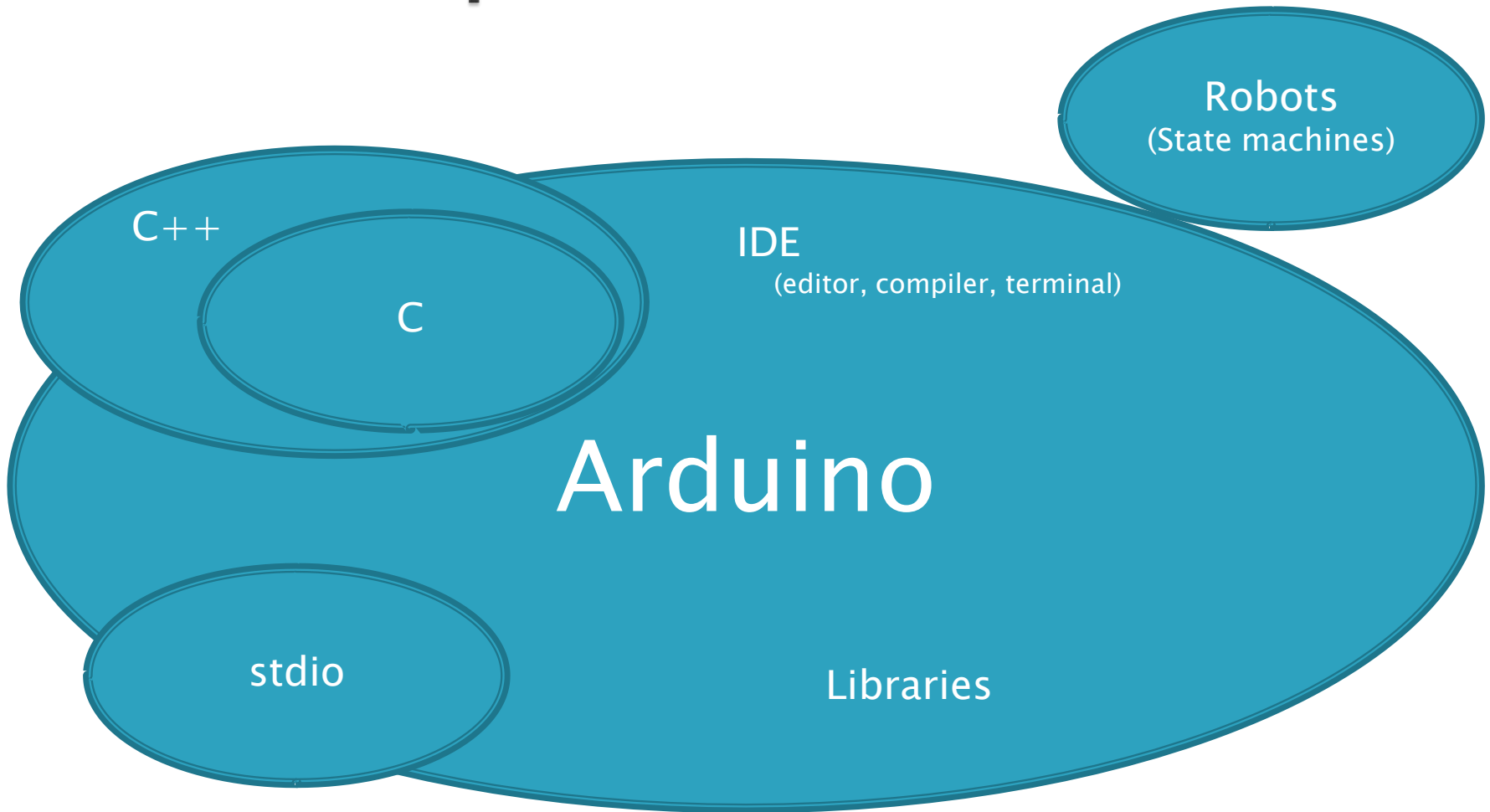


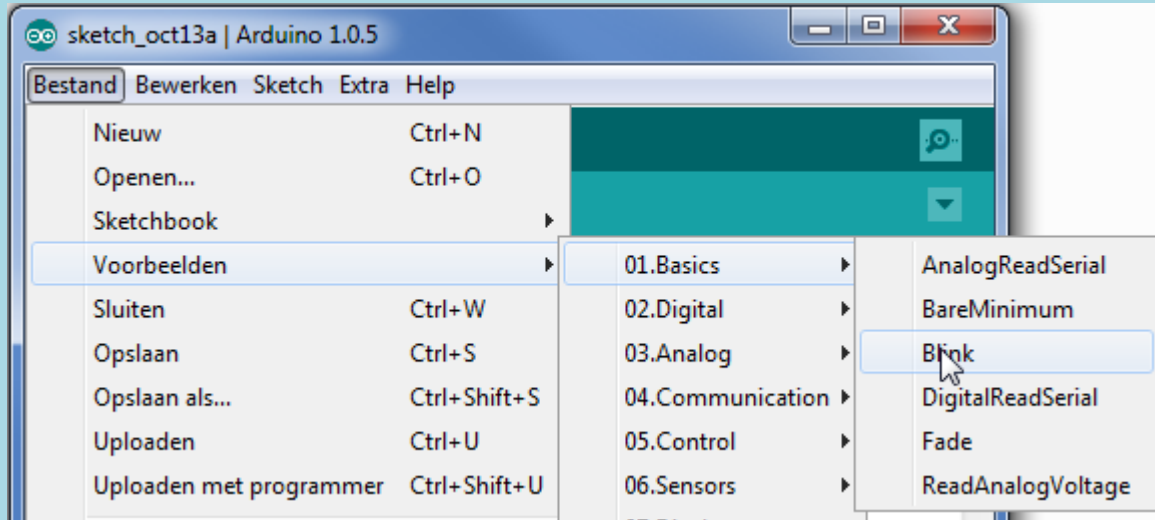
CAR – Dag 1

C, Arduino & Robots

Onderwerpen

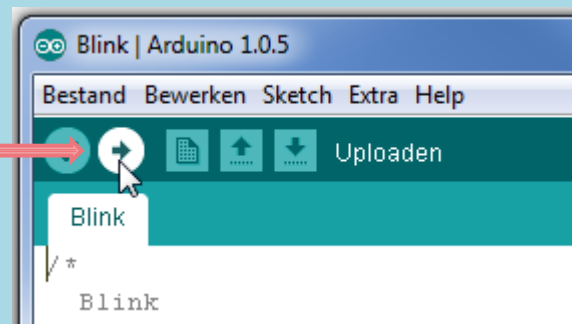


Oefening: Blink a led



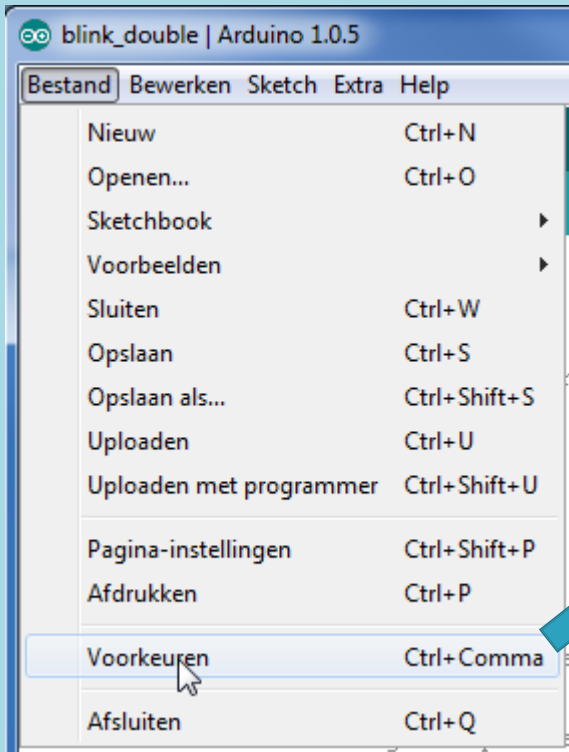
Board type
&
Serieële poort

Compileren ('controleren')
& uploaden

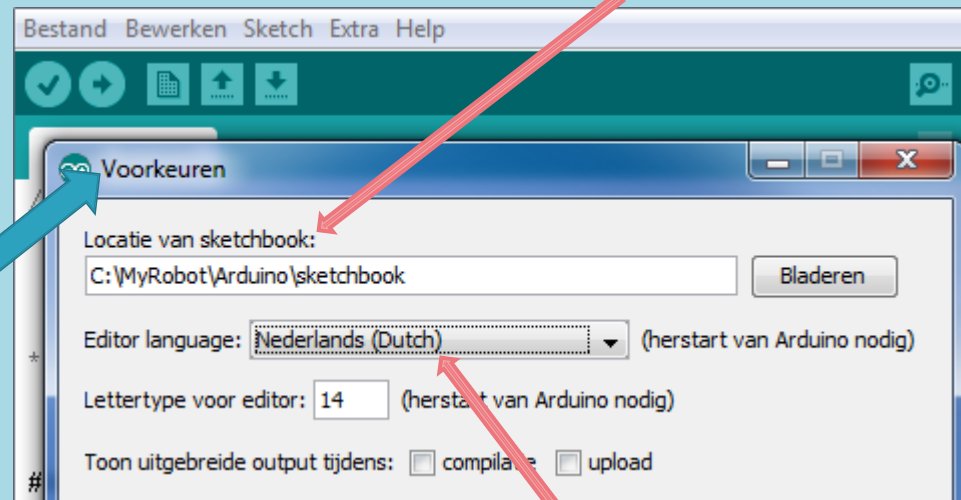


Arduino Duemilanove w/ ATmega328 on COM7

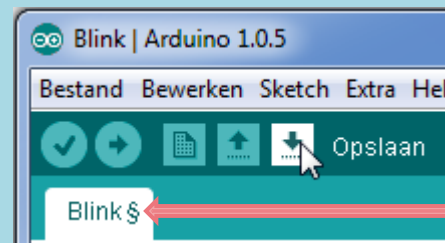
Ontwikkel omgeving



Bestanden

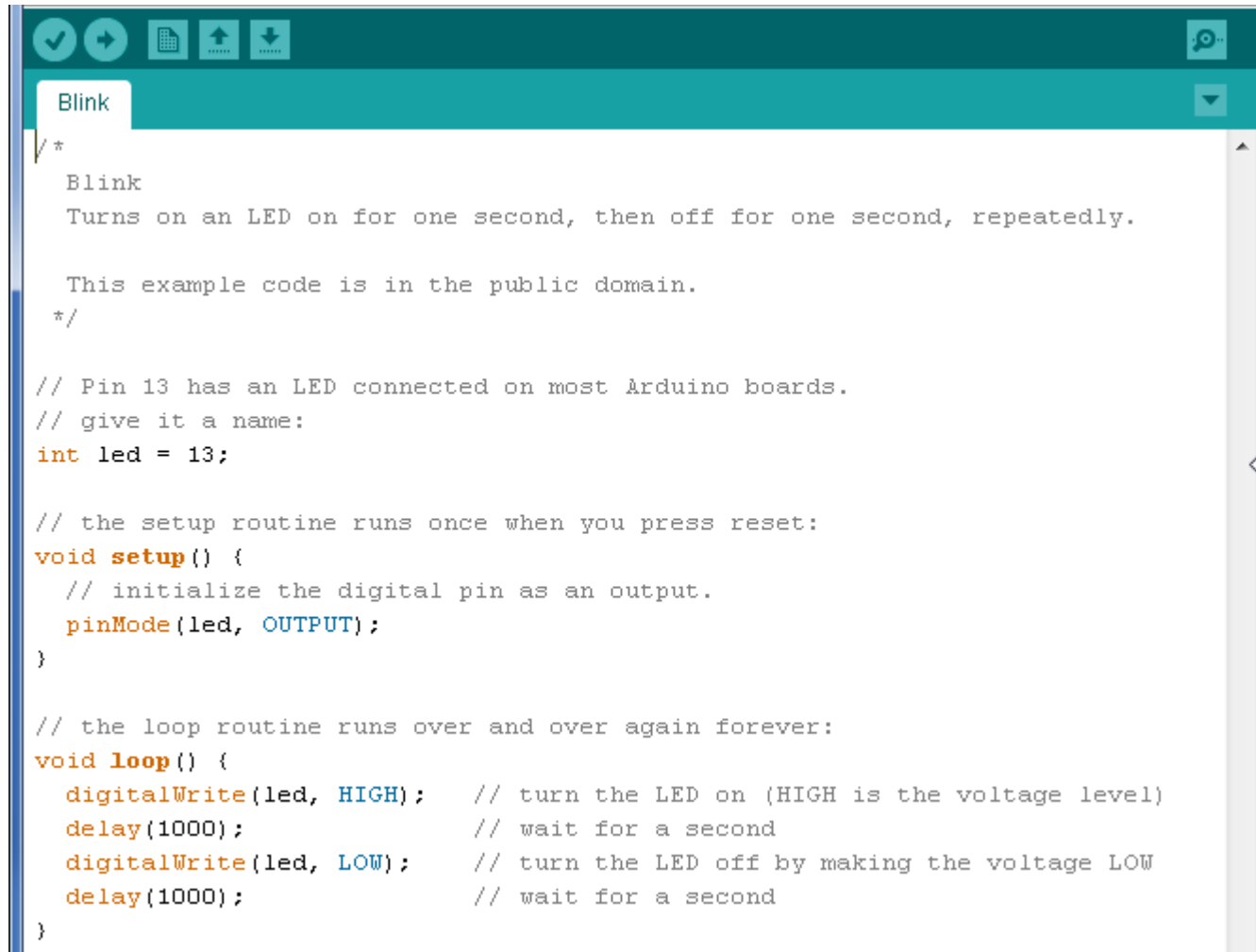


Taal



Broncode niet opgeslagen

Voorbeeld: Blink



The image shows a screenshot of the Arduino IDE interface. At the top, there is a toolbar with icons for checking, running, serial monitor, and