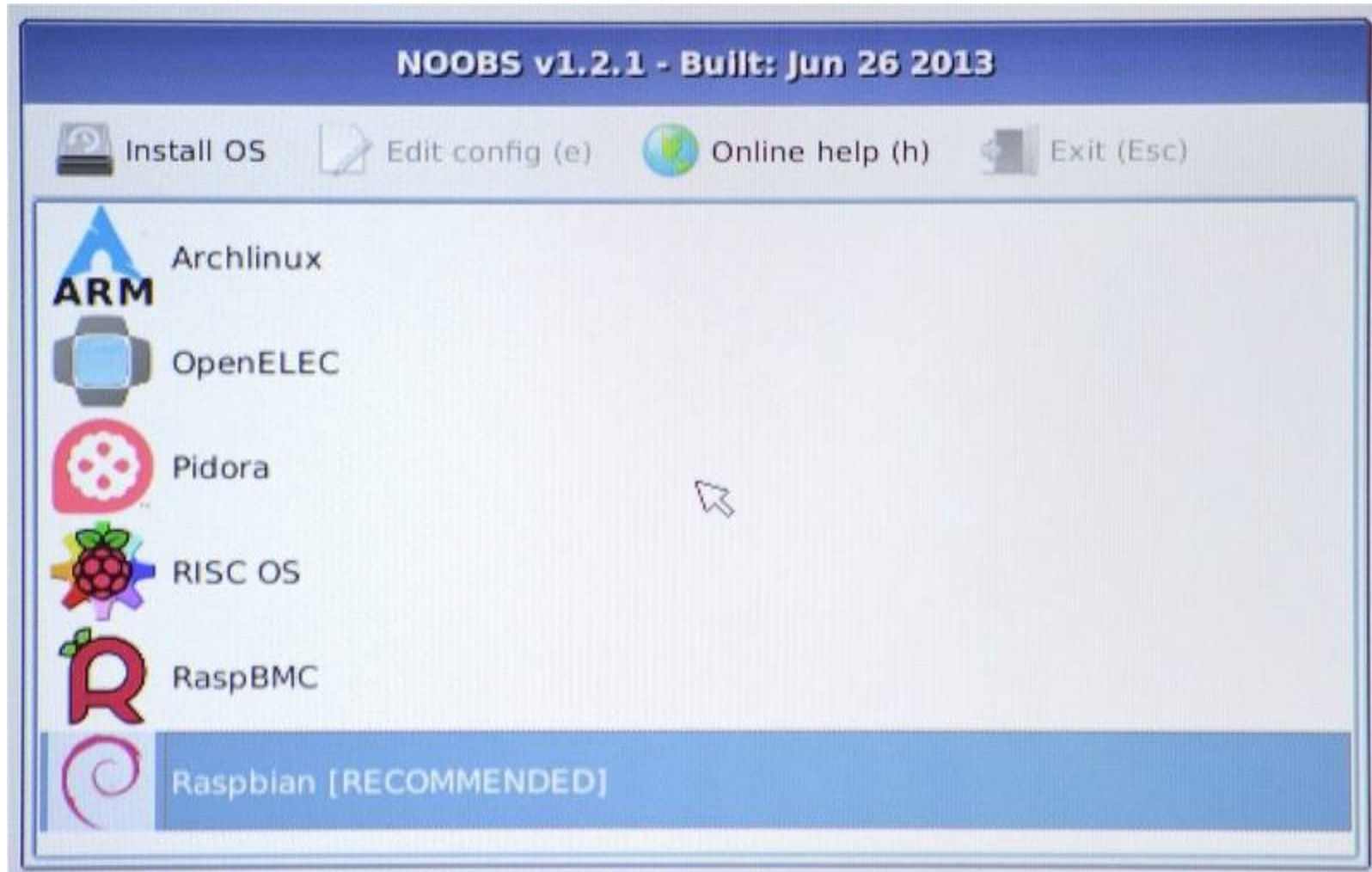
<http://home.roboticlab.eu/raspi>



Töökohaarvuti



Erinevad *lightweight* Linux op. süsteemid



Töökohaarvuti - rakendused



SCRATCH



(((Sonic π)))



