

Smartphone e tablet per l'insegnamento delle scienze

*11 - 12 settembre 2015
Città della Scienza - Napoli*

Quando un Punto Materiale diventa SMART

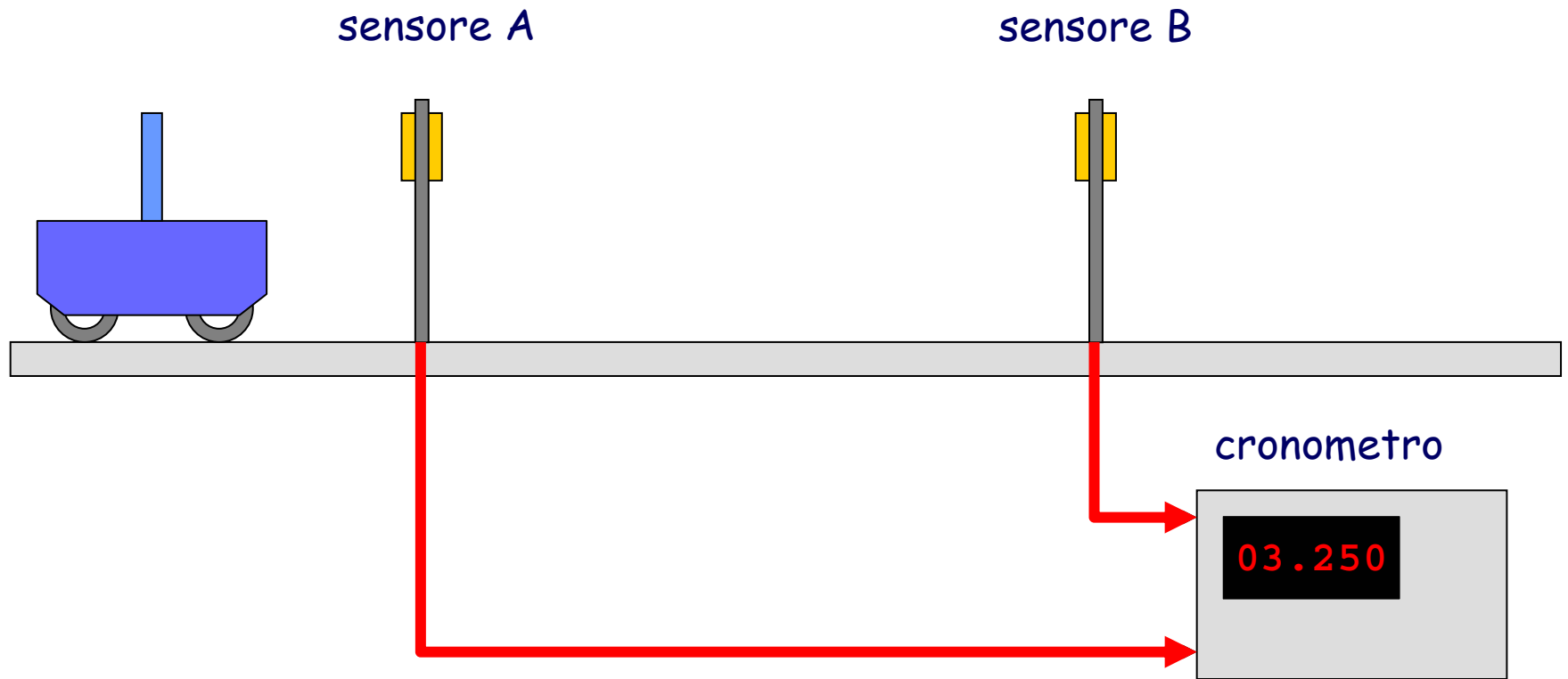
Francesco di Paola Bruno

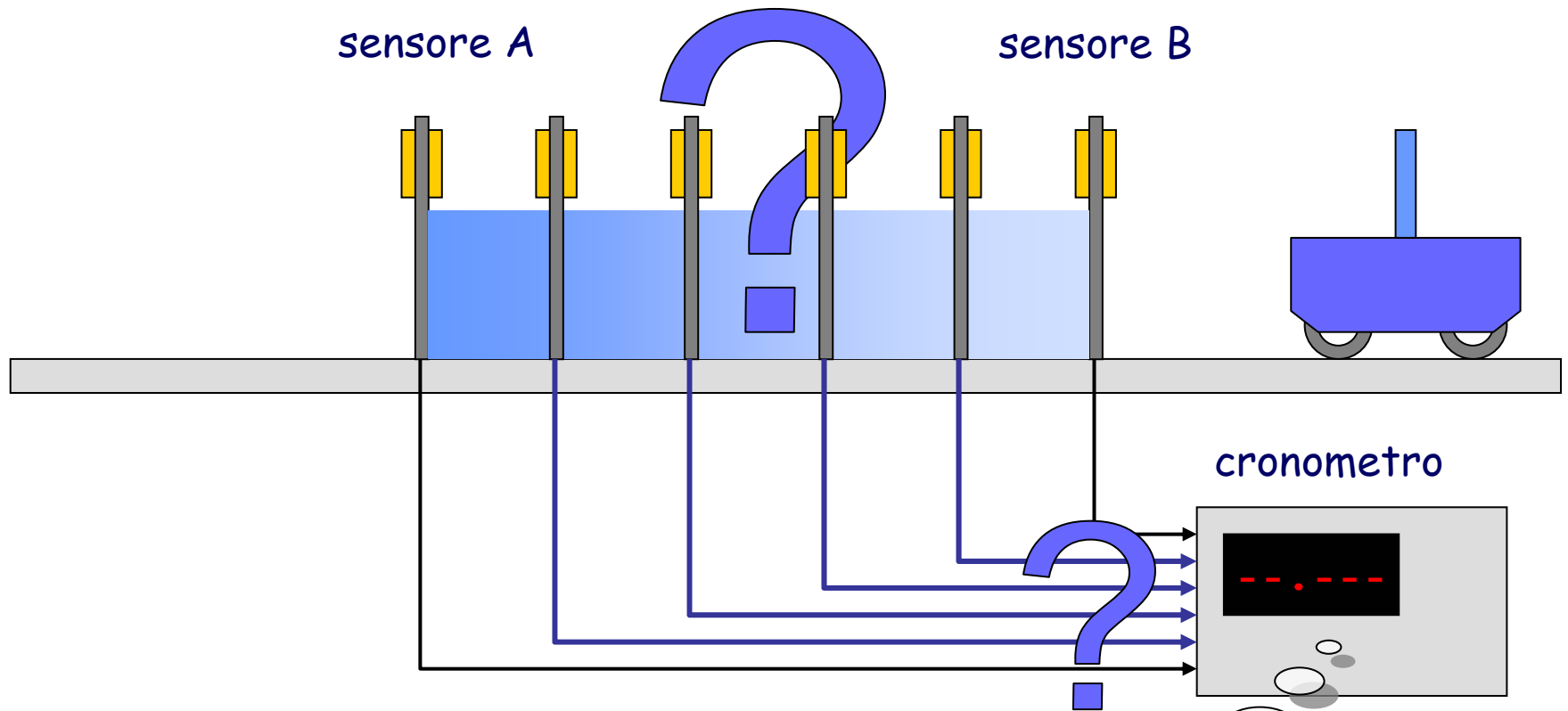
*docente di Matematica e Fisica
Liceo Scientifico "F. Severi" Castellammare di Stabia (NA)*

Giovanni di Dio Bruno

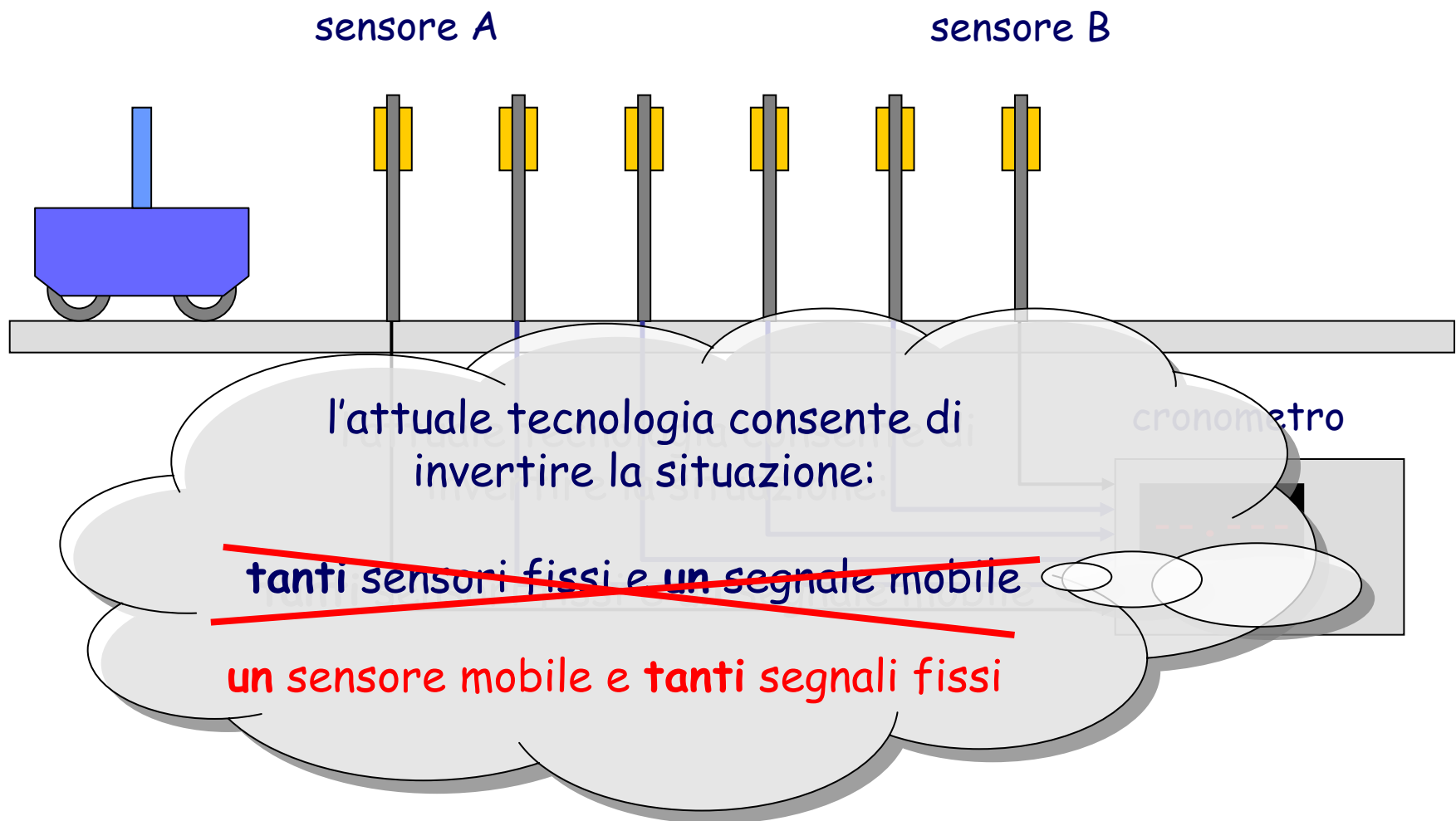
*studente Corso di Laurea in Ingegneria dell'Automazione
Scuola Politecnica e delle Scienze di base - Università di Napoli "Federico II"*