file operations. Below the toolbar, a tab labeled 'Blink' is selected. The main text area contains the following C++ code:

```
/*
  Blink
  Turns on an LED on for one second, then off for one second, repeatedly.

  This example code is in the public domain.
  */

// Pin 13 has an LED connected on most Arduino boards.
// give it a name:
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
}
```

C functies

- ▶ C Looft in functies
- ▶ Functies `setup()` en `loop()`
- ▶ `{}` = code block
- ▶ `;` statement einde
- ▶ Digitale pinnen Arduino, input, output

les_1_p10_Blink

```
void setup() {  
    pinMode(13, OUTPUT);  
}  
  
void loop() {  
    digitalWrite(13, HIGH);  
    delay(100);  
    digitalWrite(13, LOW);  
    delay(100);  
}
```

Oefening functie

- ▶ Maak een functie `wacht()` met vaste wachttijd van 100 miliseconden
- ▶ Pas het voorbeeld aan zodat `delay()` alleen in de functie `wacht()` wordt gebruikt.
- ▶ Voeg commentaar toe met `//` en met `/* */`

Oefening functie (2)

- ▶ Maak een functie **wacht()** met vaste wachttijd van 100 miliseconden
- ▶ Pas het voorbeeld aan zodat **delay()** alleen in de functie **wacht()** wordt gebruikt.

```
les_1_p15_Blink_wacht

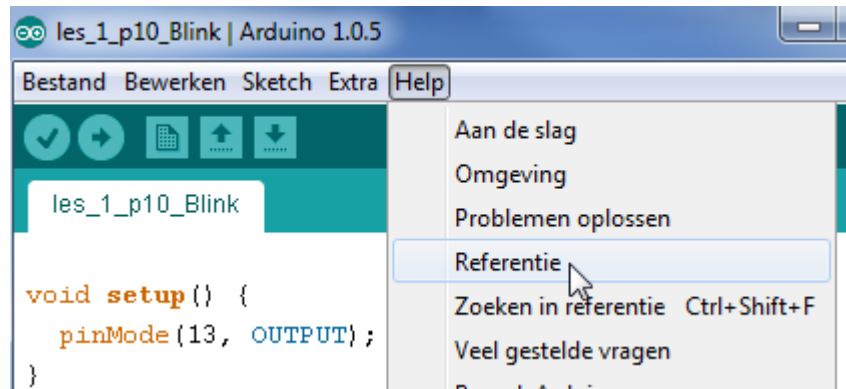
void setup() {
    pinMode(13, OUTPUT);
}

void wacht() {
    delay(100);
}

void loop() {
    digitalWrite(13, HIGH);
    wacht();
    digitalWrite(13, LOW);
    wacht();
}
```