The Wolfram Language and Mathematica



MINECRAFT

Meediaserver



XBMC

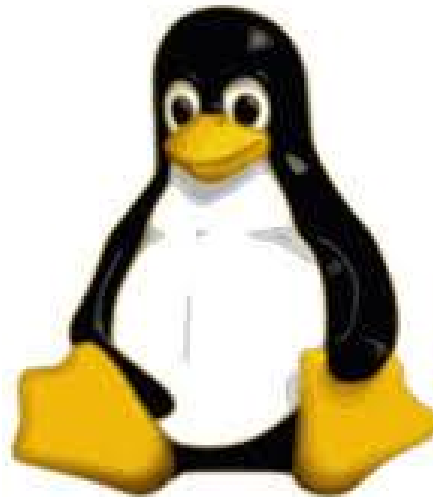


LAMP server

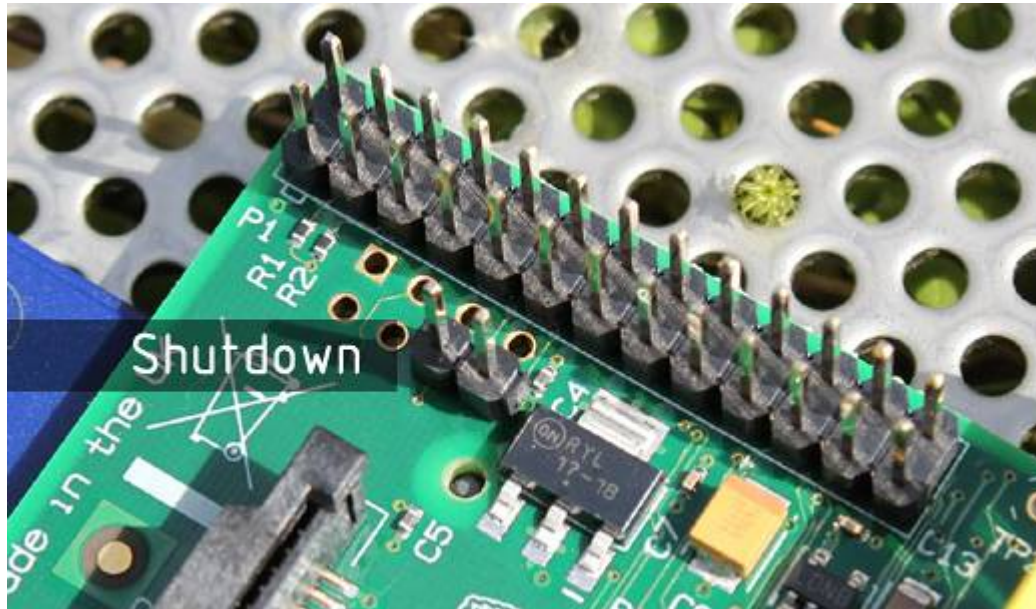


Linux
Apache
MySQL
PHP

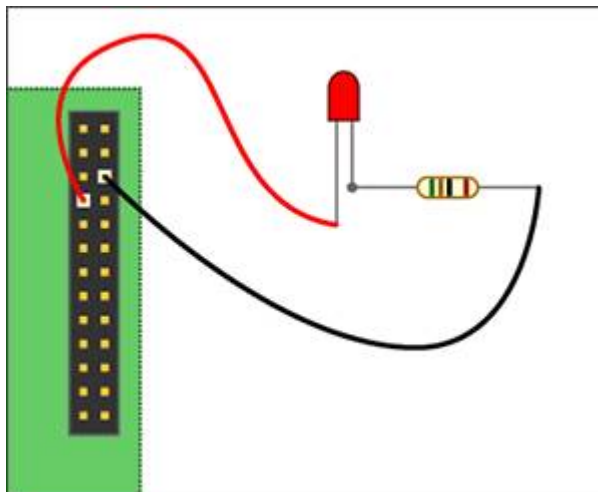
Video (mjpg-streamer)



Raspberry Pi I/O



3.3V	1	2	5V
I2C0 SDA	3	4	DNC
I2C0 SCL	5	6	GROUND
GPIO4	7	8	UART TXD
DNC	9	10	UART RXD
GPIO 17	11	12	GPIO 18
GPIO 21	13	14	DNC
GPIO 22	15	16	GPIO 23
DNC	17	18	GPIO 24
SP10 MOSI	19	20	DNC
SP10 MISO	21	22	GPIO 25
SP10 SCLK	23	24	SP10 CE0 N
DNC	25	26	SP10 CE1 N



```
import RPi.GPIO as GPIO
```

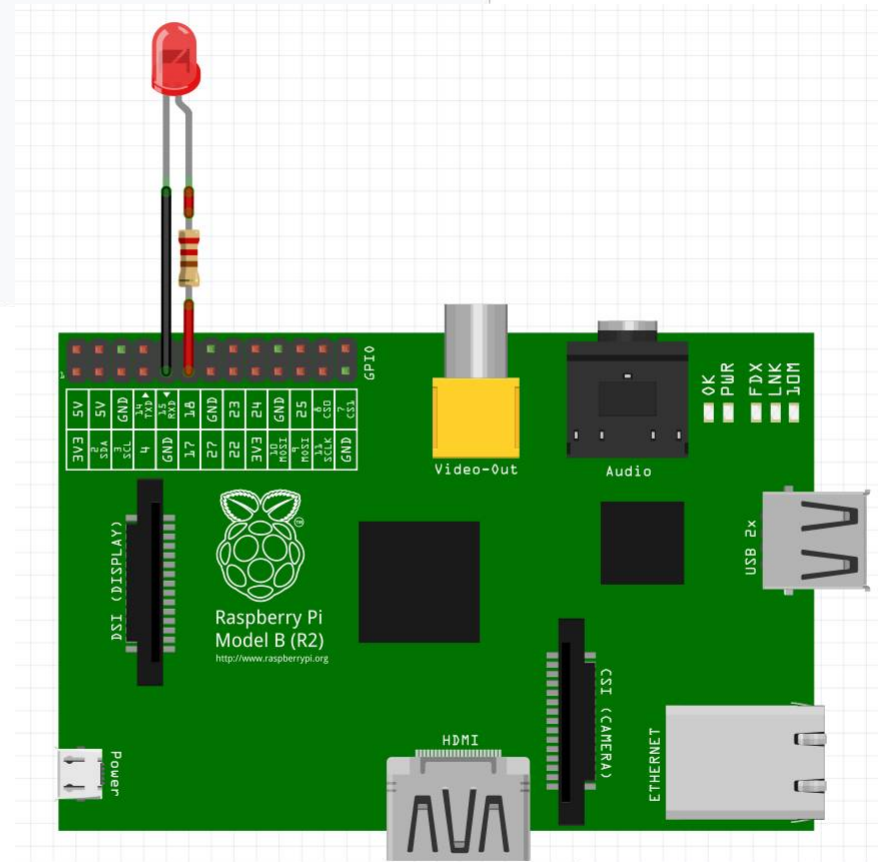
Python I/O LED

```
import RPi.GPIO as GPIO
import time

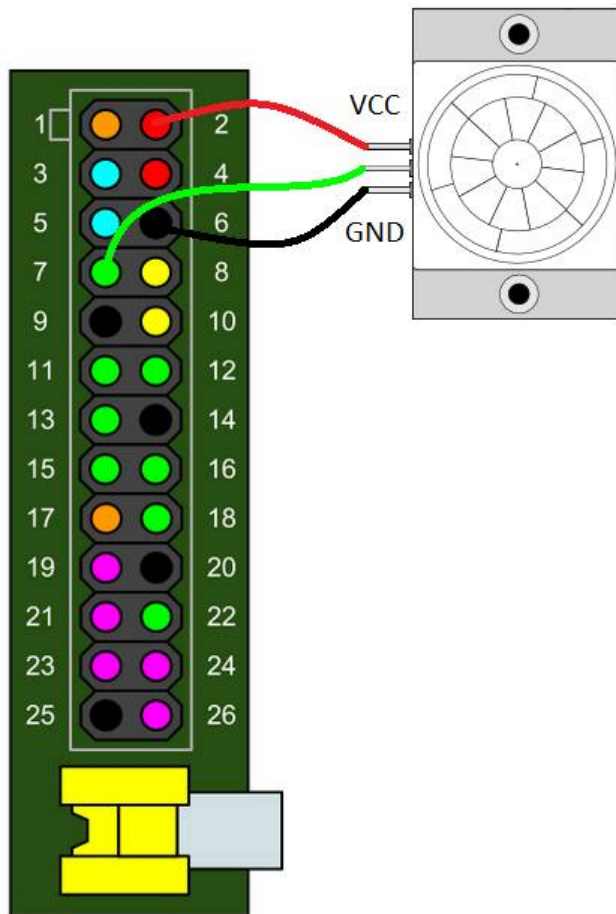
ledPin = 11

GPIO.setmode(GPIO.BOARD)
GPIO.setup(ledPin, GPIO.OUT)

while True:
    GPIO.output(ledPin, True)
```