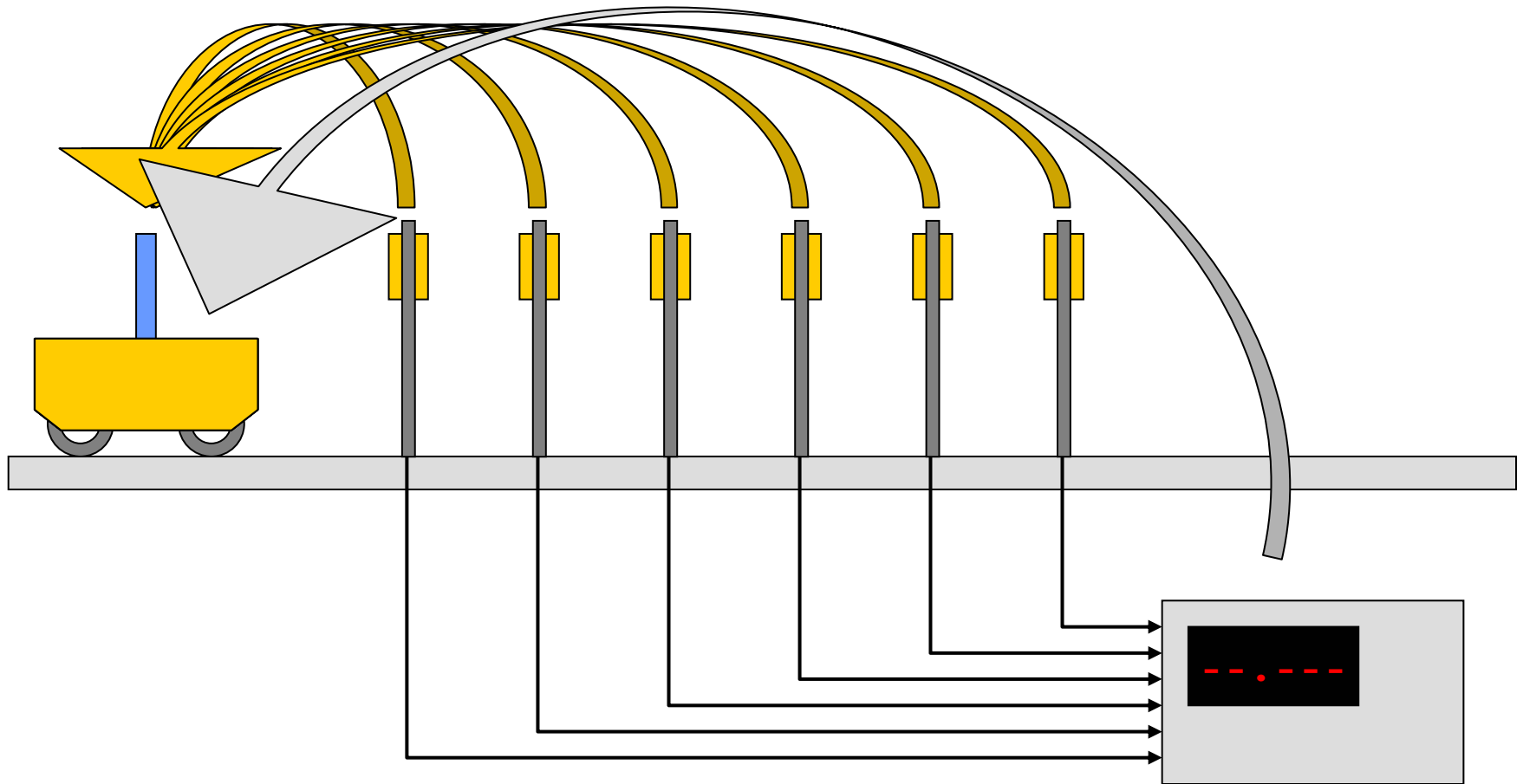
1. L'idea

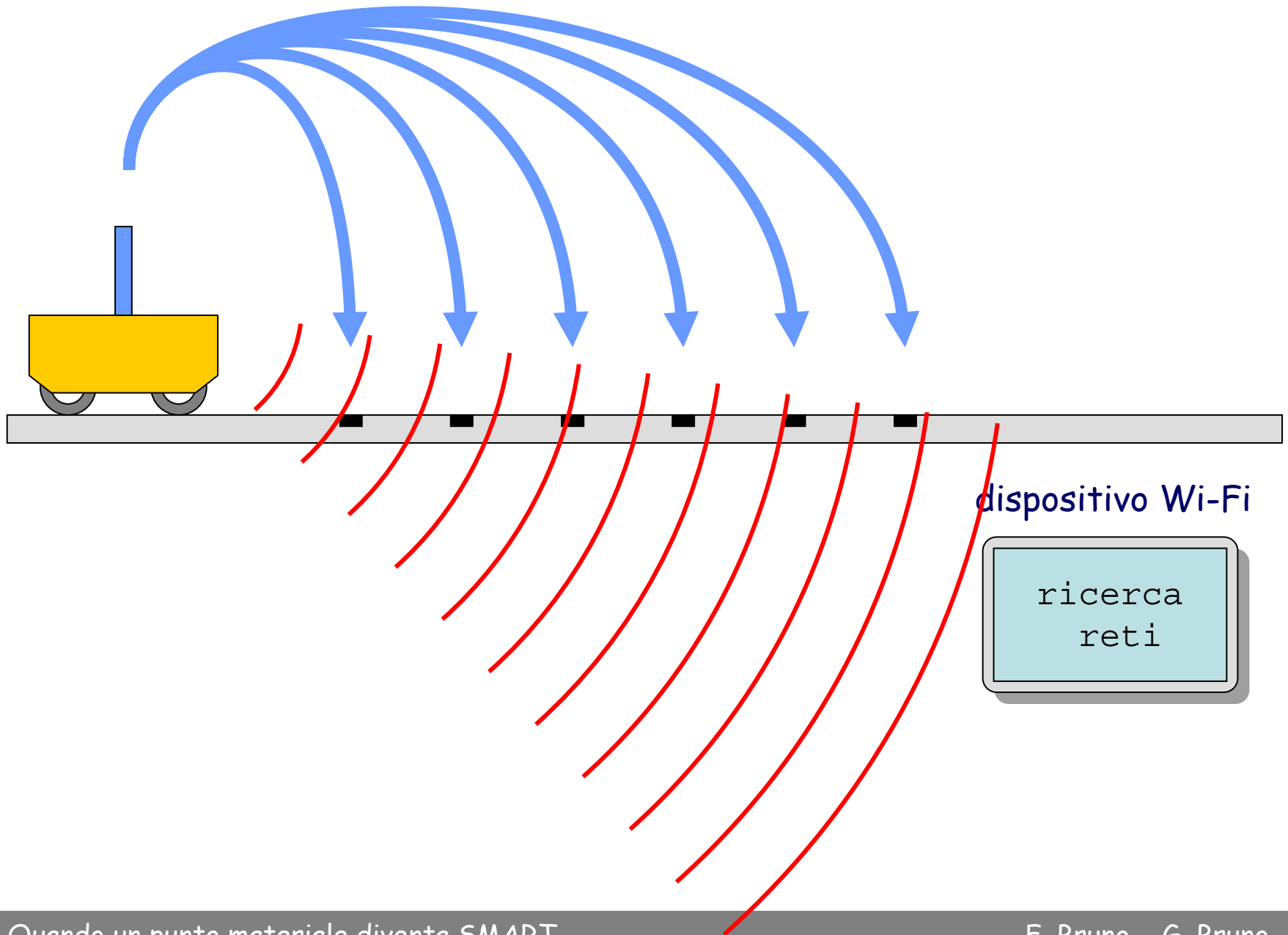




aumento di:
- complessità
- costi

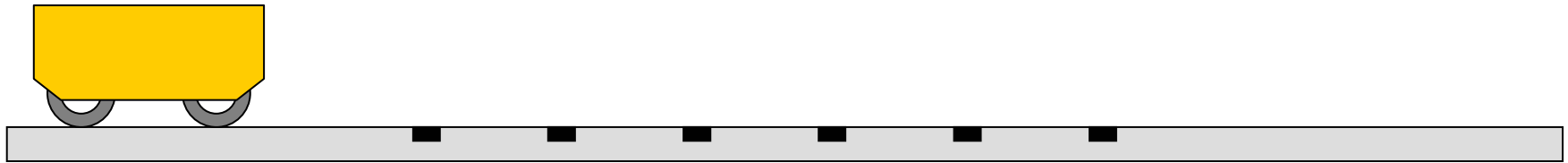






il nostro carrello diventa

SMa**A**R**T**obile **a**pp**l**iance **r**ecord**i**ng **t**ime



dispositivo Wi-Fi



parte il cronometro $t_0 = 0.000$

memorizza $t_1 = 0.420$

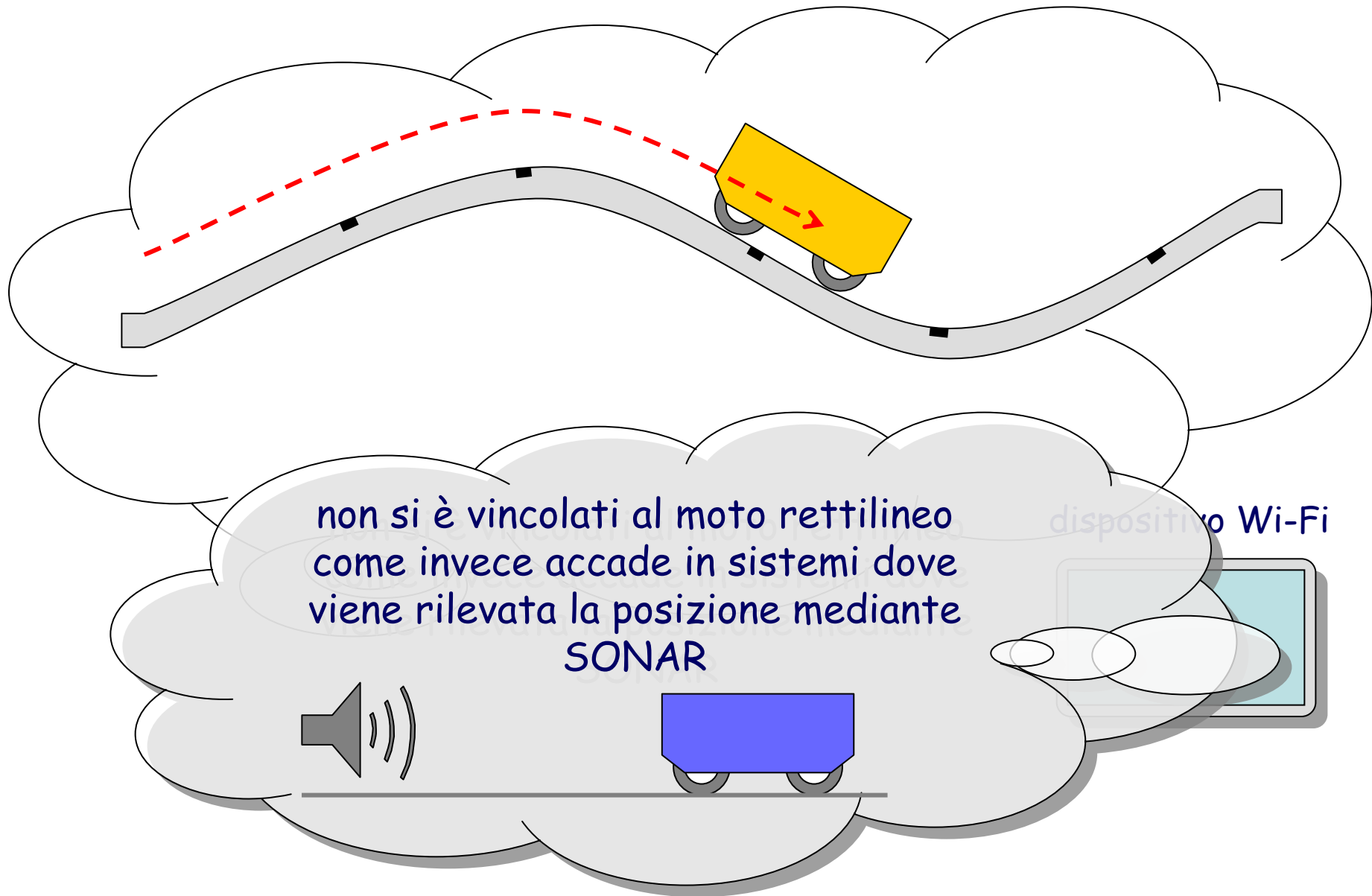
memorizza $t_2 = 0.895$

memorizza $t_3 = 1.450$