Arduino functies

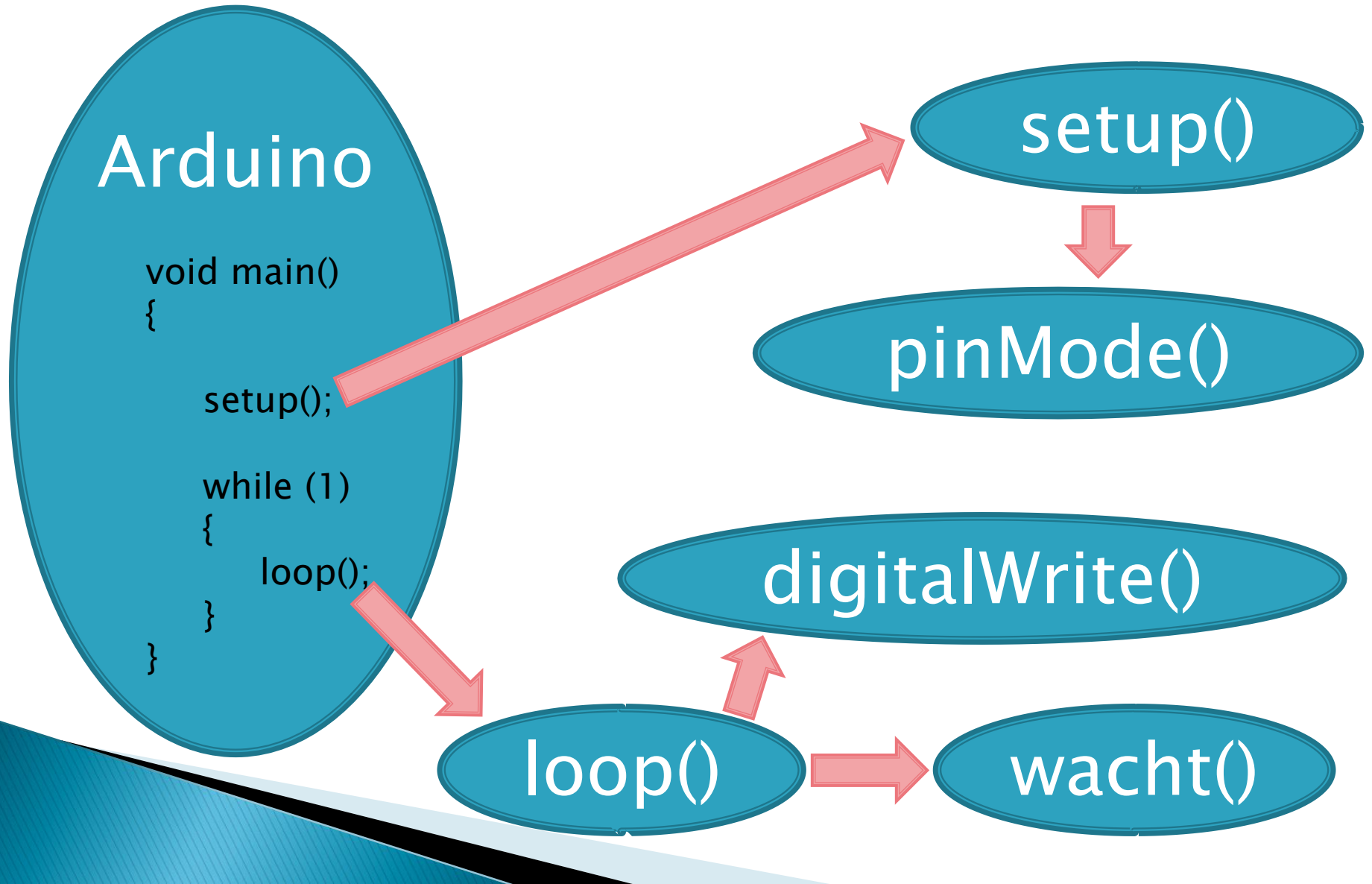
- ▶ Engelse referentie in de IDE



- ▶ Nederlandse documentatie

http://www.kompanje.nl/arduino/Arduino%20manual%201_0%20NL.pdf

C leeft in functies



Layout

```
void setup() {  
    pinMode(13, OUTPUT);  
}  
  
void loop() {  
    digitalWrite(13, HIGH);  
    delay(100);  
  
    digitalWrite(13, LOW);  
    delay(100);  
}
```

```
void setup() { pinMode(13,  
    OUTPUT); } void loop() {  
    digitalWrite(13, HIGH);  
    delay(100); digitalWrite(  
    13, LOW); delay(100);}
```

```
void setup()  
{  
    pinMode( 13, OUTPUT ) ;  
}  
  
void loop()  
{  
    digitalWrite( 13, HIGH ) ; delay( 100 ) ;  
  
    digitalWrite( 13, LOW ) ; delay( 100 ) ;  
}
```