Turvarakendus

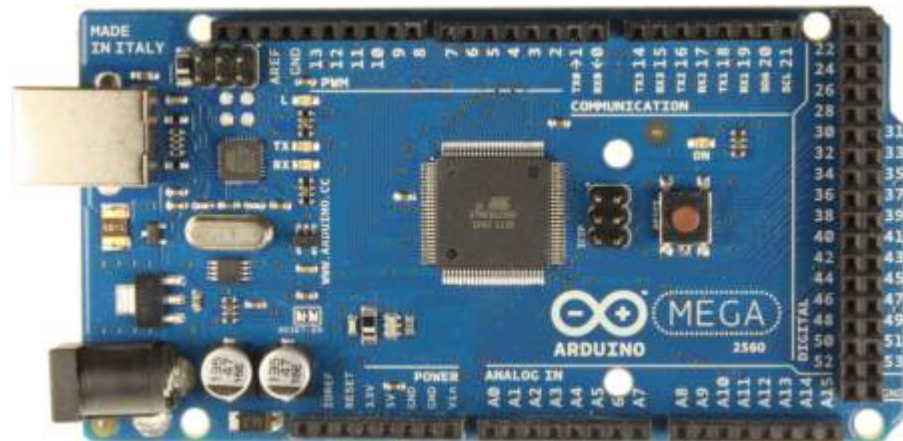


Passiivne infrapuna andur liikumise tuvastamiseks.

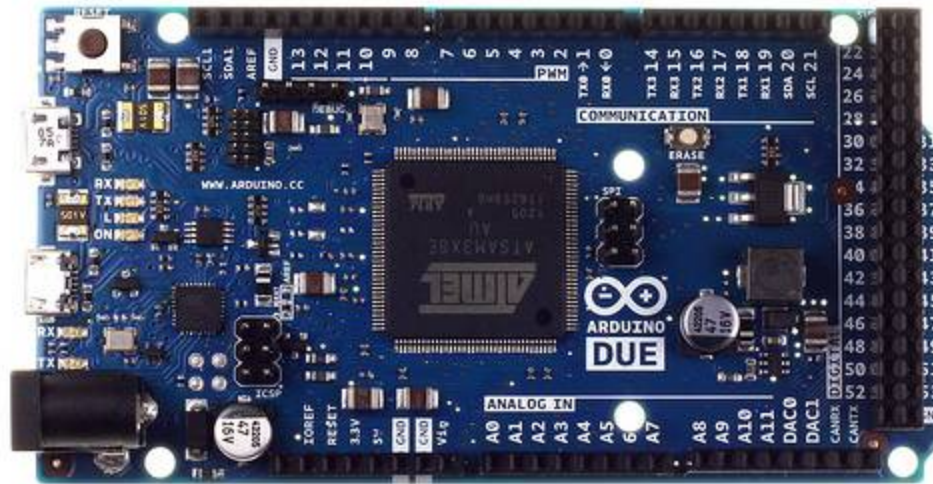
ARDUINO RIISTVARA

Pildid: Arduino.cc

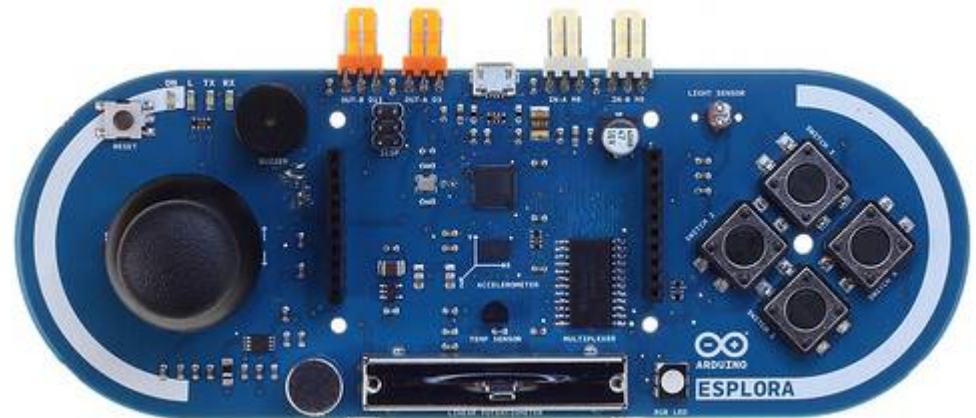
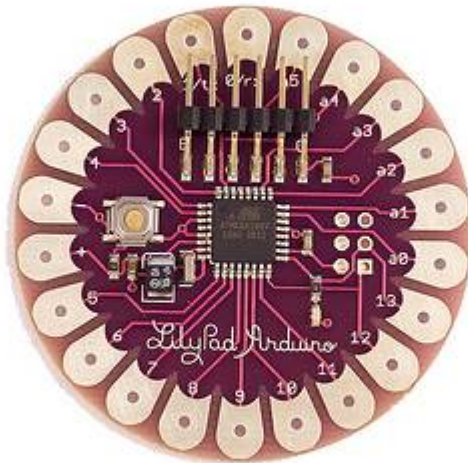
AVR põhised kontrollerplaadid



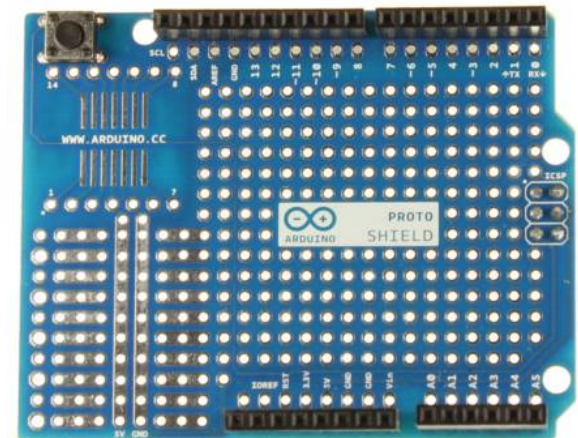
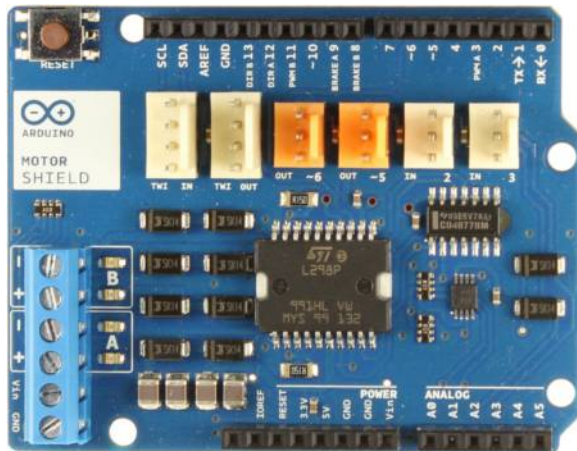
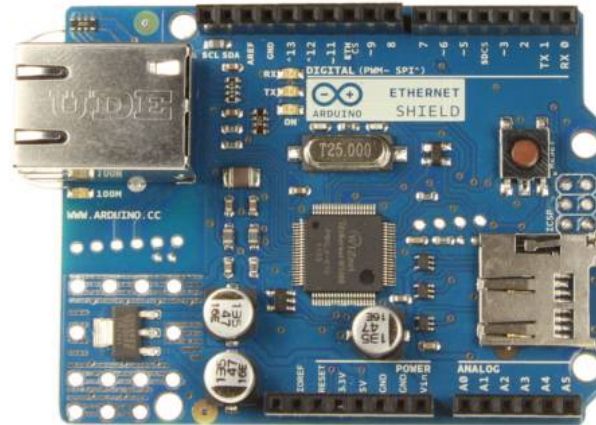
ARM põhised kontrollerplaadid