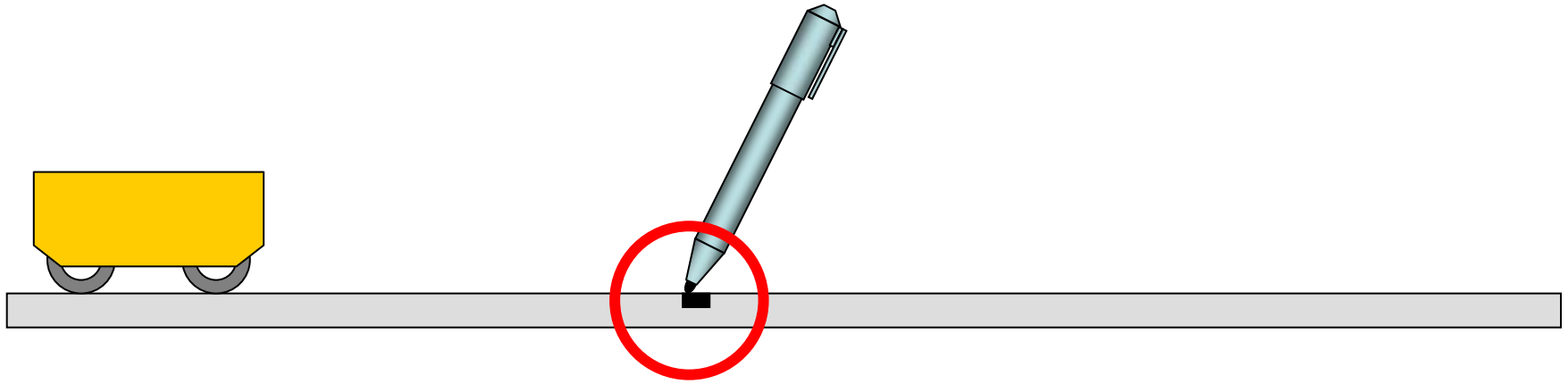
memorizza $t_4 = 2.145$

memorizza $t_5 = 3.250$





2. I componenti



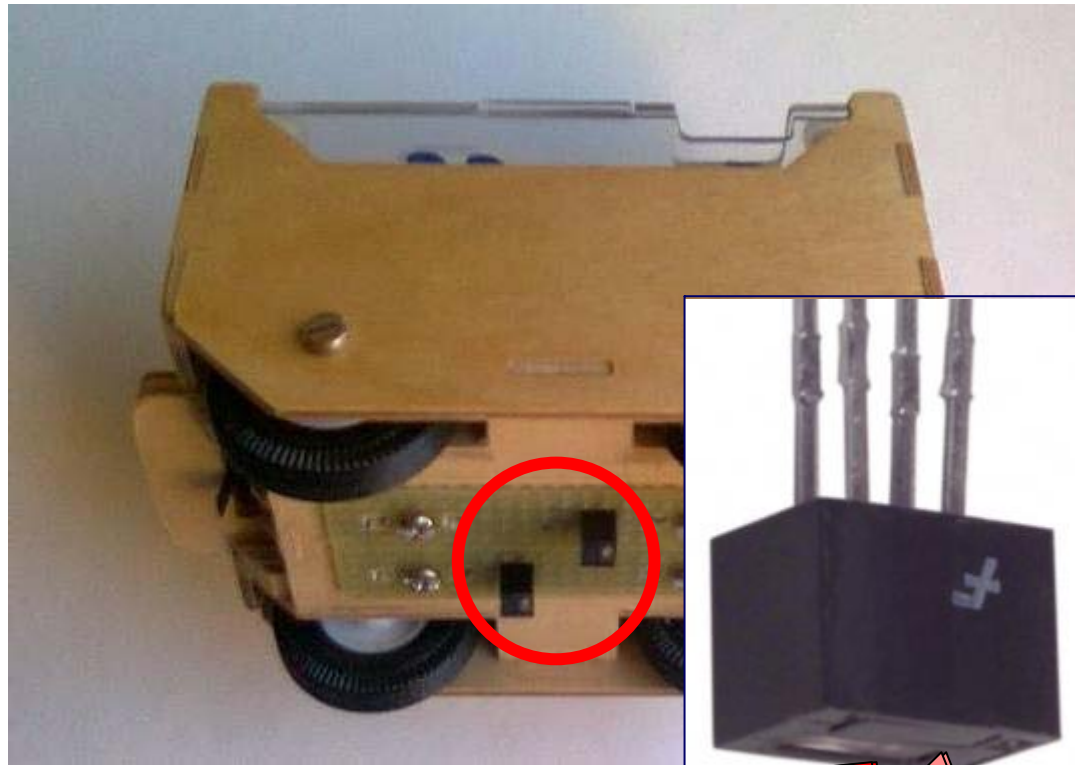


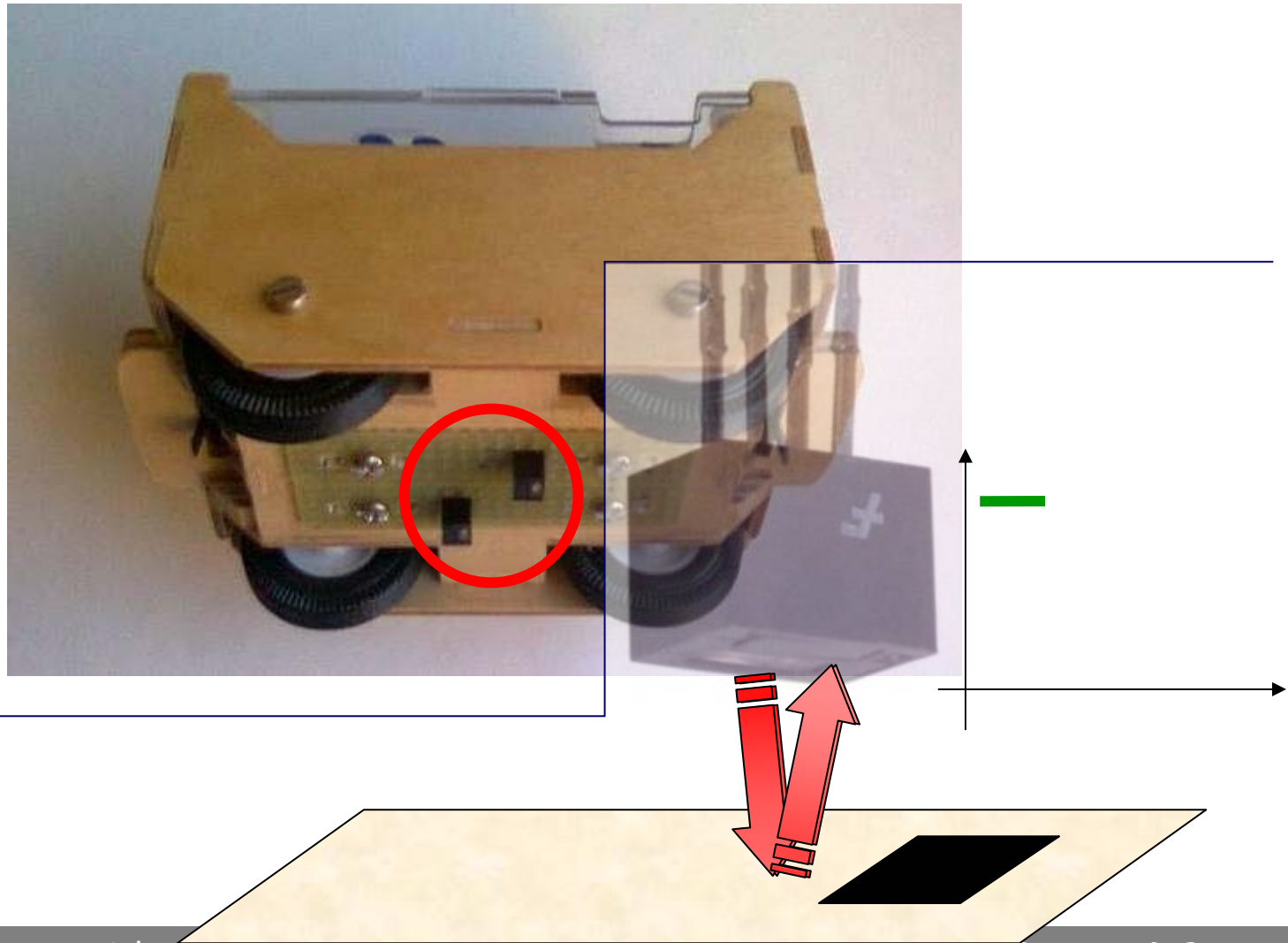
QRD1114
reflective
infrared
sensor

Schematic

LED IR (920 nm)

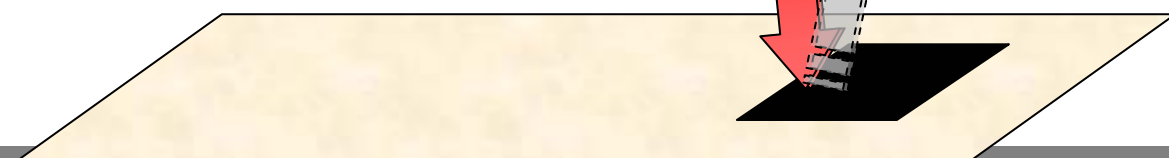
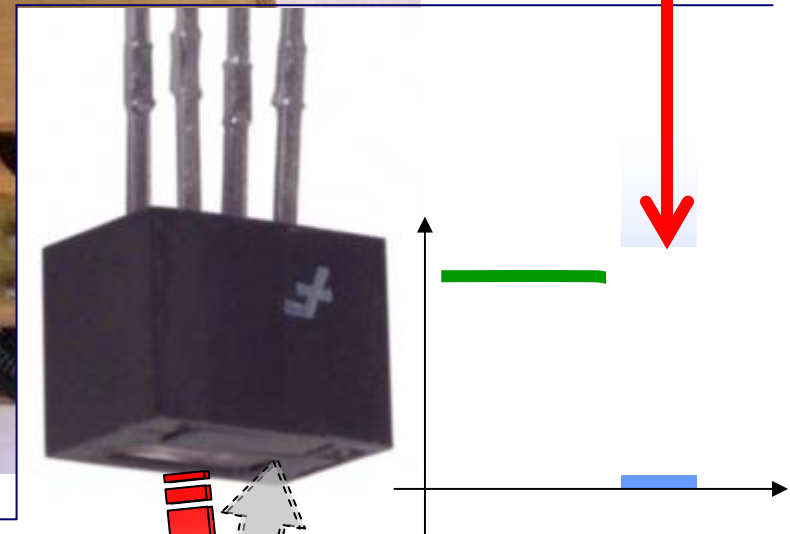
fototransistor con filtro IR

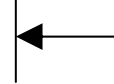
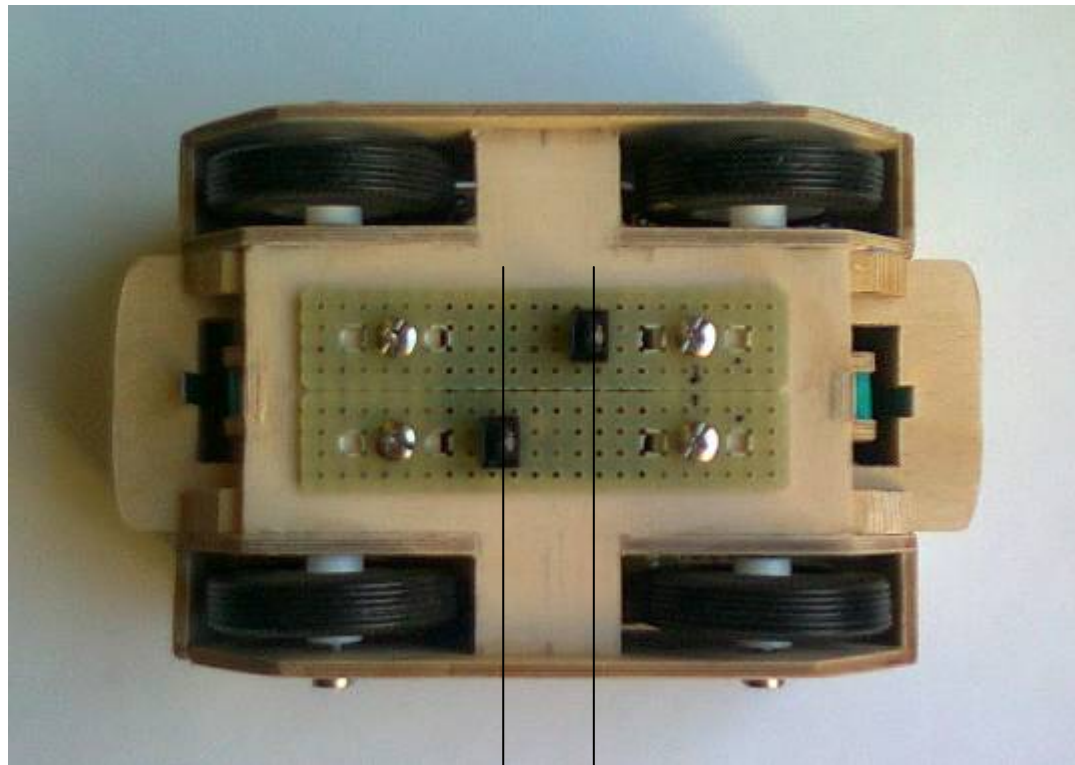