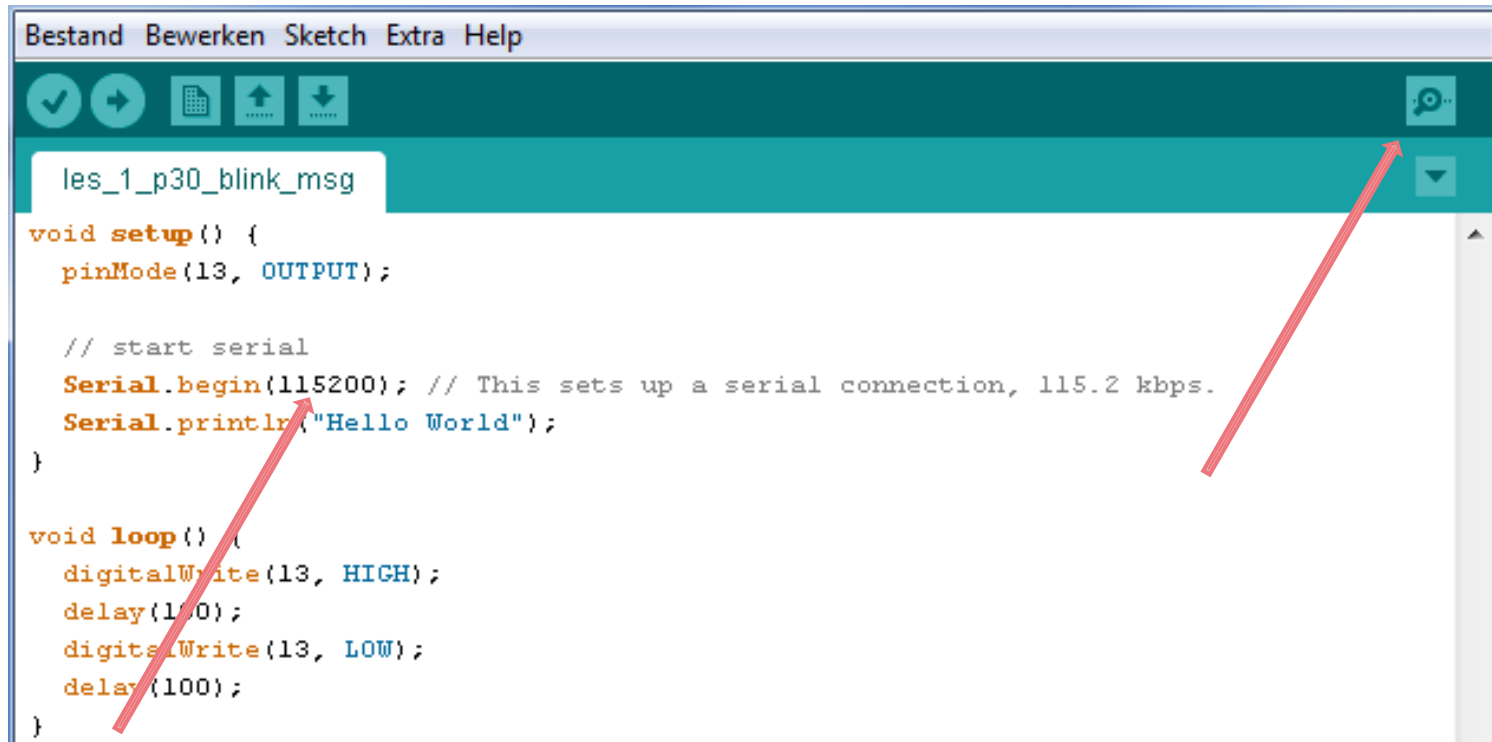
Obfuscated C Code Contest

les_1_p20_obfuscated

```
#include<stdio.h>
typedef unsigned int _; _ d,b,
#define i(I1,I1,I1)if(I1){I1;}else{I1;}
I[256], n,y,a,r,u,k,o
,L,l[ 256],0,K[
/**/ #define\
q(g) g char\
*C, *Q,c{\
|= "KEW"\
"" "Ww|\\"
/* 'UU!\\"
% NYA!\\"
*/ "Z)"\
"._s"\
"Ro"\
"di"\
"ef"\
"e"\
"n"\
"*\\"
"o"\
" "\
"#"\
"-"\
"/z;
}}+u
{u>>
;256
^K[
main
"rb"
=0=
for
!=
=S
(p
^=
0=
2
,
;
0;}
```