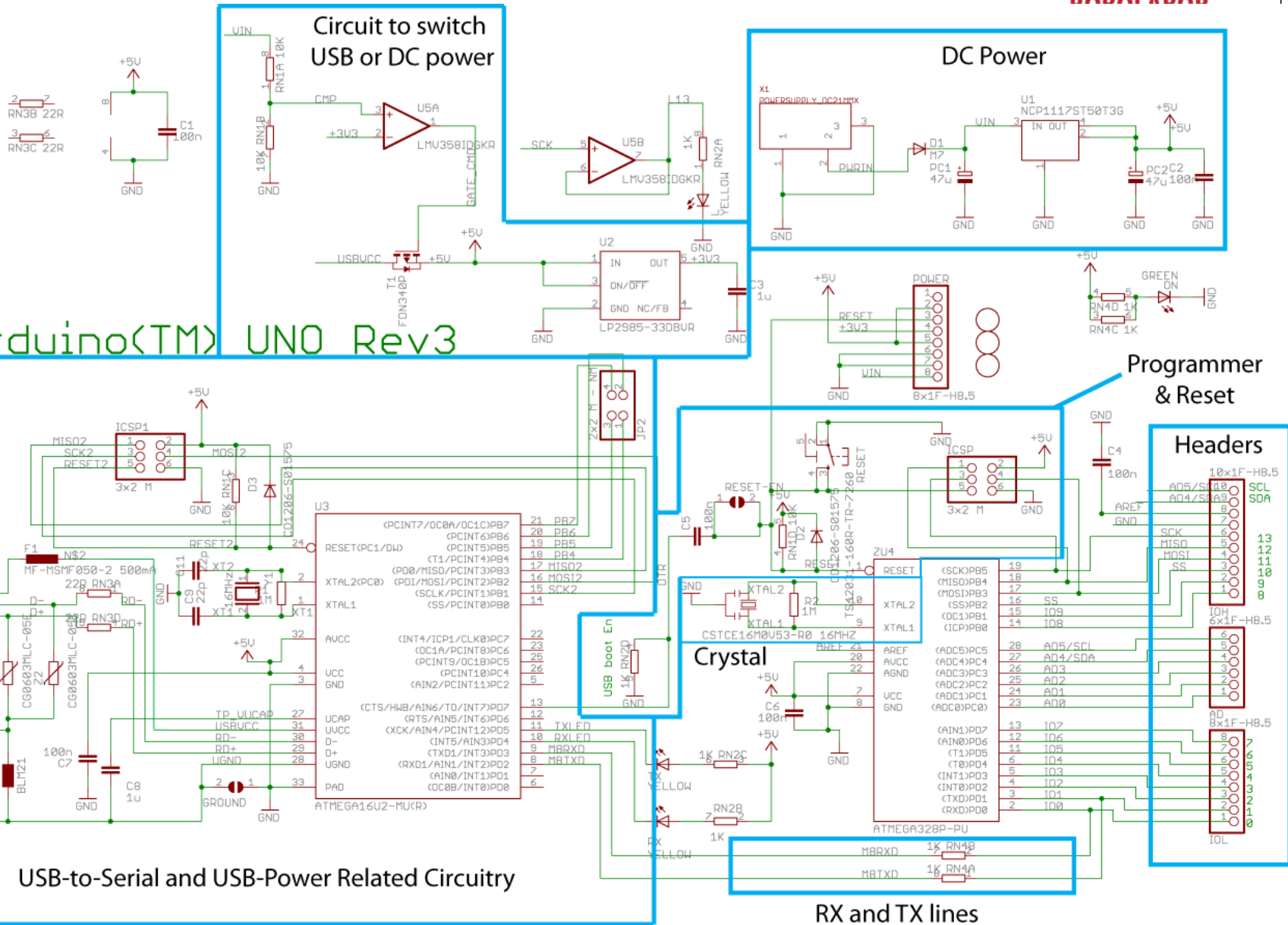
Eriotstarbelised kontrollerplaadid



Kontrollerplaadi laiendusplaadid



Arduino Uno



TARKVARA

Koodinäited ja alusmaterjal: Arduino Reference,
Sparkfun

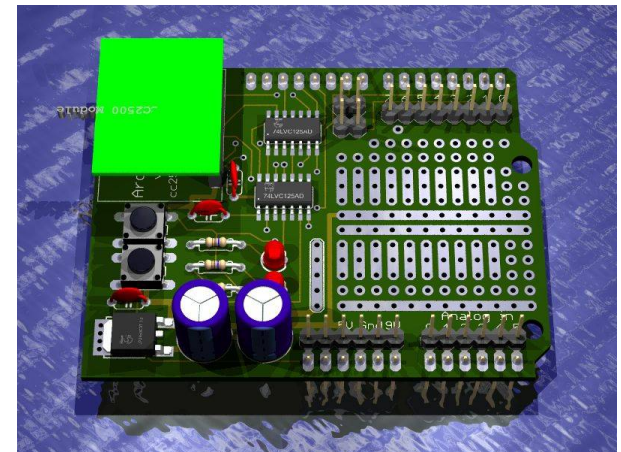
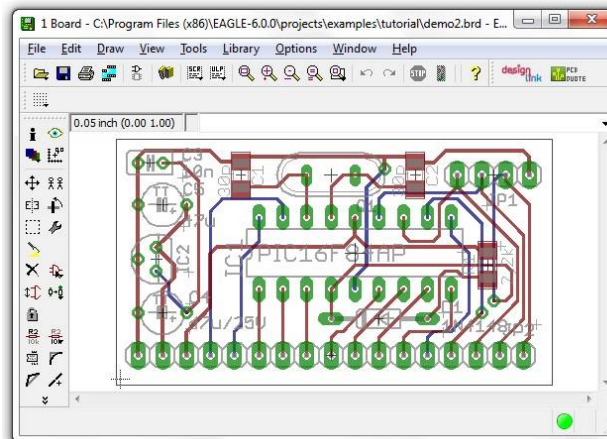
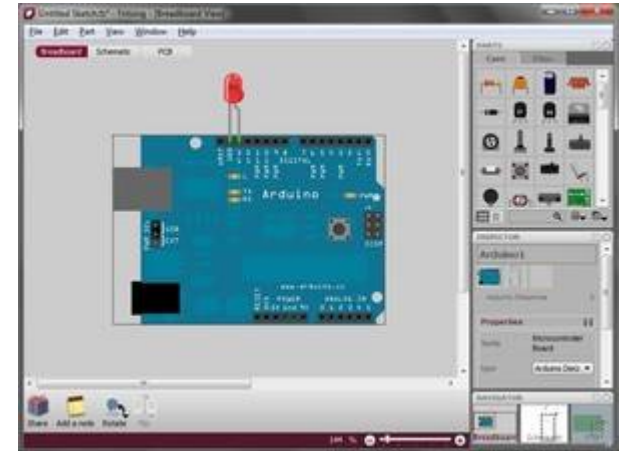
Tarkvara