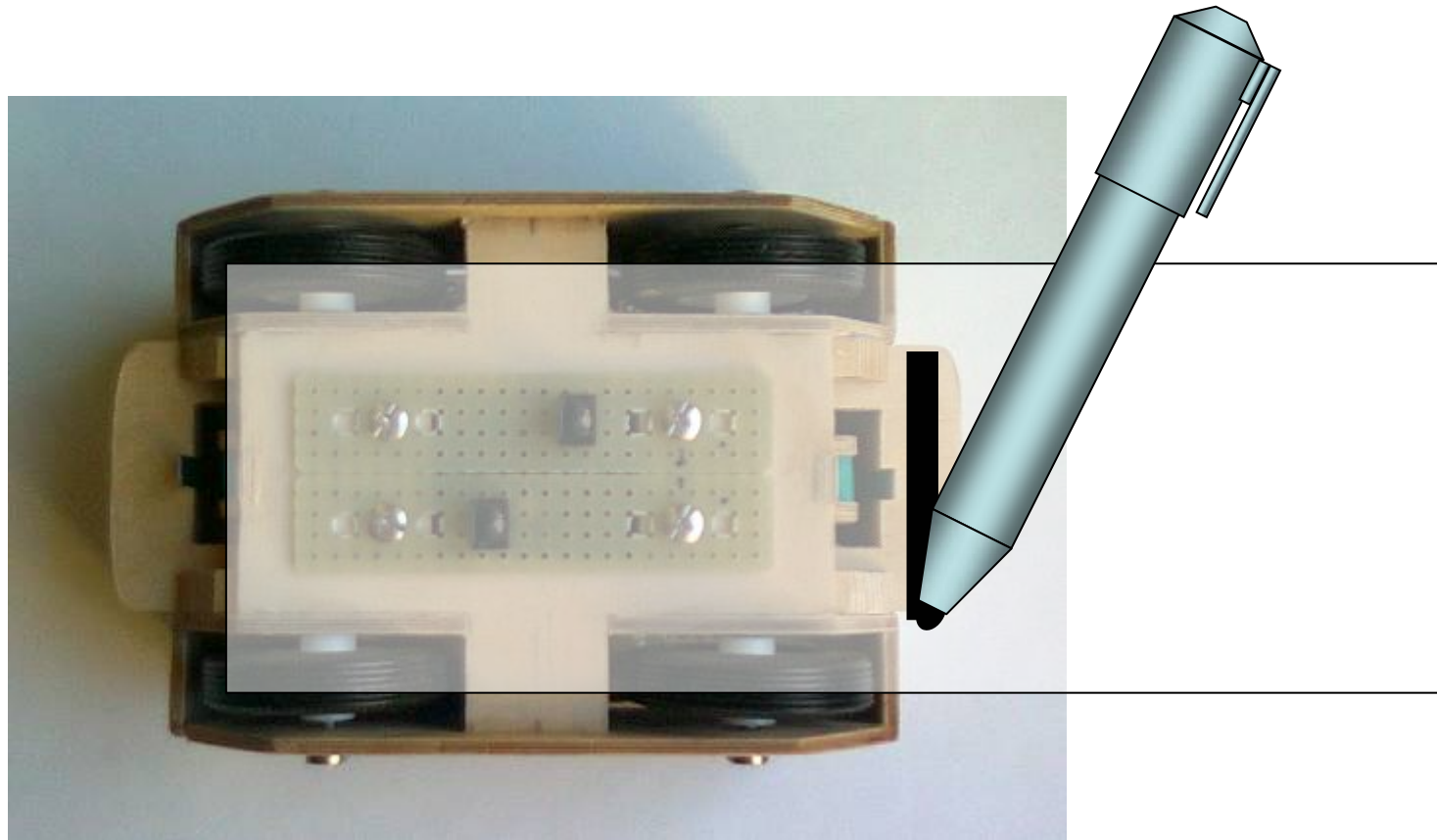


segnale sensore
fronte discesa fototransistor
filtrato

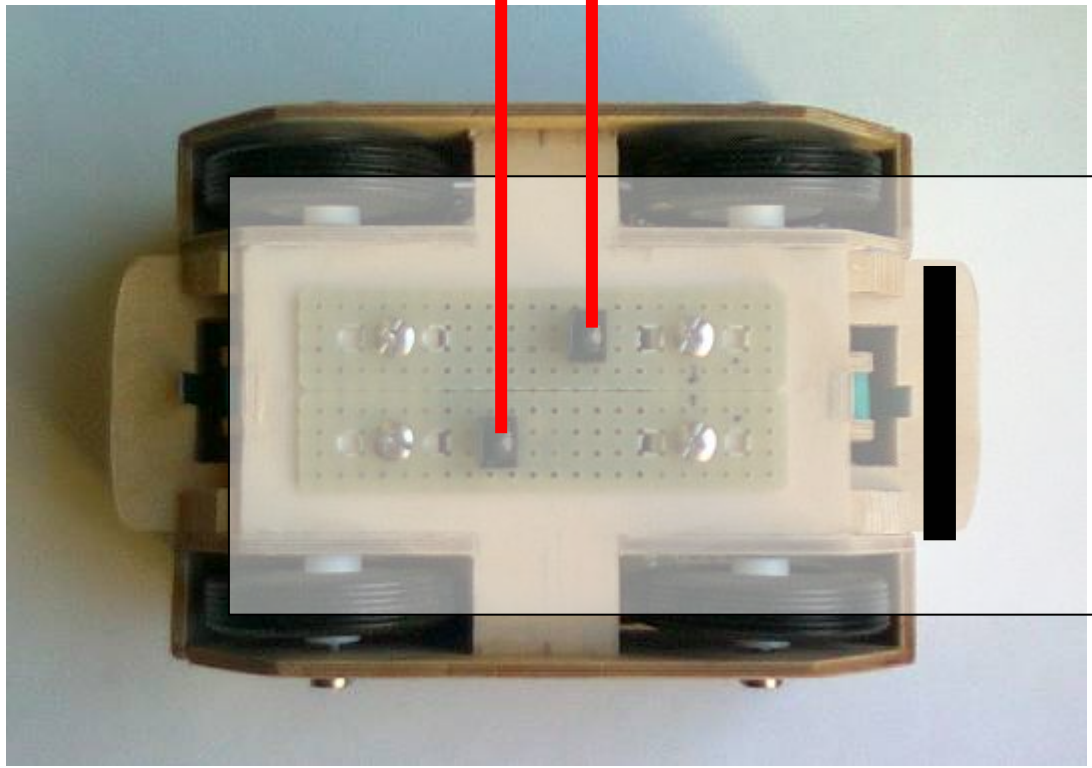


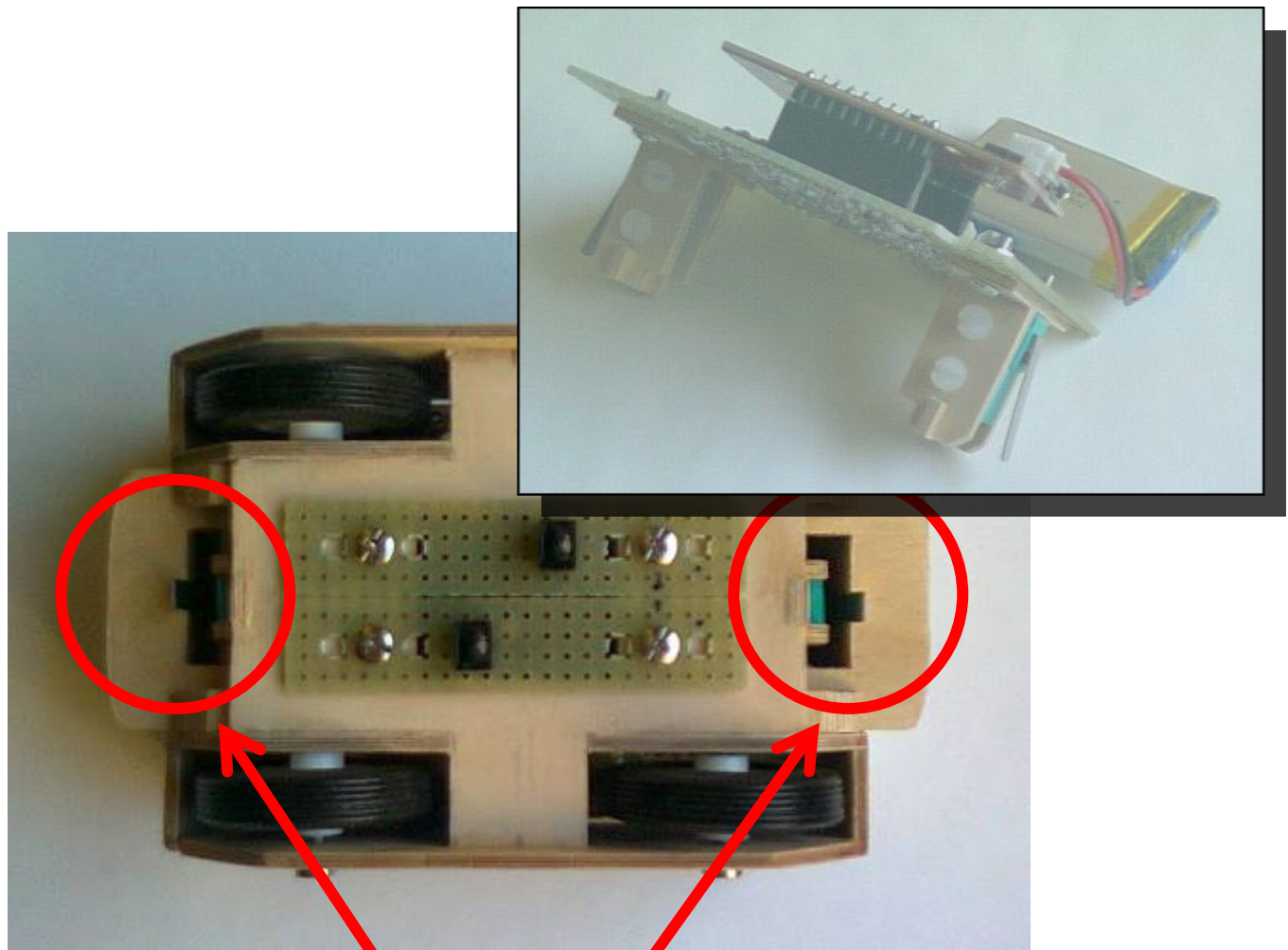


passo = 10 mm
(possibili 0, 5, 10, 15, 20, 25 mm)