Oefening opstartbericht

- ▶ Voeg opstartbericht via seriele poort toe.



```
Bestand  Bewerken  Sketch  Extra  Help

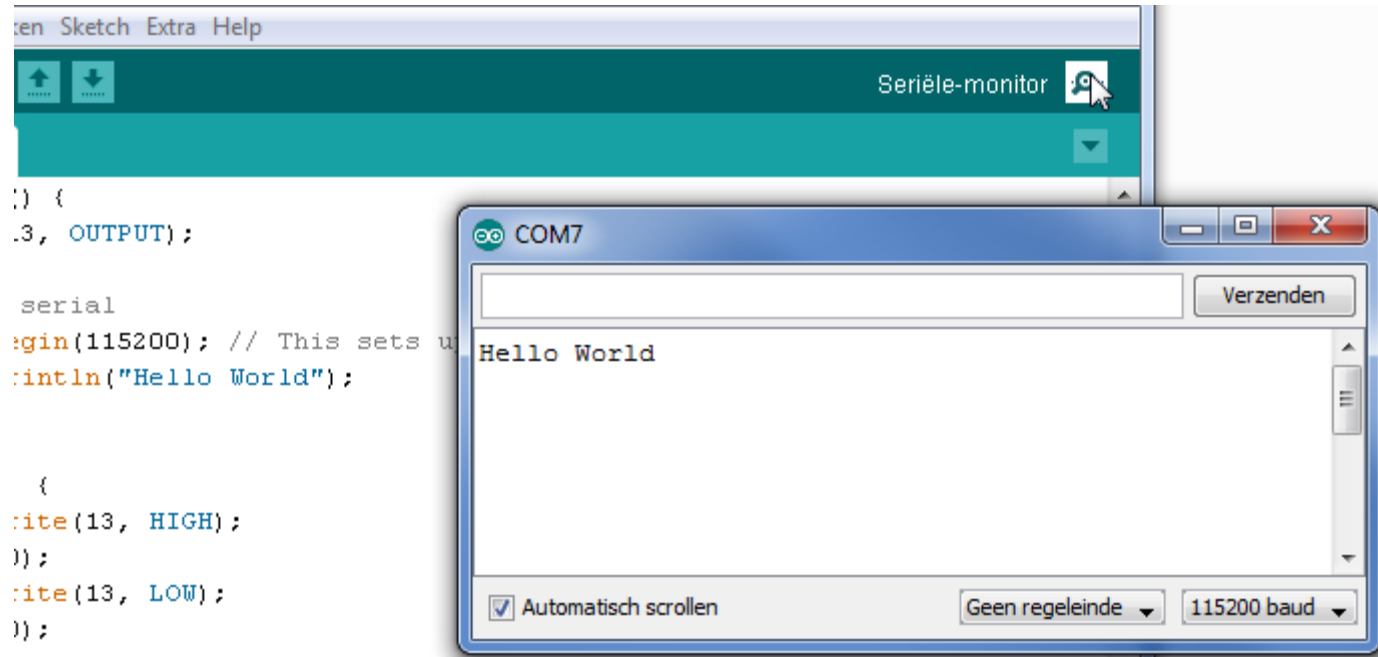
les_1_p30_blink_msg

void setup() {
  pinMode(13, OUTPUT);

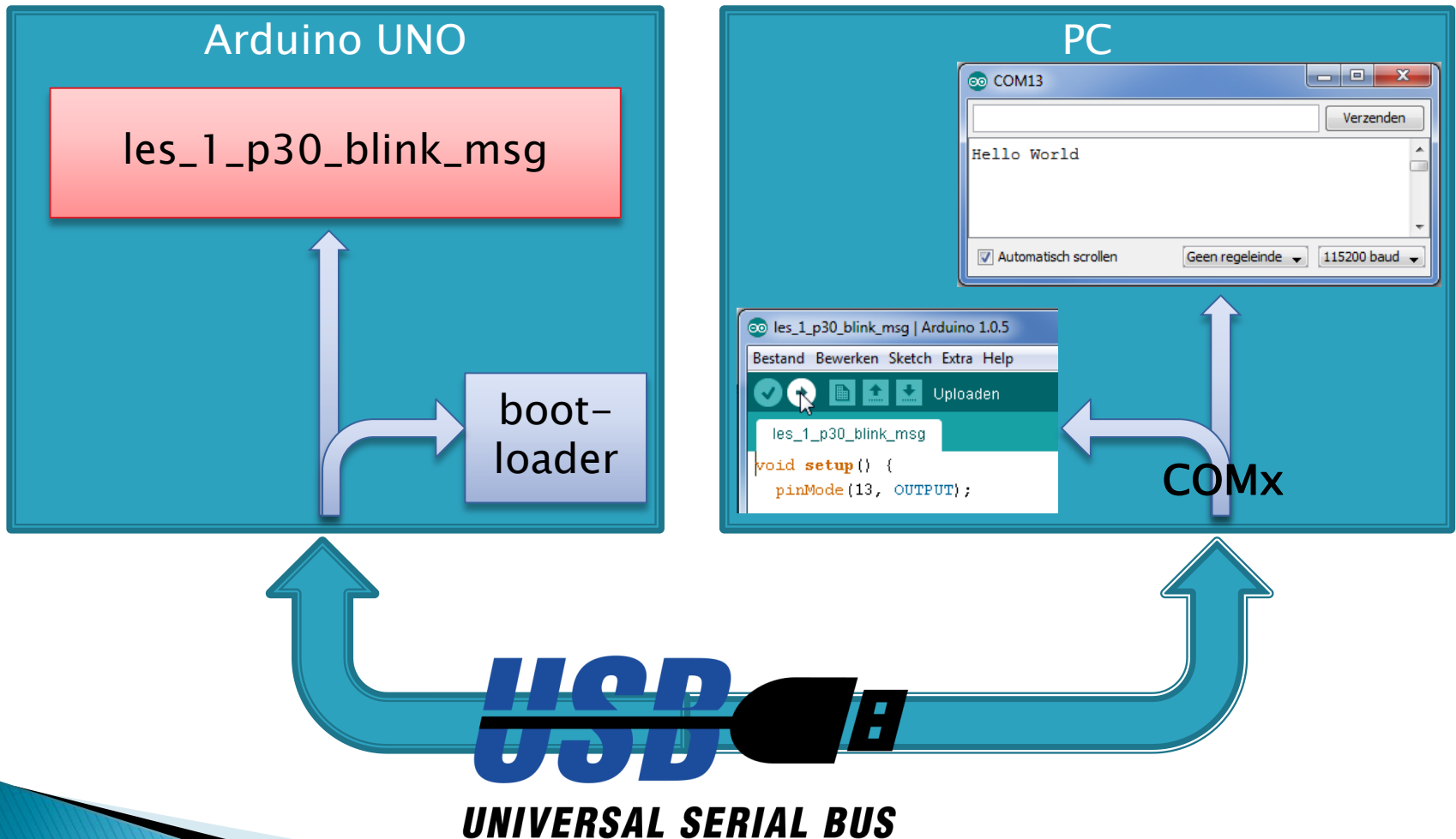
  // start serial
  Serial.begin(115200); // This sets up a serial connection, 115.2 kbps.
  Serial.println("Hello World");
}

void loop() {
  digitalWrite(13, HIGH);
  delay(100);
  digitalWrite(13, LOW);
  delay(100);
}
```