Arduino tarkvara

- Arduino IDE
- Arduino plugin for Eclipse
- avr-gcc + avrdude

Elektroonika koostamise tarkvara

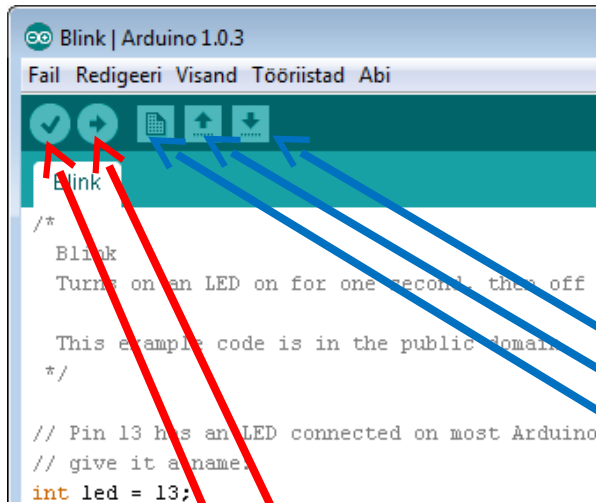
- Fritzing
- Eagle
- Eagle3D



Arduino IDE



Tööriistariba



Kompileerimine

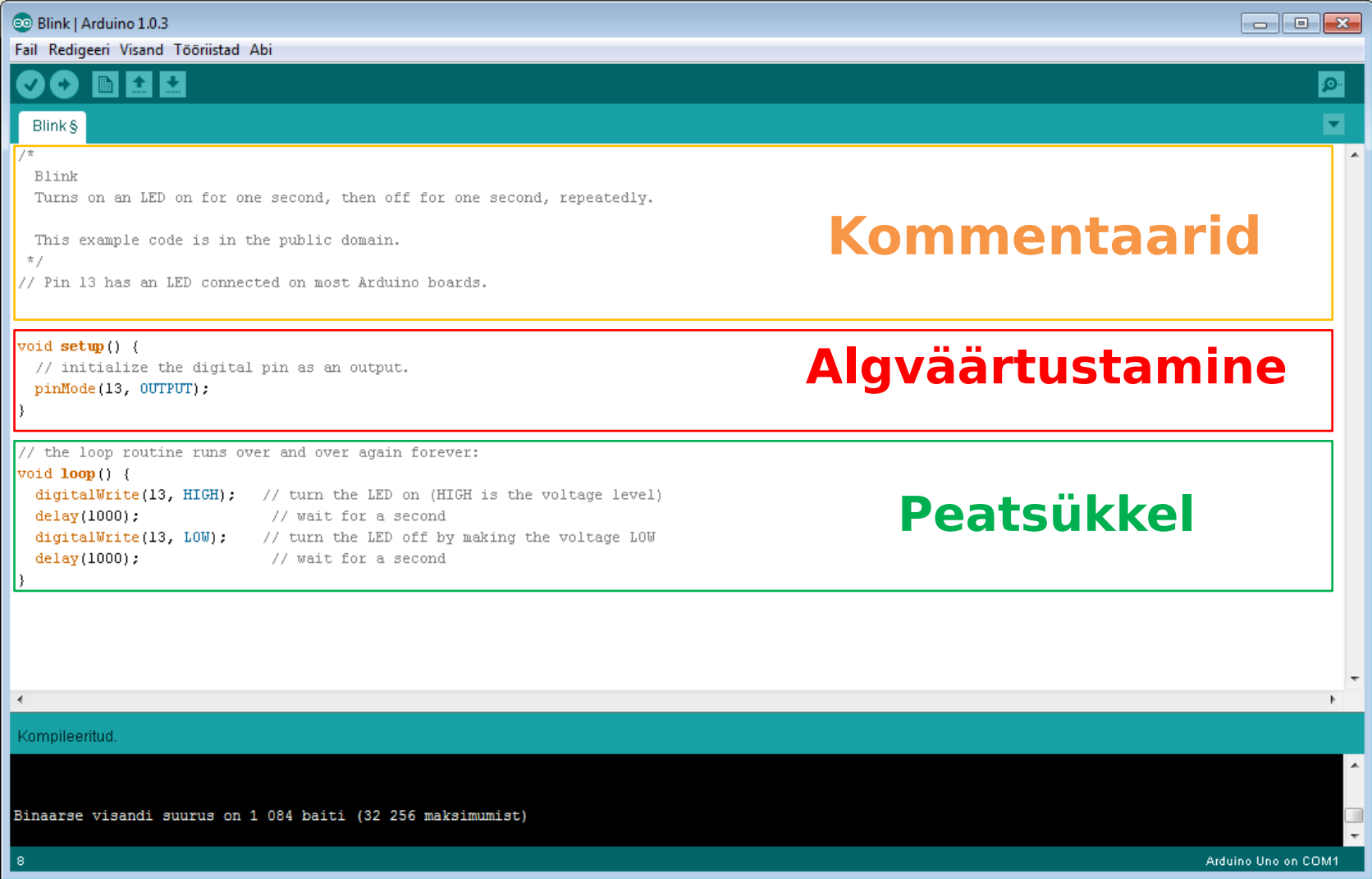
**Kontrollerisse
laadimine**

**Uus
visand**

**Ava
visand**

**Salvesta
visand**

Programmi struktuur

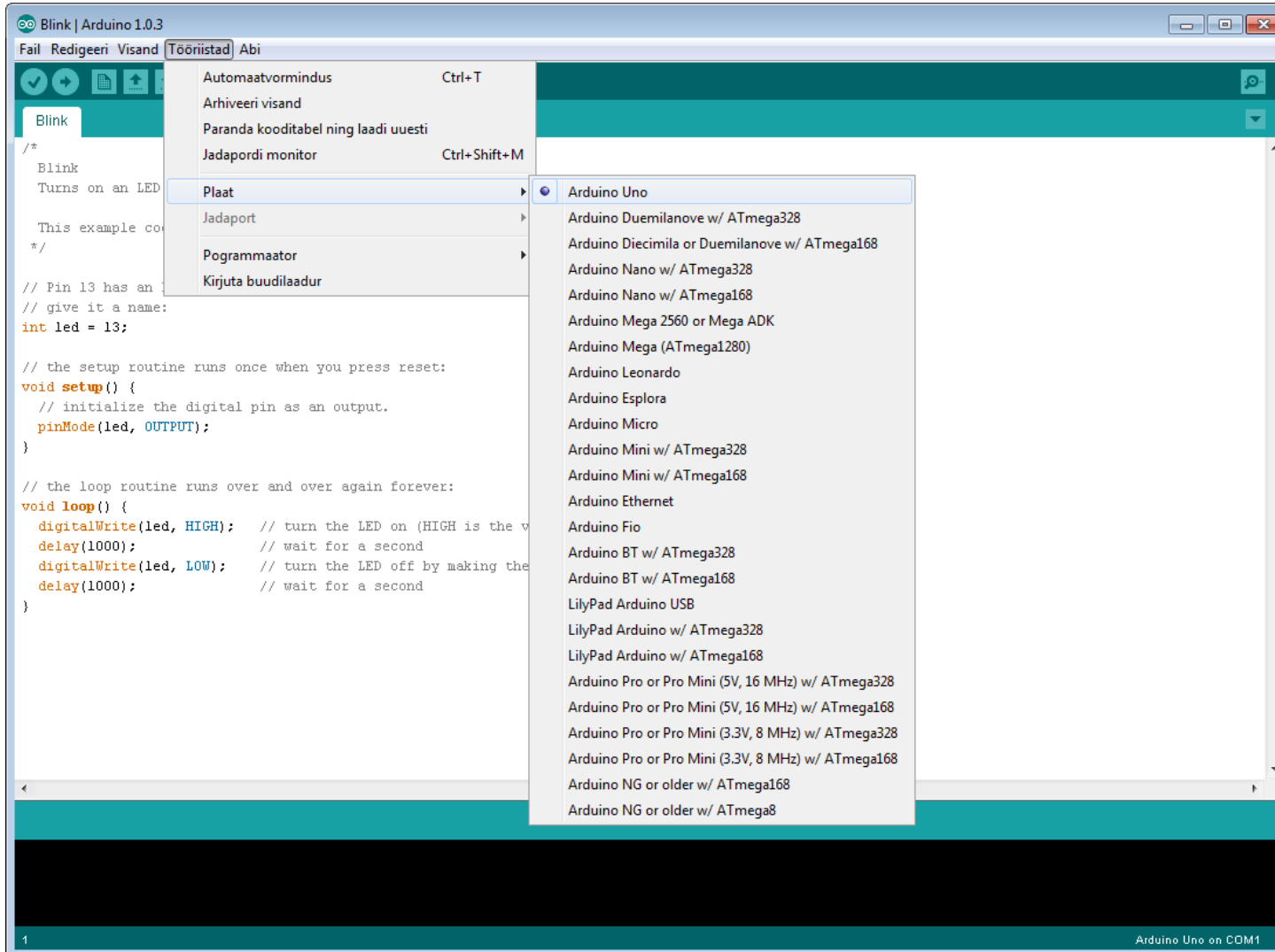


The screenshot shows the Arduino IDE interface with the 'Blink' sketch loaded. The code is annotated with three colored boxes and labels:

- Kommentaarid** (Comments): A yellow box highlights the multi-line comment at the top of the sketch, explaining the purpose of the program and the hardware setup.
- Algväärtustamine** (Initialization): A red box highlights the `void setup()` function, which initializes the digital pin 13 as an output.
- Peatsükkel** (Loop): A green box highlights the `void loop()` function, which contains the logic to turn the LED on and off repeatedly.

At the bottom of the IDE, the status bar indicates 'Kompileeritud.' (Compiled) and 'Binaarse visandi suurus on 1 084 baiti (32 256 maksimumist)' (Binary file size is 1 084 bytes (32 256 maximum)). The bottom right corner shows 'Arduino Uno on COM1'.