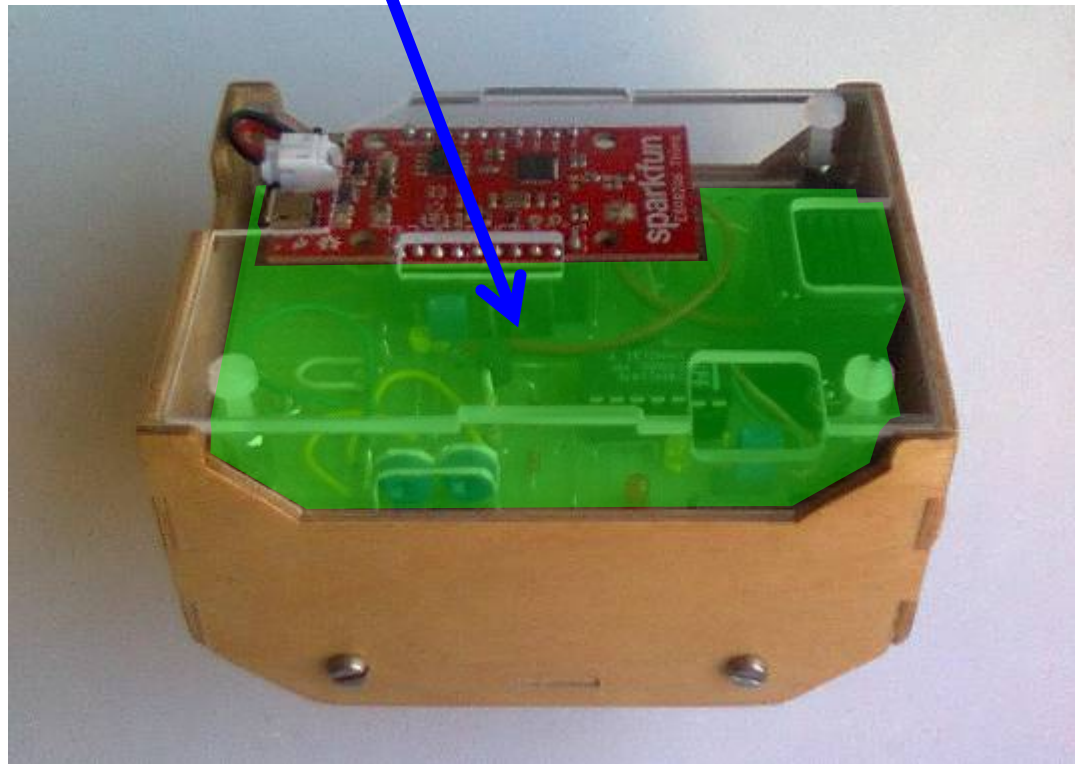
segnale sensore B segnale sensore A

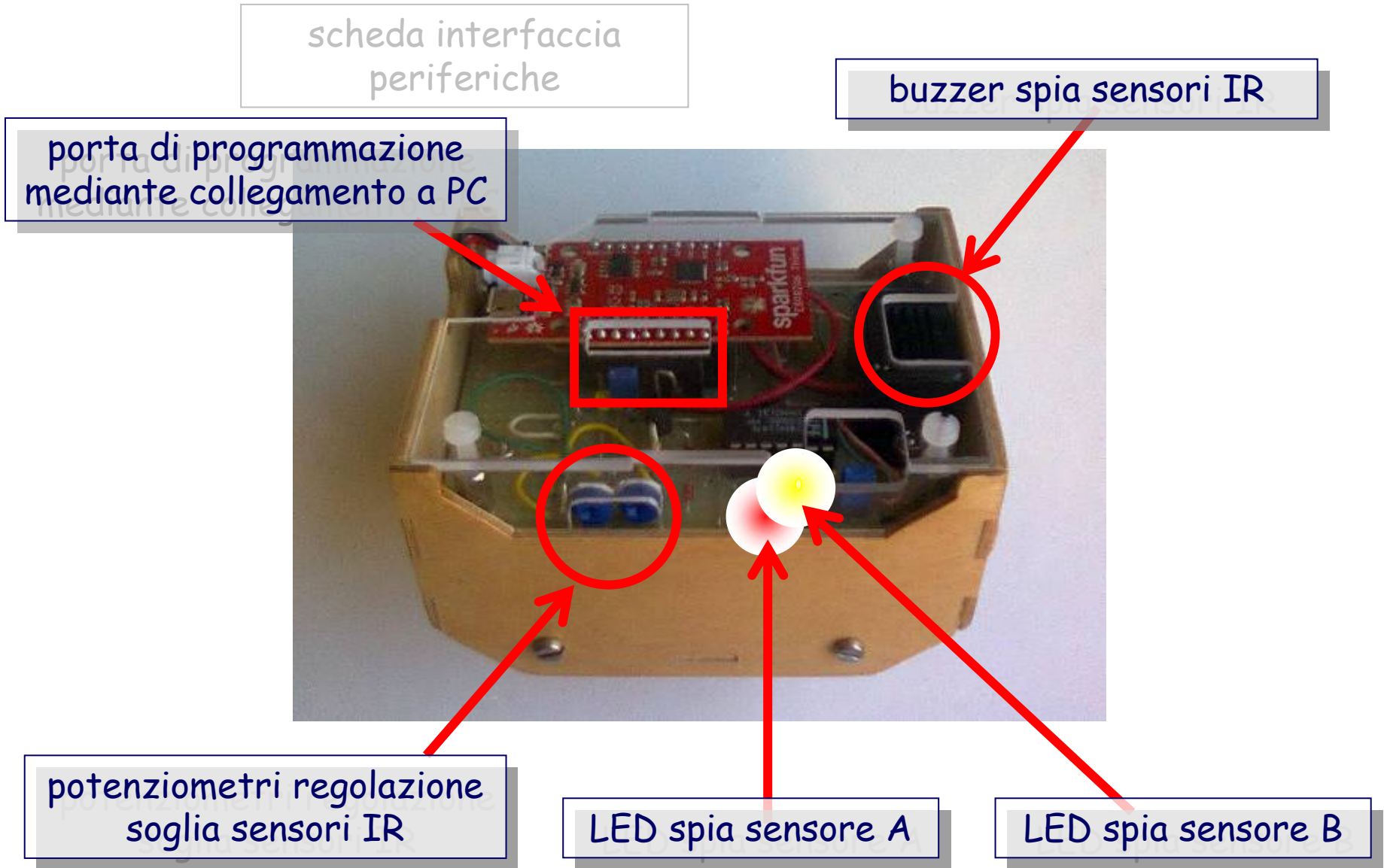




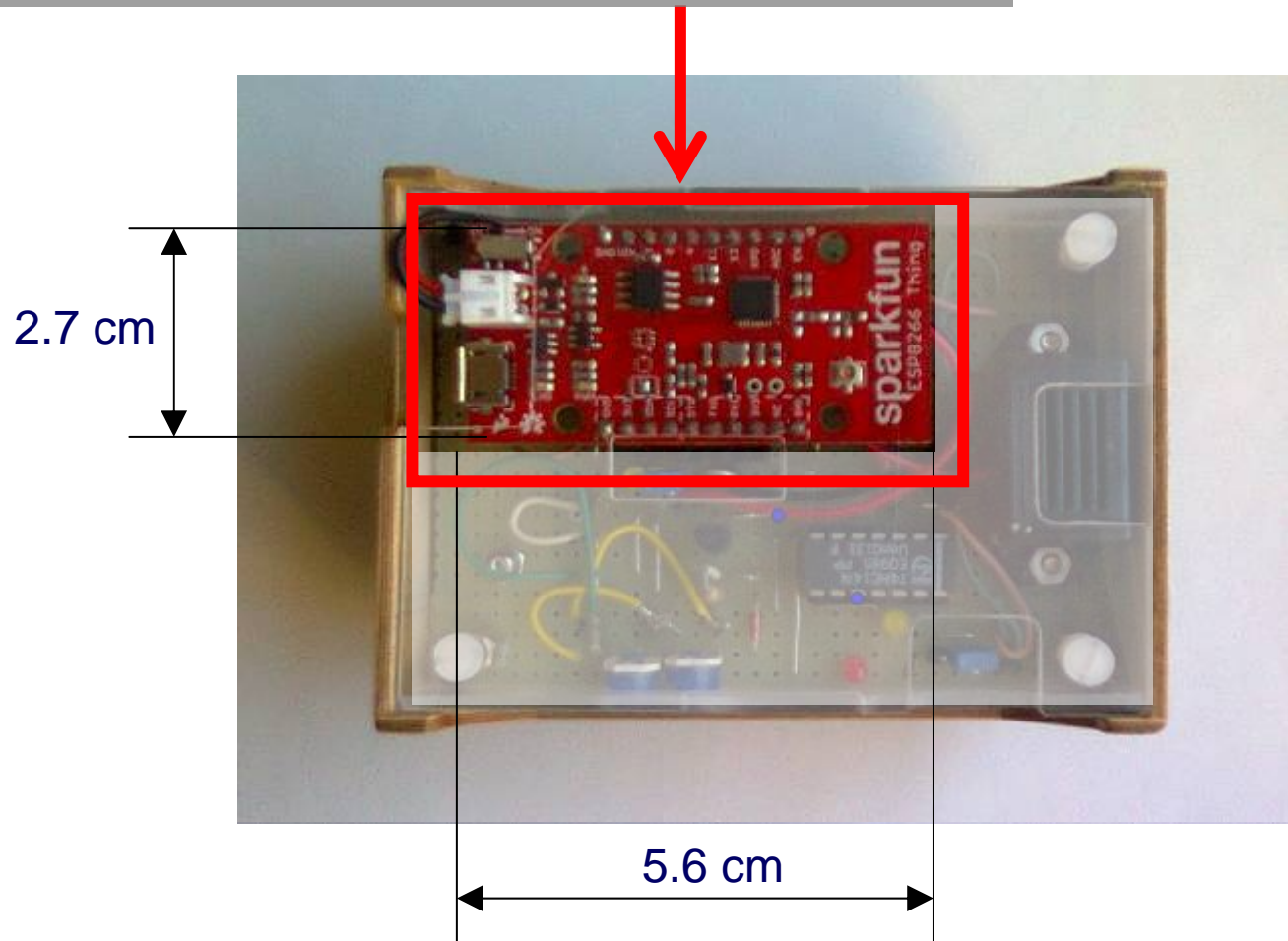
microswitch per rilevare urti anteriori o posteriori
o utilizzabili come pulsanti di Input

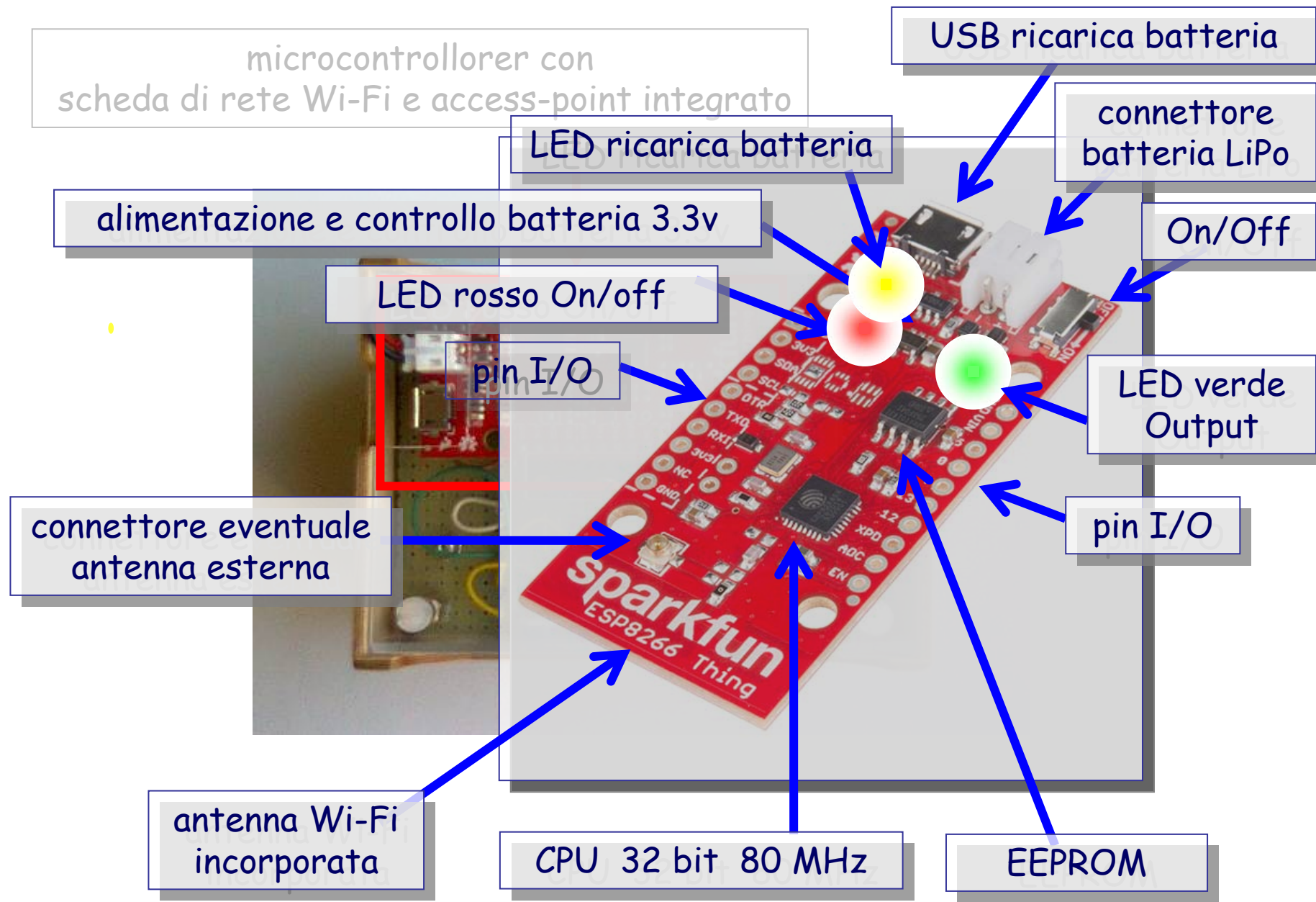
scheda interfaccia
periferiche

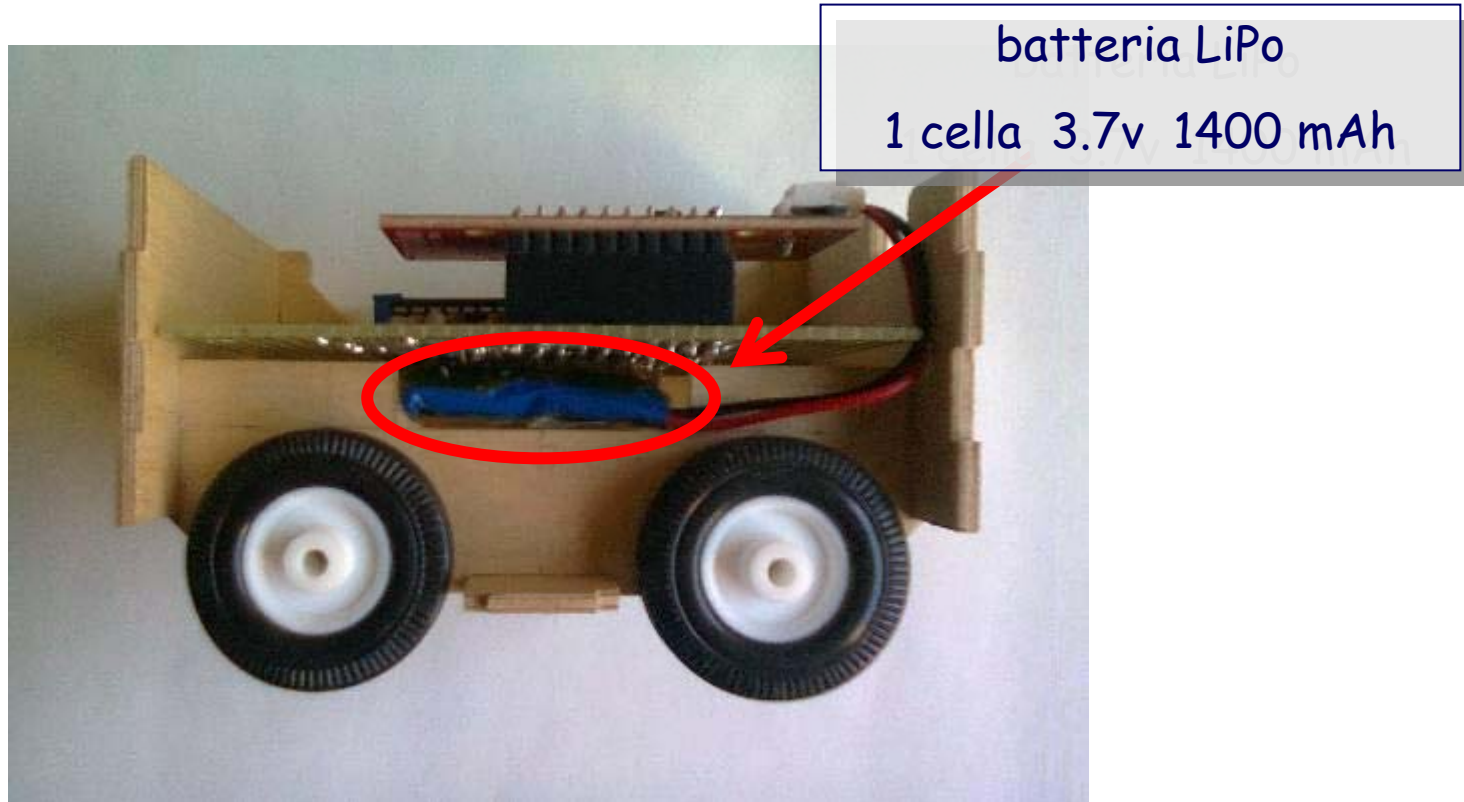




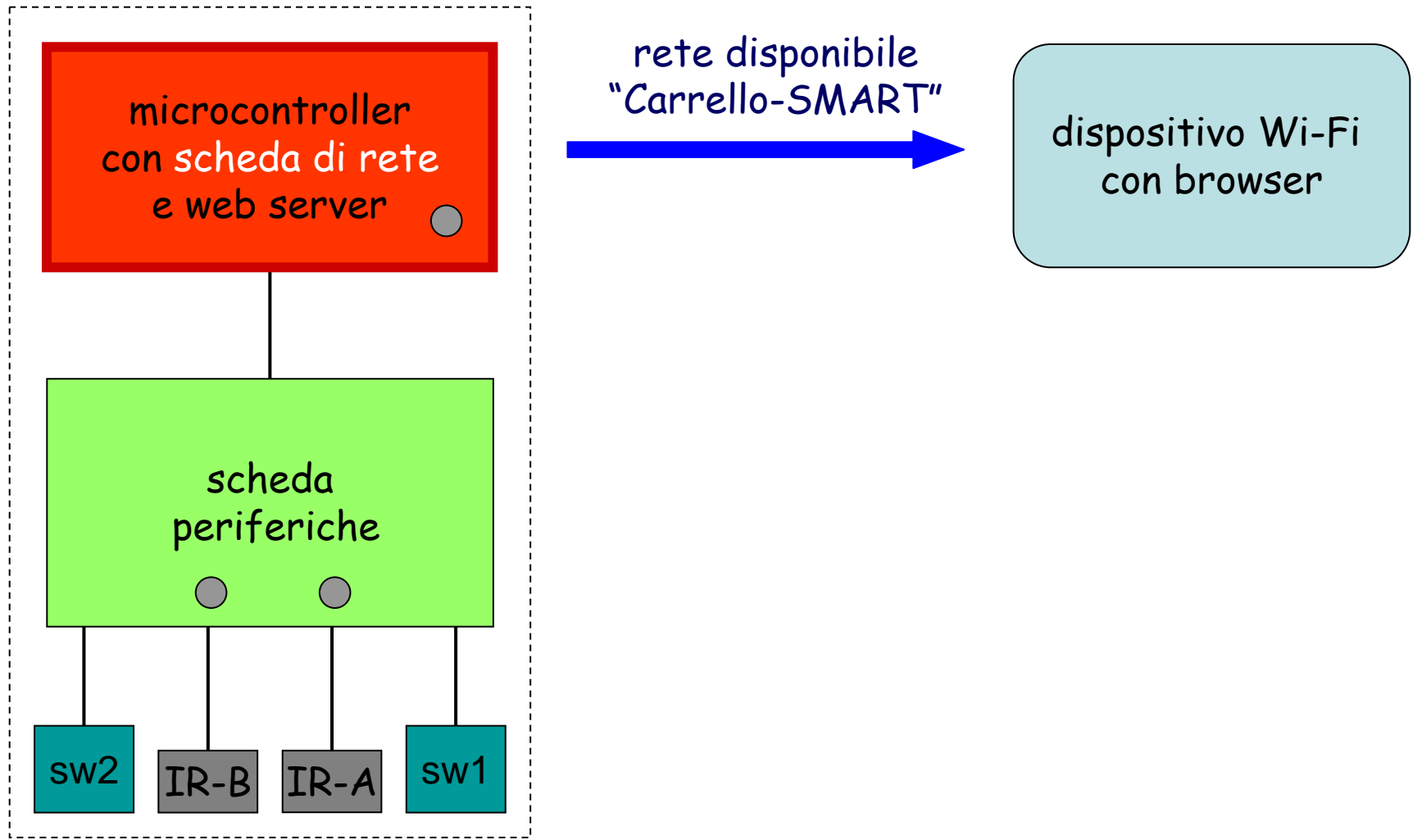
microcontroller con
scheda di rete Wi-Fi e access-point integrato