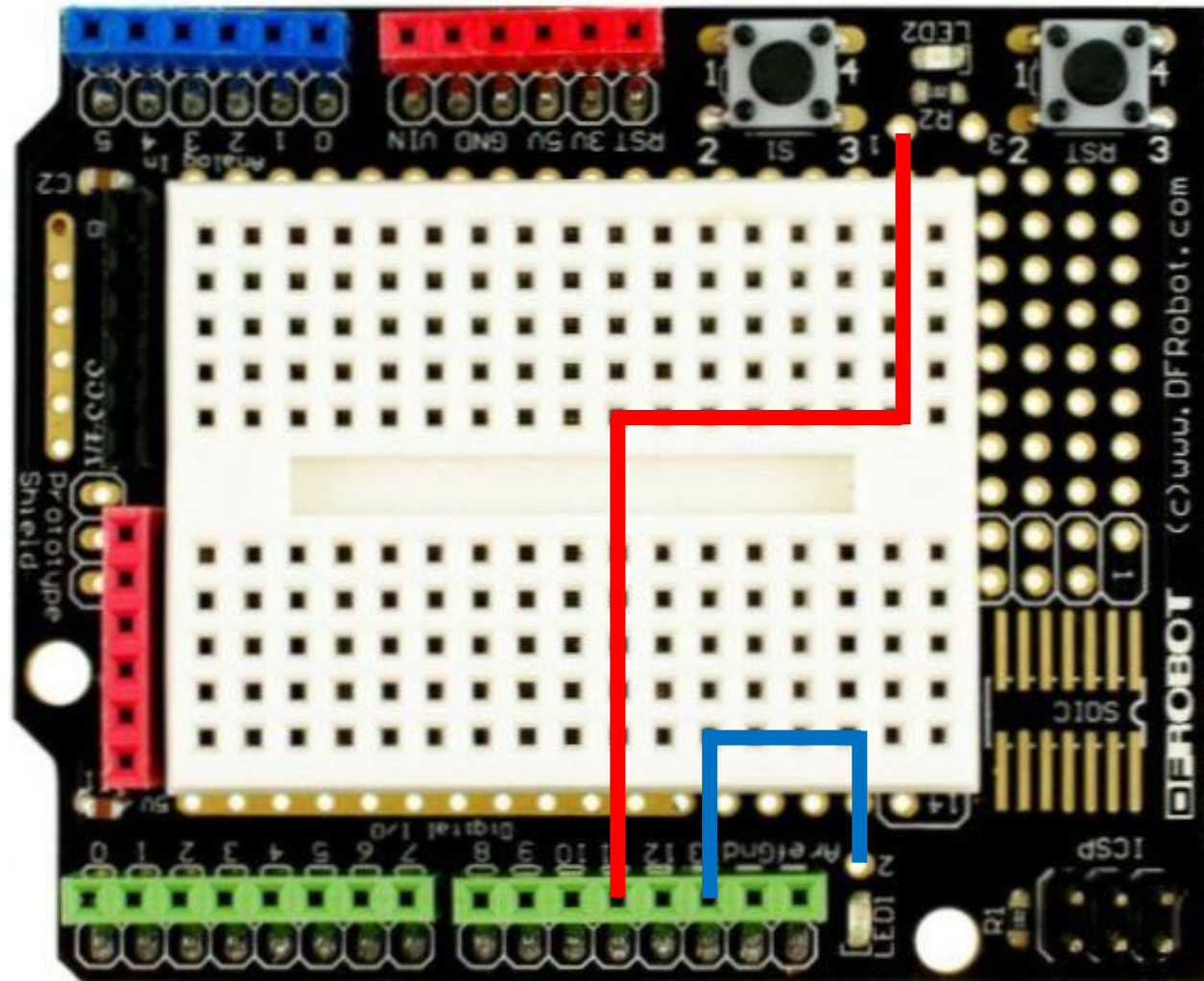
Resultaat opstartbericht



Seriële verbinding

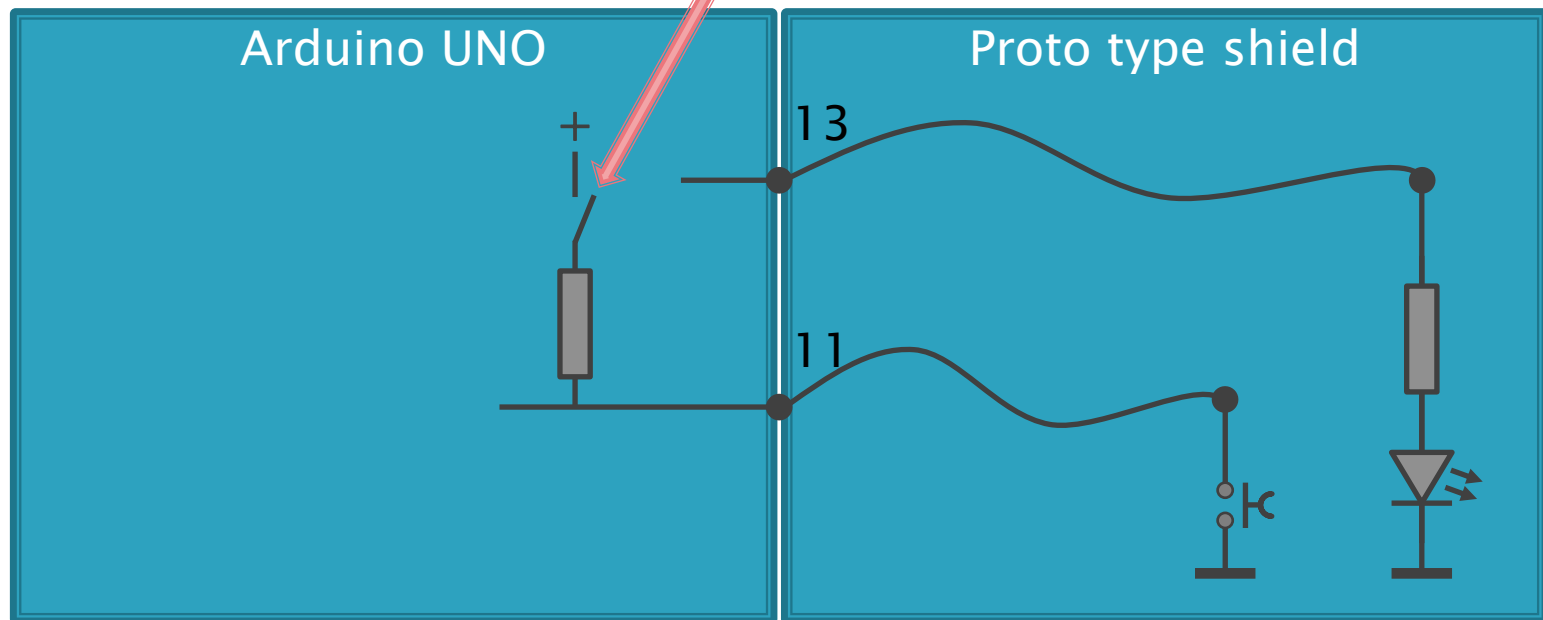


Knop lezen – de hardware



Knop lezen – de hardware (2)

`pinMode(11, INPUT_PULLUP);`
sluit deze schakelaar



Oefening: Knop lezen

```
les_1_p98_lees_knop

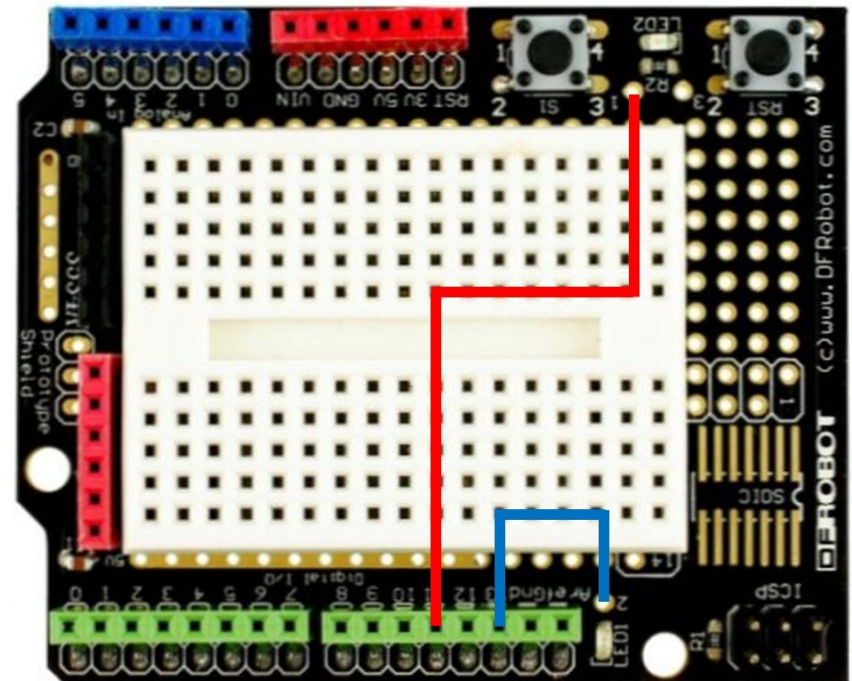
void setup() {
  pinMode(13, OUTPUT);          // led output
  pinMode(11, INPUT_PULLUP);    // knop input & pull-up

  // start serial
  Serial.begin(115200);
  Serial.println("Hallo arduino wereld.");
}

void loop() {
  int Knop;

  Knop = digitalRead(11);
  Serial.println(Knop);

  if (Knop) {
    digitalWrite(13, true);
  } else {
    digitalWrite(13, false);
  }
}
```



Resultaat: Knop lezen

arduino digitaal pin nummer

arduino processor specifiek:
input met pull-up

Variabele maken

Variabele vullen

Variabele gebruiken

```
les_1_p98_lees_knop

void setup() {
  pinMode(13, OUTPUT);           // led output
  pinMode(11, INPUT_PULLUP);    // knop input & pull-up

  // start serial
  Serial.begin(115200);
  Serial.println("Hallo arduino wereld.");
}

void loop() {
  int Knop;

  Knop = digitalRead(11);
  Serial.println(Knop);

  if (Knop) {
    digitalWrite(13, true);
  } else {
    digitalWrite(13, false);
  }
}
```

Voor thuis...

- ▶ Laat de LED snel knipperen als de knop is ingedrukt, laat de LED langzaam knipperen als de knop los is.
- ▶ Voorspel de output van:

```
les_1_p99

void setup() {
  // start serial
  Serial.begin(115200);
  Serial.println("START");

  int t = 7;
  if (t < 0)
    Serial.println("aap");
    Serial.println("noot");
    Serial.println("mies");
}

void loop() {
}
```

Vragen en opmerkingen via
https://groups.google.com/forum/#!forum/hcc_robotmc