Kontrollerplaadi tüüp



Kompileerimine

```
Blink | Arduino 1.0.3
Fail Redigeeri Visand Toonistad Abi

Blink $
int led = 13;

// the setup routine runs once when you press reset:
void setup() {
  // initialize the digital pin as an output.
  pinMode(led, OUTPUT);
}

// the loop routine runs over and over again forever:
void loop() {
  digitalWrite(led, HIGH); // turn the LED on (HIGH is the voltage level)
  delay(1000);             // wait for a second
  digitalWrite(led, LOW);  // turn the LED off by making the voltage LOW
  delay(1000);             // wait for a second
}

'digitalWrit' was not declared in this scope

Blink.ino: In function 'void loop()':
Blink:20: error: 'digitalWrit' was not declared in this scope

20 Arduino Uno on COM1
```

```
Blink | Arduino 1.0.3
Fail Redigeeri Visand Toonistad Abi

Blink $
int led = 13;

// the setup routine runs once when you press reset:
void setup() {
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  delay(1000);             // wait for a second
  digitalWrite(led, LOW);  // turn the LED off by making the voltage LOW
  delay(1000);             // wait for a second
}

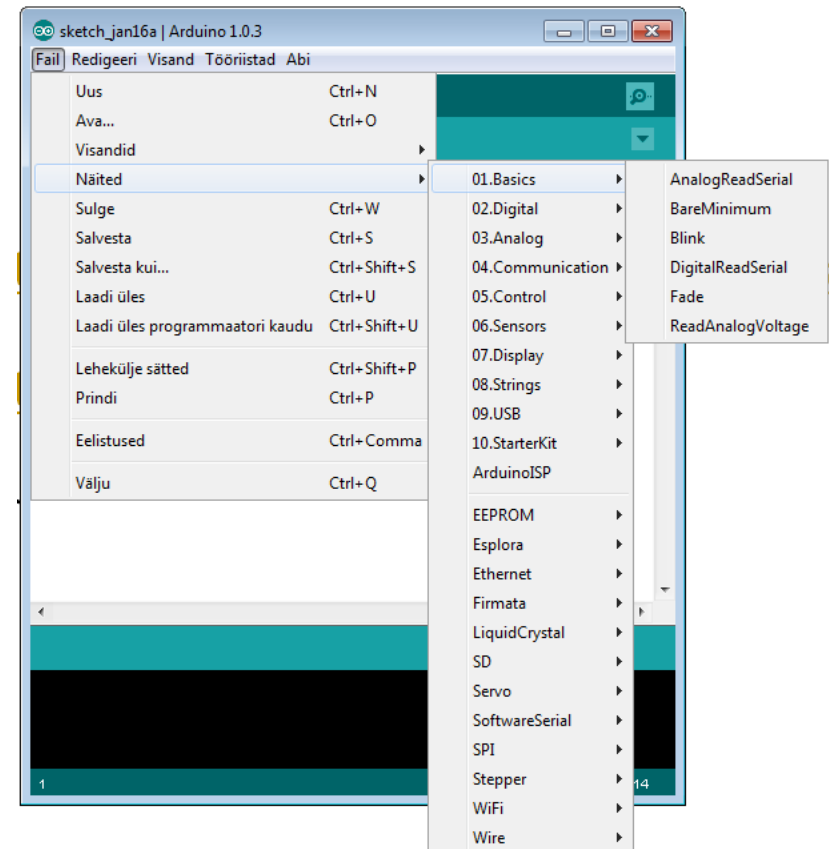
Kompileeritud.

Binaarse visandi suurus on 1 084 baiti (32 256 maksimumist)

20 Arduino Uno on COM1
```