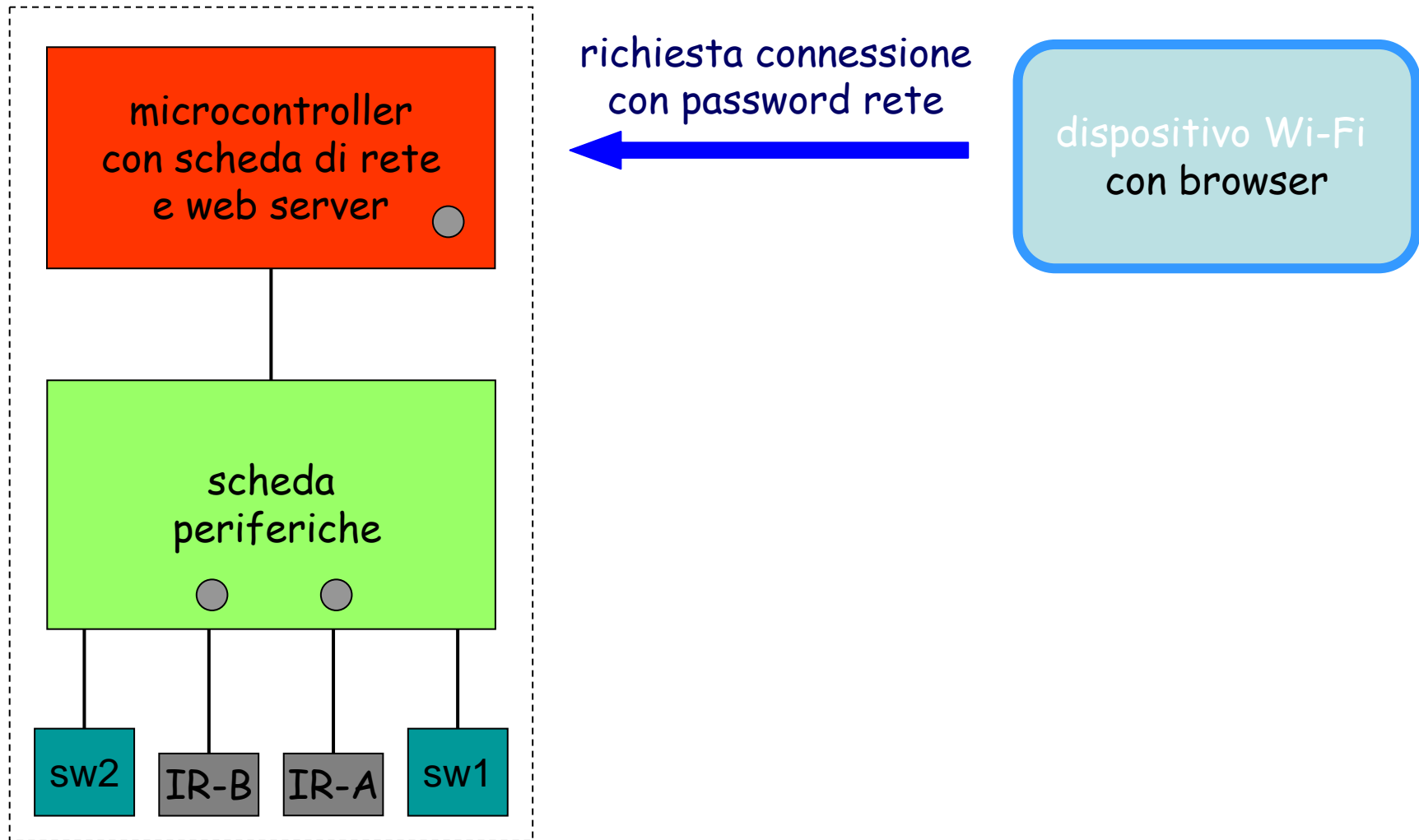


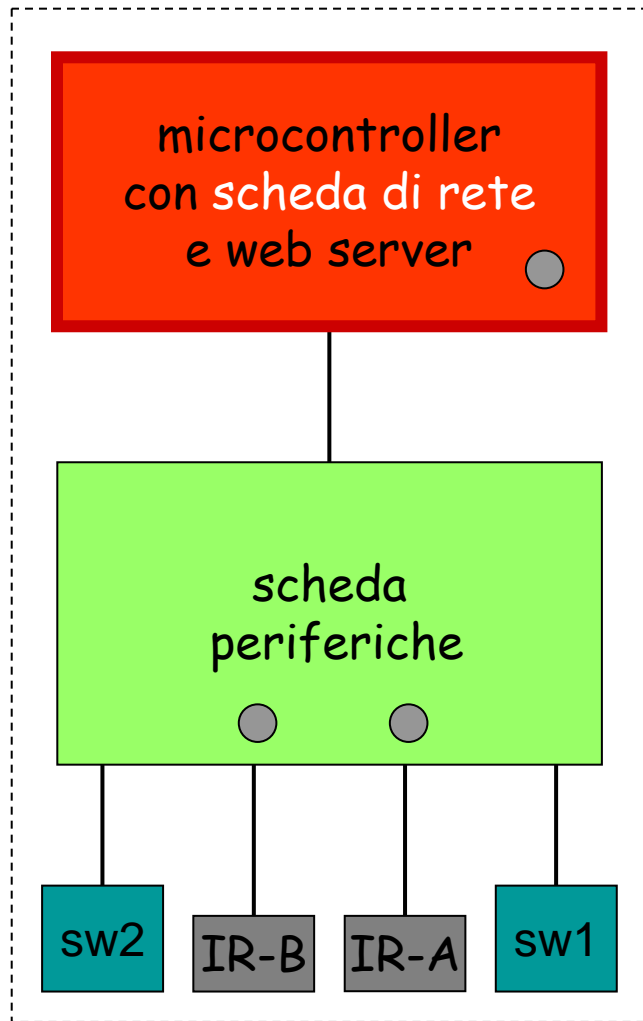




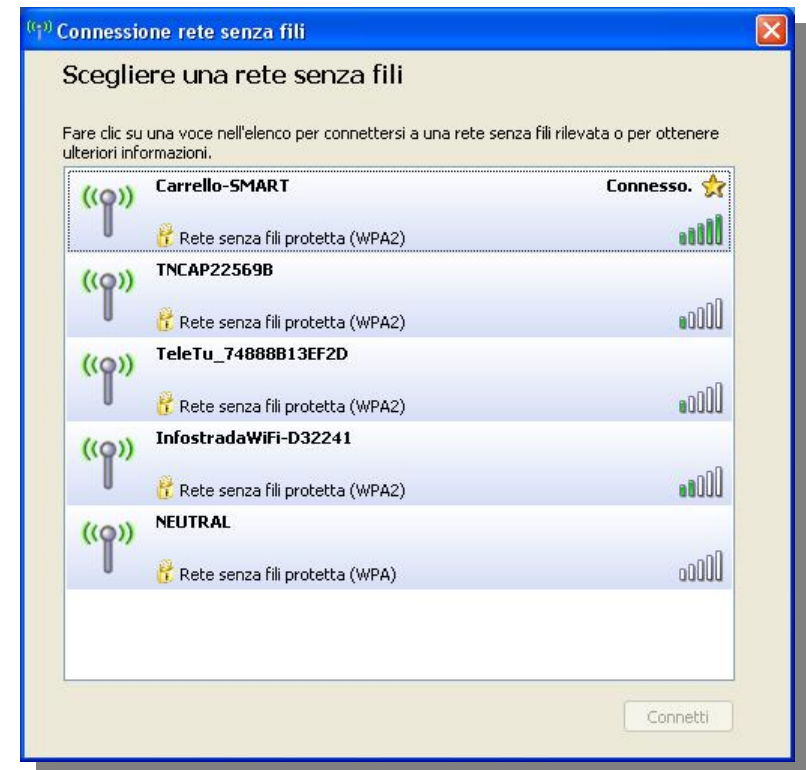
3. Il funzionamento

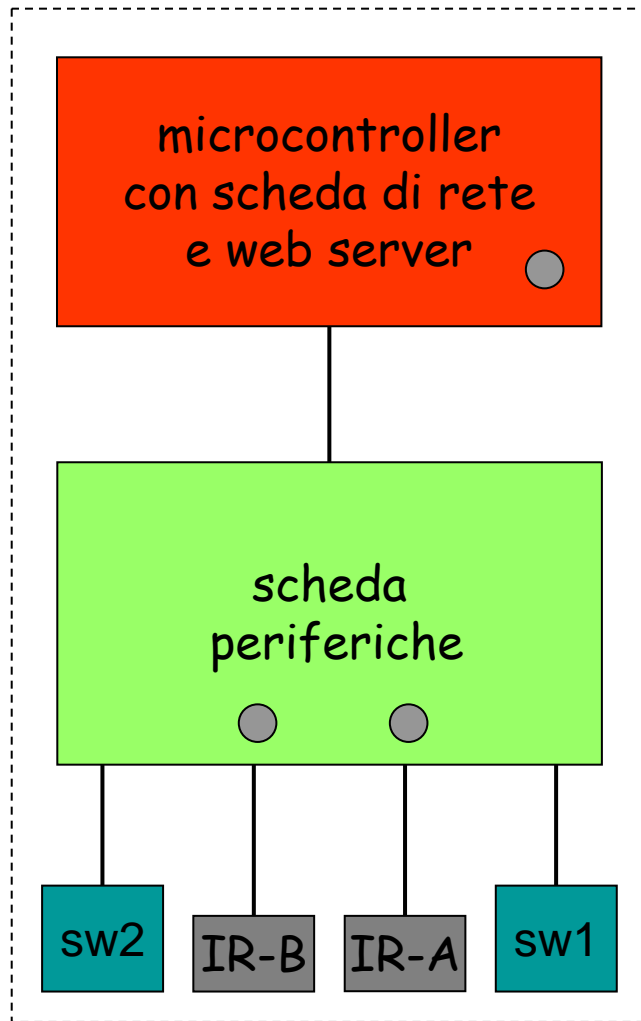






dispositivo Wi-Fi
con browser

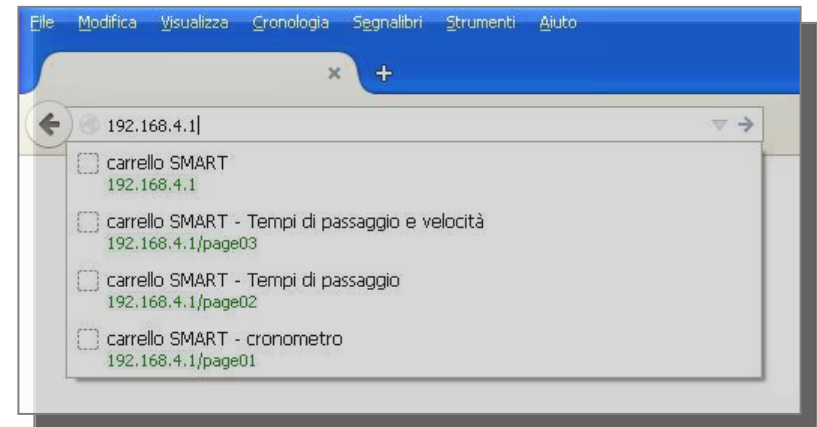


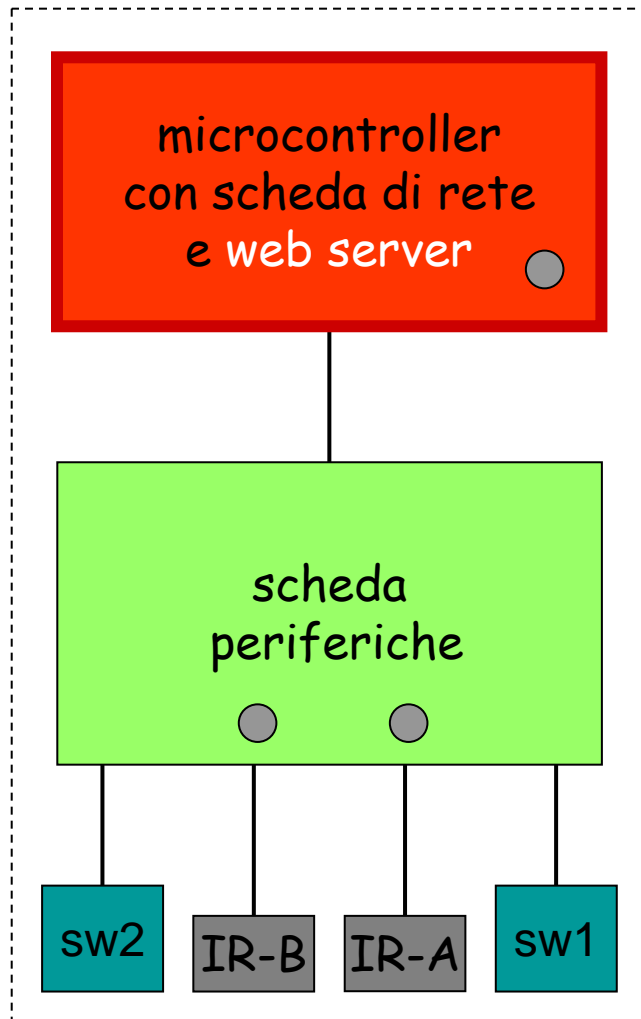


richiesta http
192.168.4.1



dispositivo Wi-Fi
con browser