Näiteid

- <http://arduino.cc/en/Reference/HomePage>
- <http://arduino.cc/en/Tutorial/HomePage>
- Arduino kataloog: examples



Robootika Kodulabor III

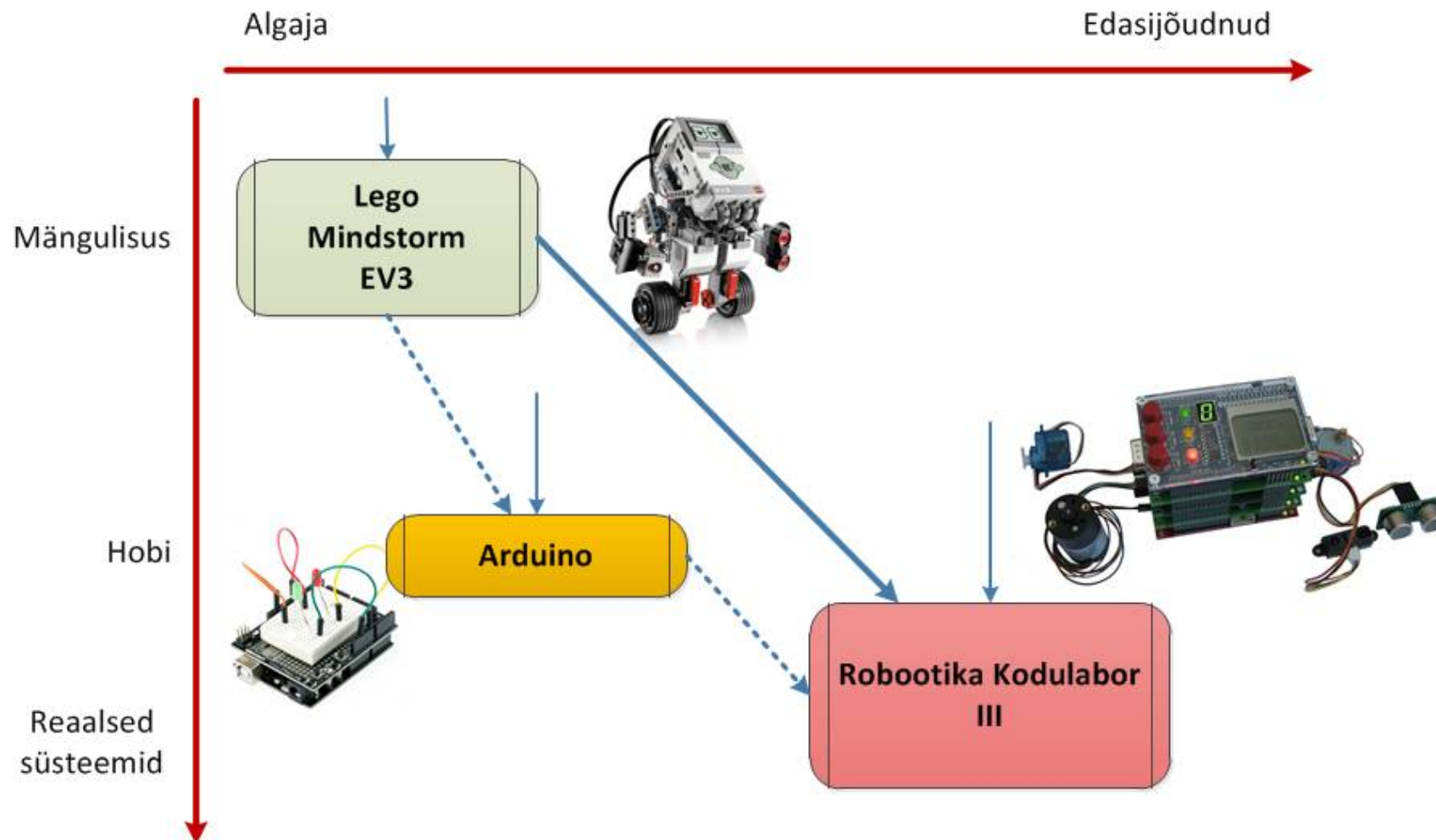
<http://home.roboticleb.eu>

Riistvara



- » Kontrollermoodul
- » Kasutajaliidese moodul
- » Kombomoodul
- » Multimeeter
- » Toiteplokk
- » USB kaabel
- » USB/SD mälukaart
- » Kohver