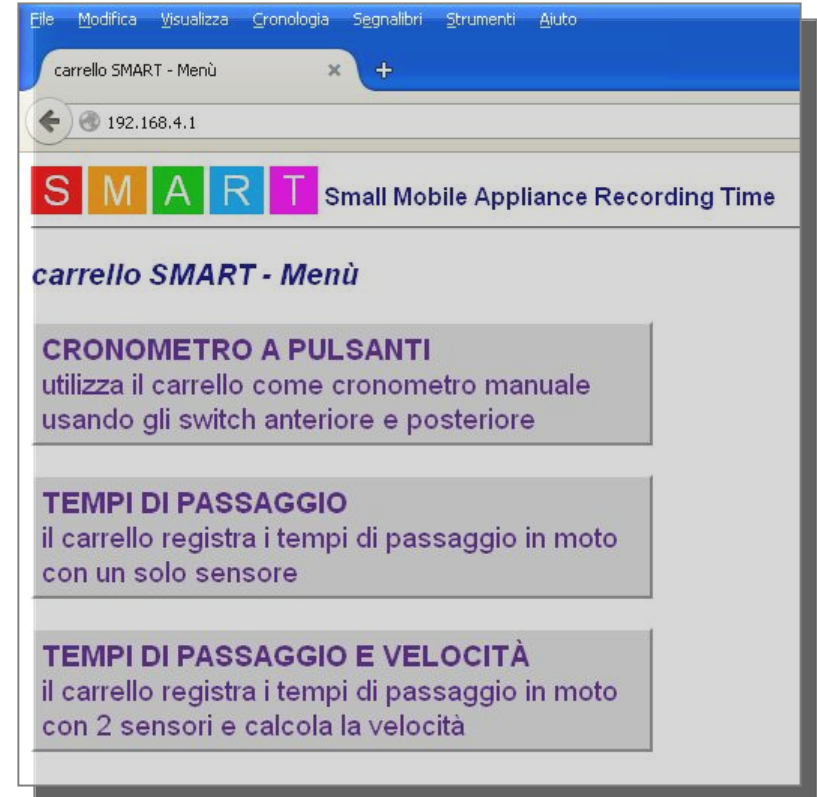


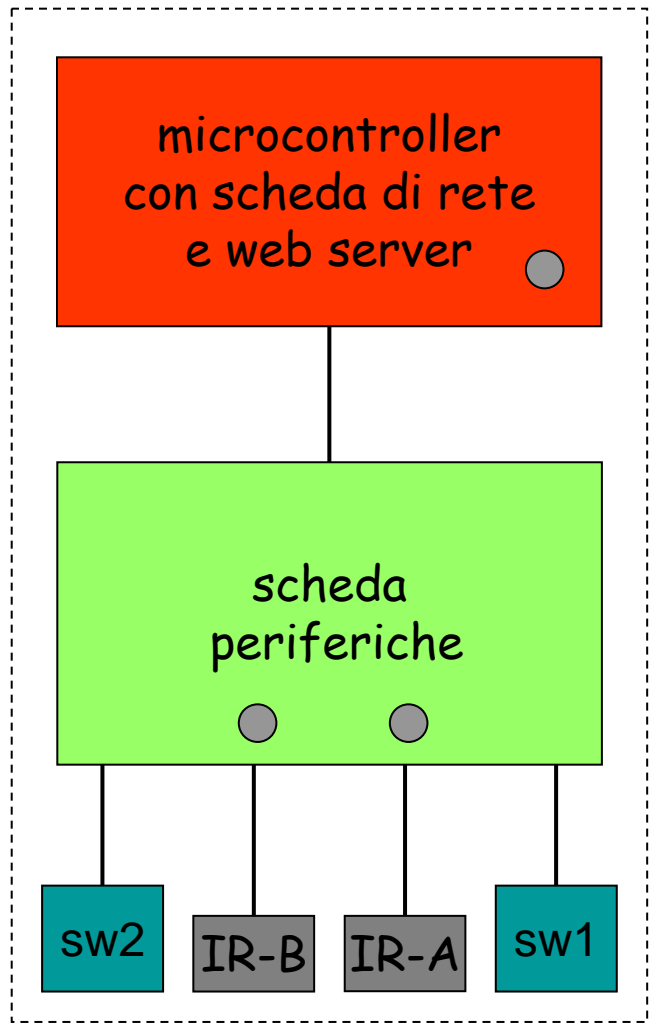


homepage HTML
menù di scelta



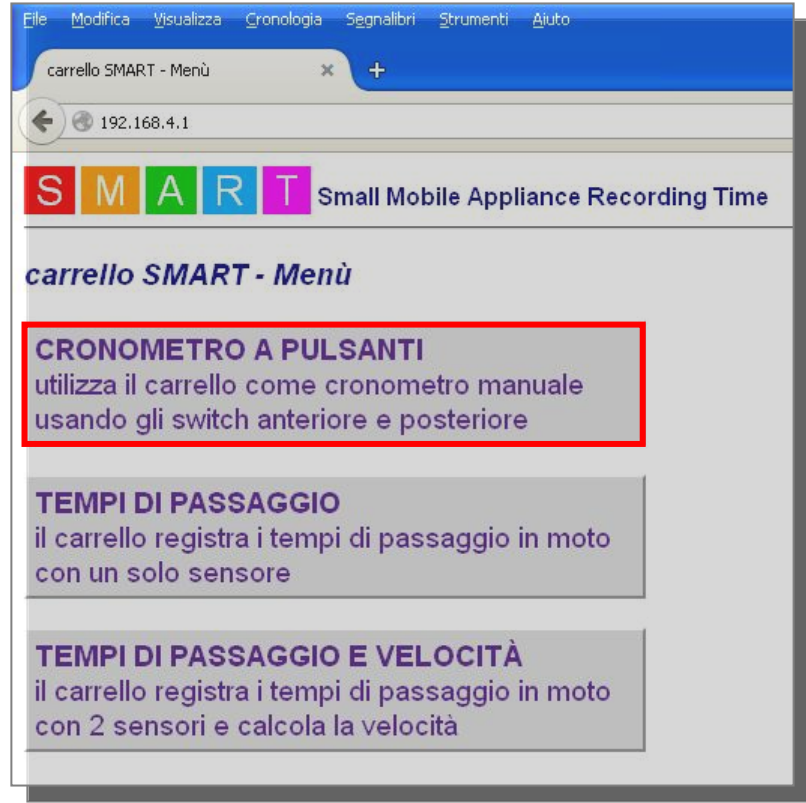
dispositivo Wi-Fi
con browser

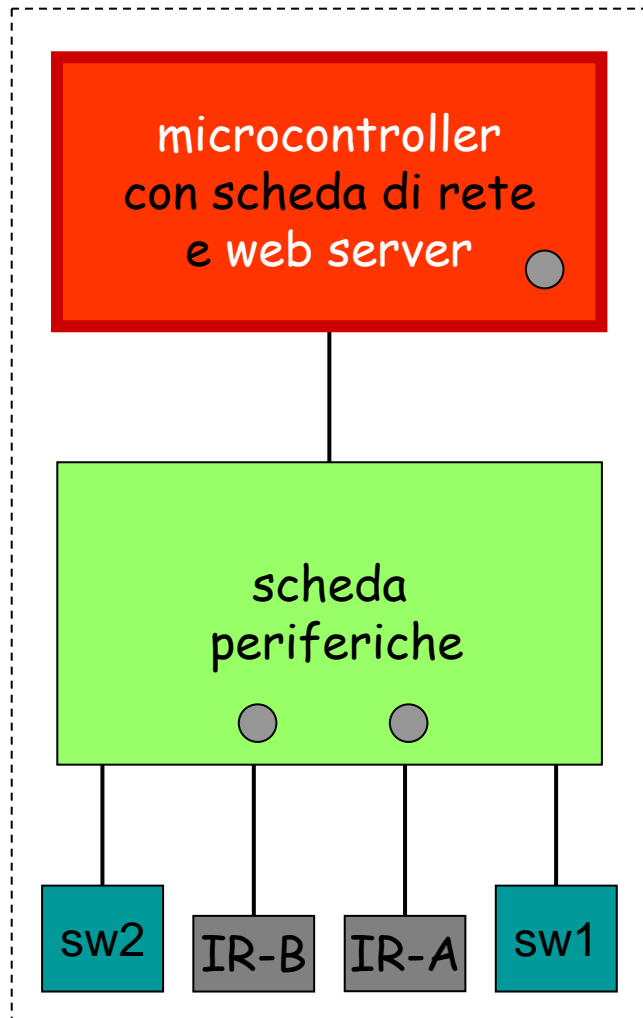




scelta 1
 "cronometro a pulsanti"
 ←

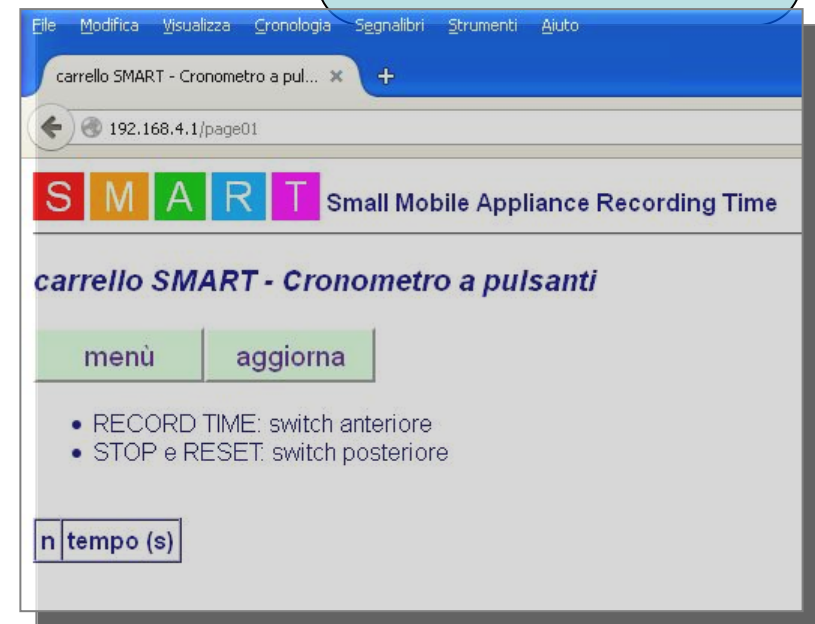
dispositivo Wi-Fi
 con browser

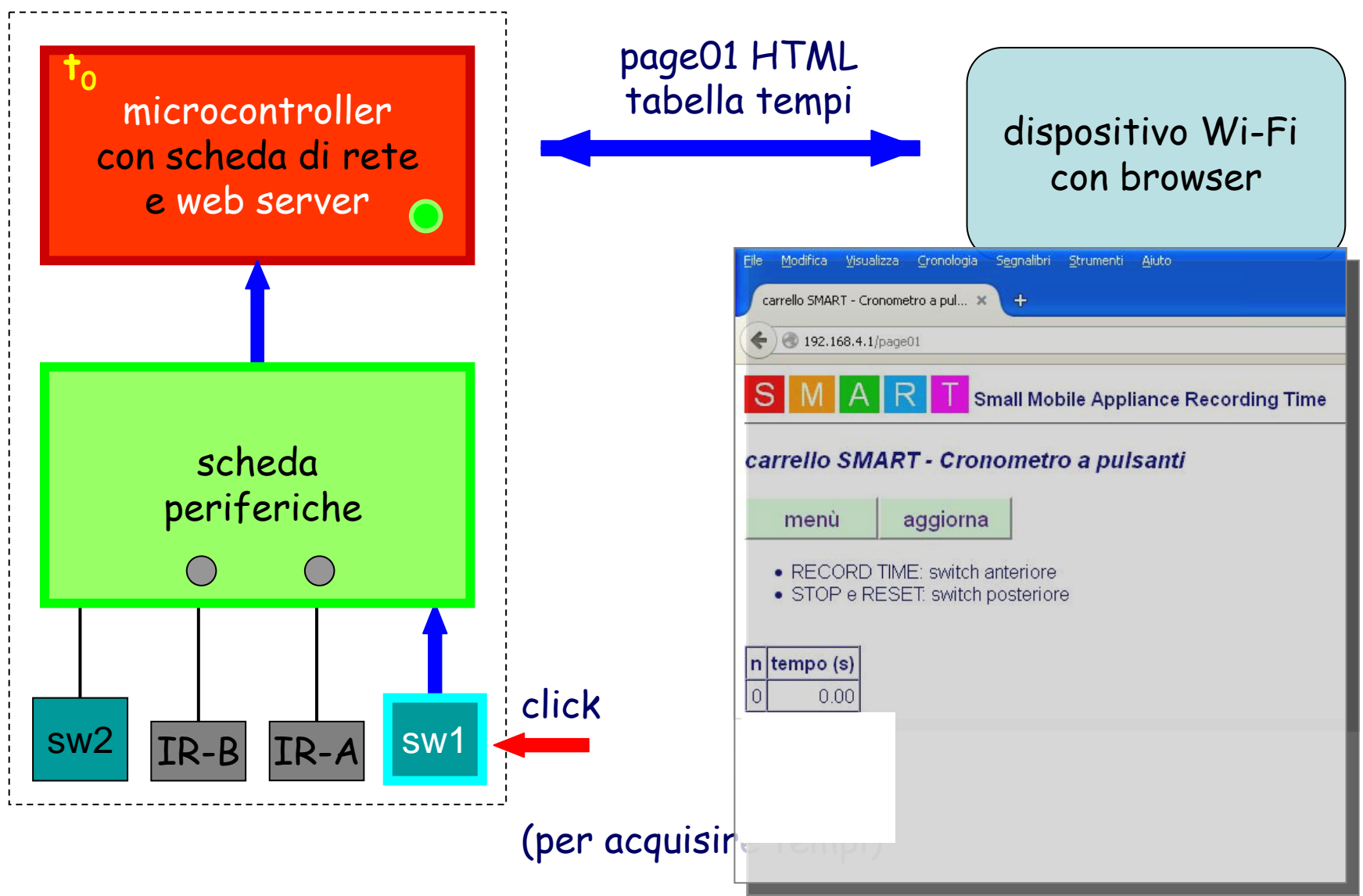