Komplektid Eesti koolides



Robootika Kodulabor baaskomplekt

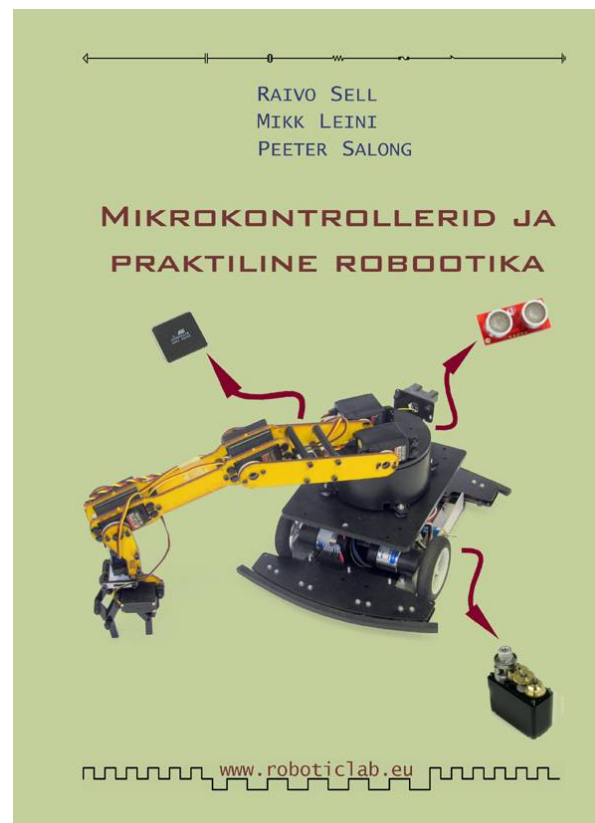
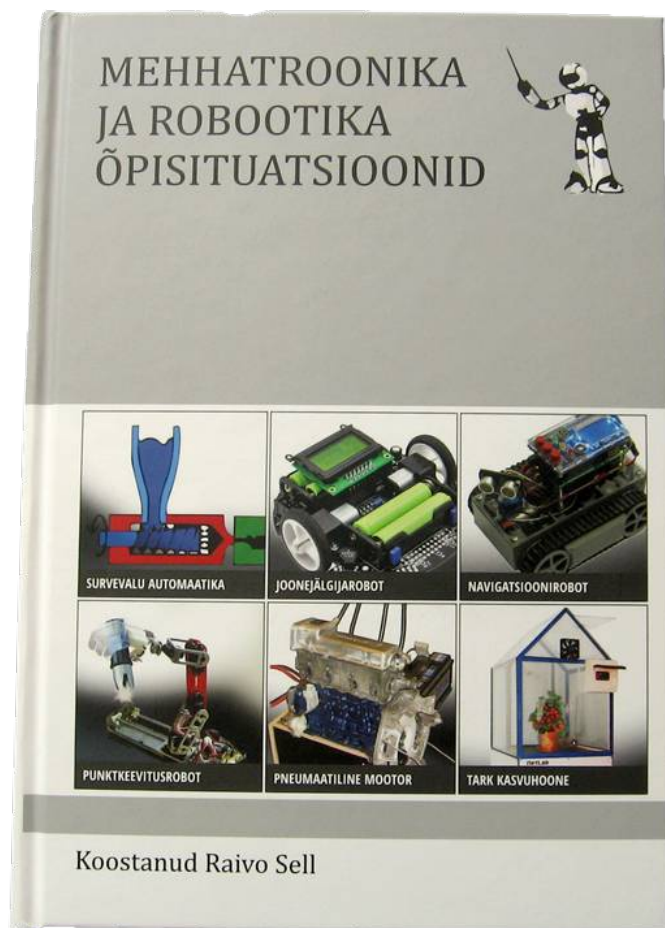


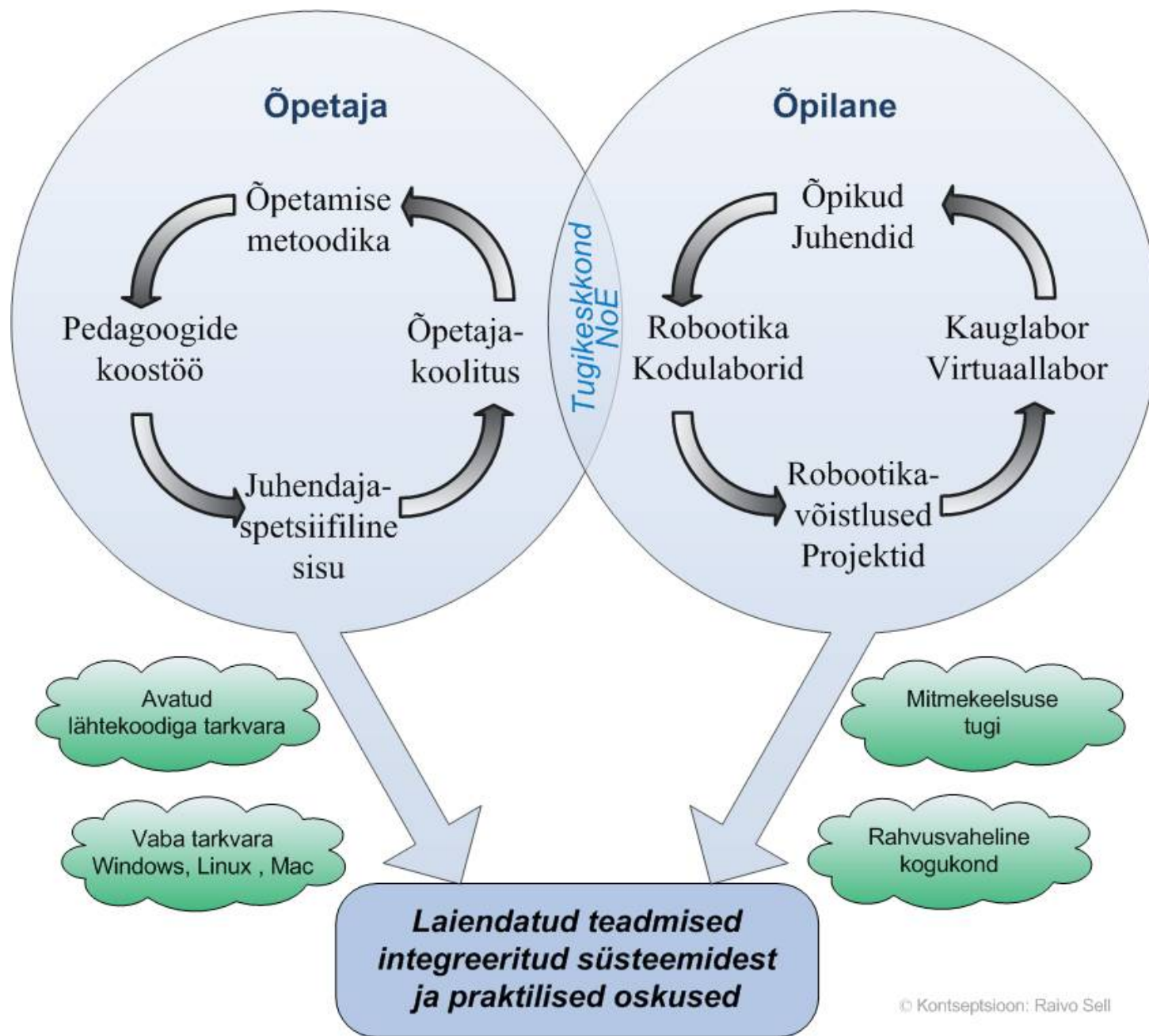
- » Kontrollermoodul
- » Kasutajaliidese moodul
- » Kombomoodul
- » Multimeeter
- » Toiteplokk
- » USB kaabel
- » USB/SD mälukaart
- » Kohver

Robotplatvormid



Kirjandus





Lisainfo:

www.robolabor.ee
www.ittgroup.ee