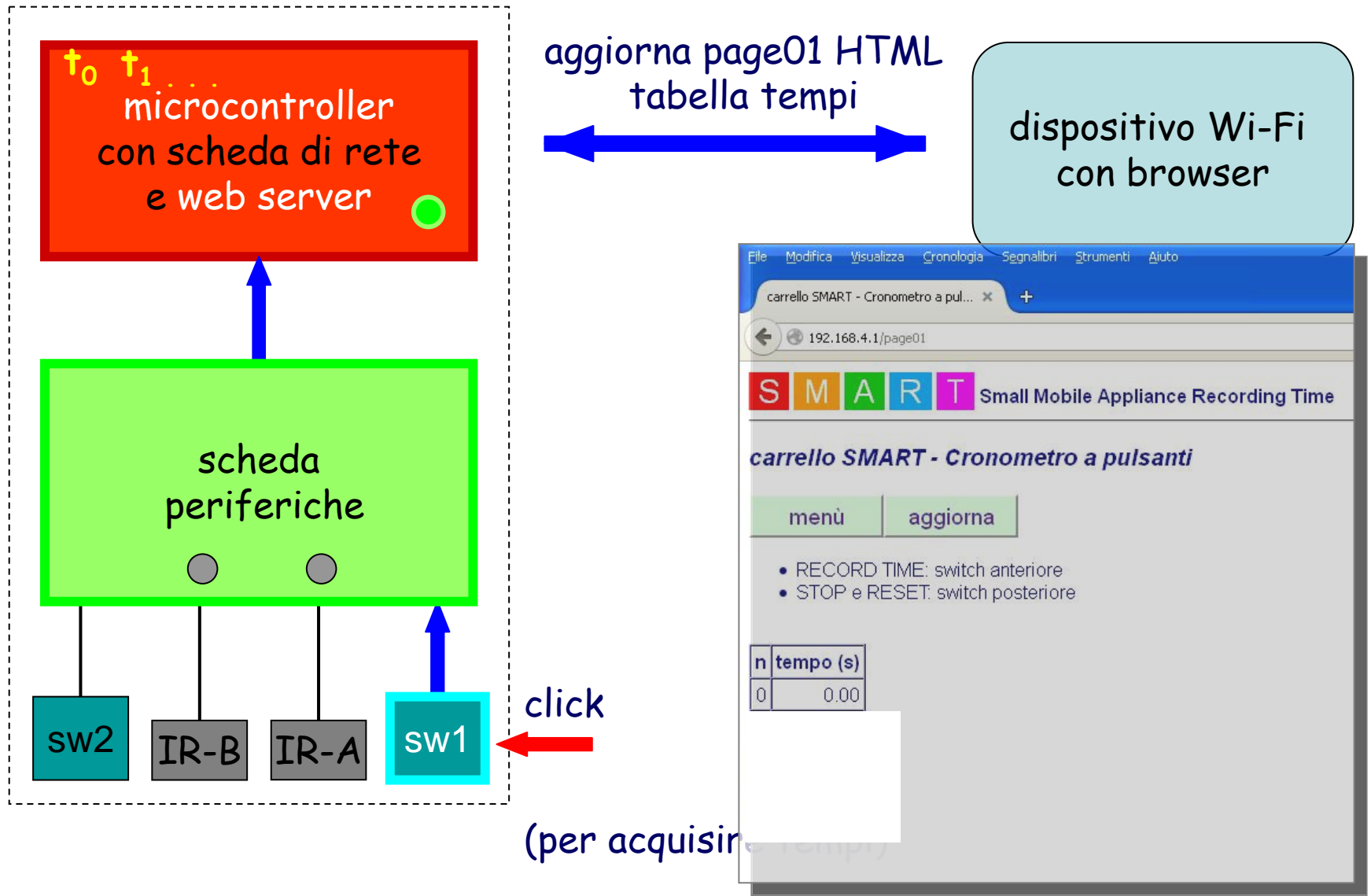


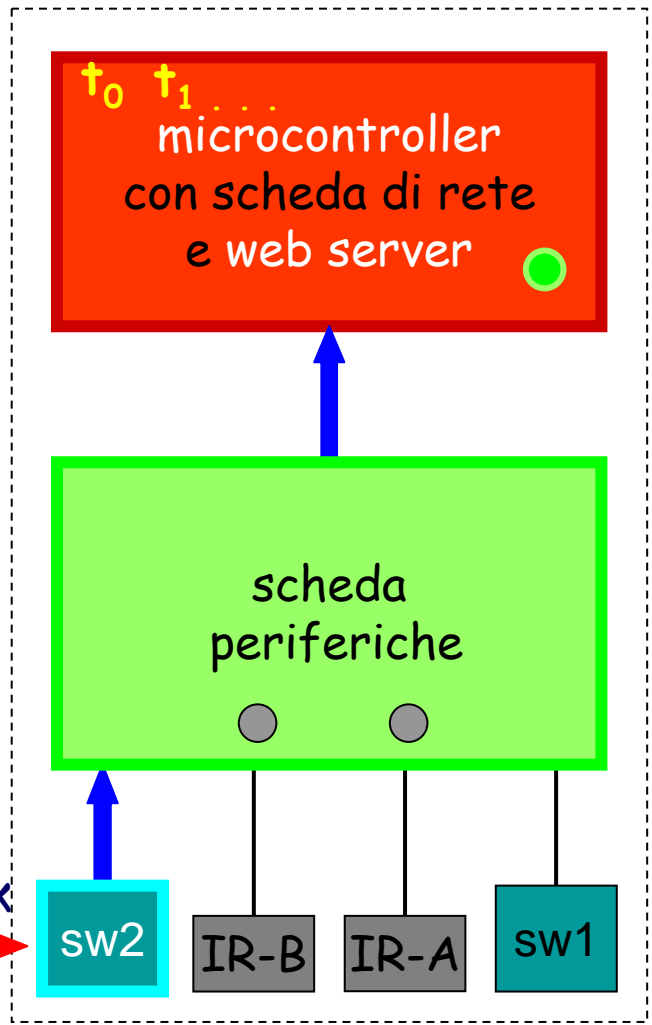
page01 HTML
tabella tempi vuota

dispositivo Wi-Fi con browser







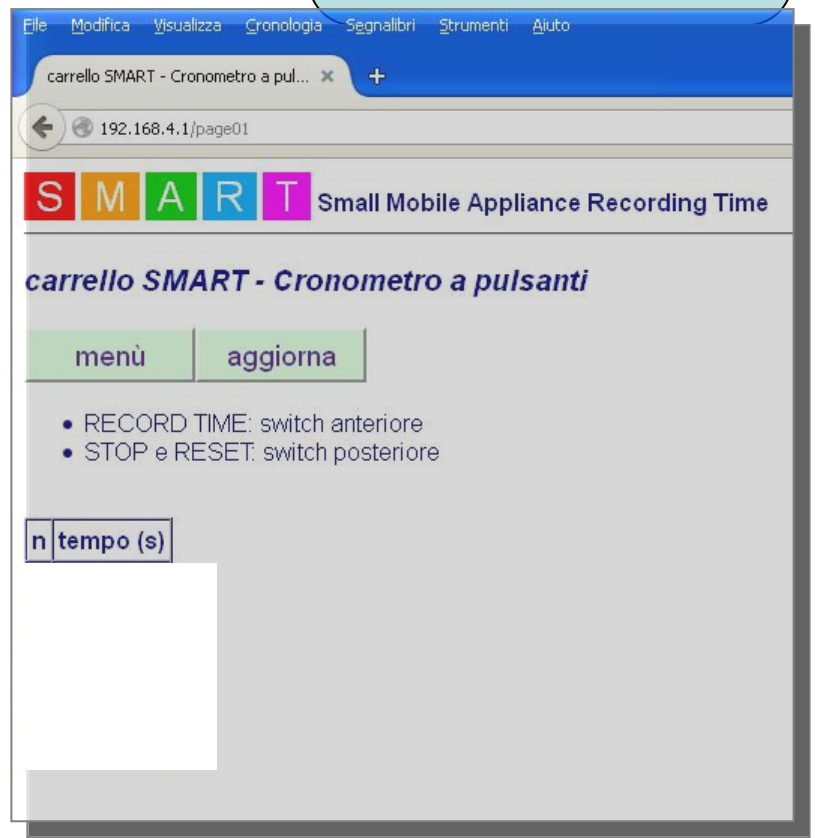


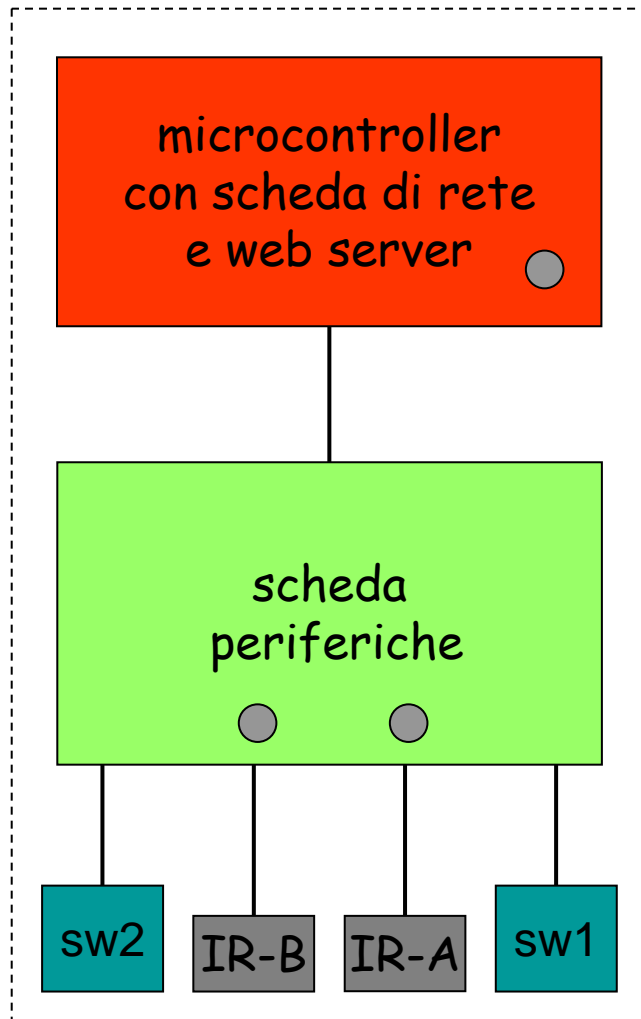
click
 (per resettare)

aggiorna page01 HTML
 tabella tempi vuota



dispositivo Wi-Fi
 con browser

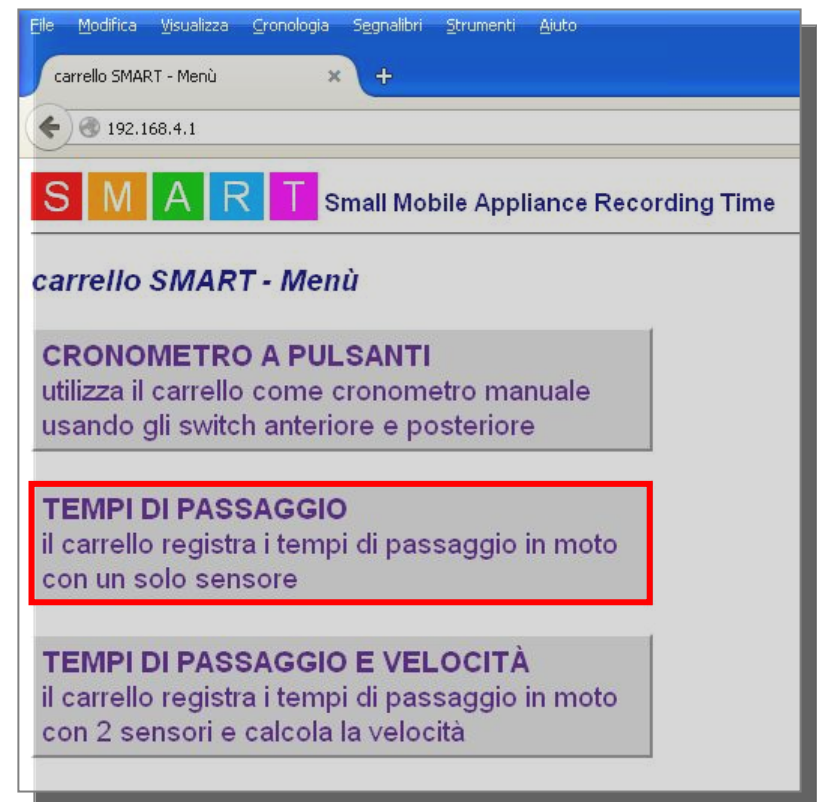


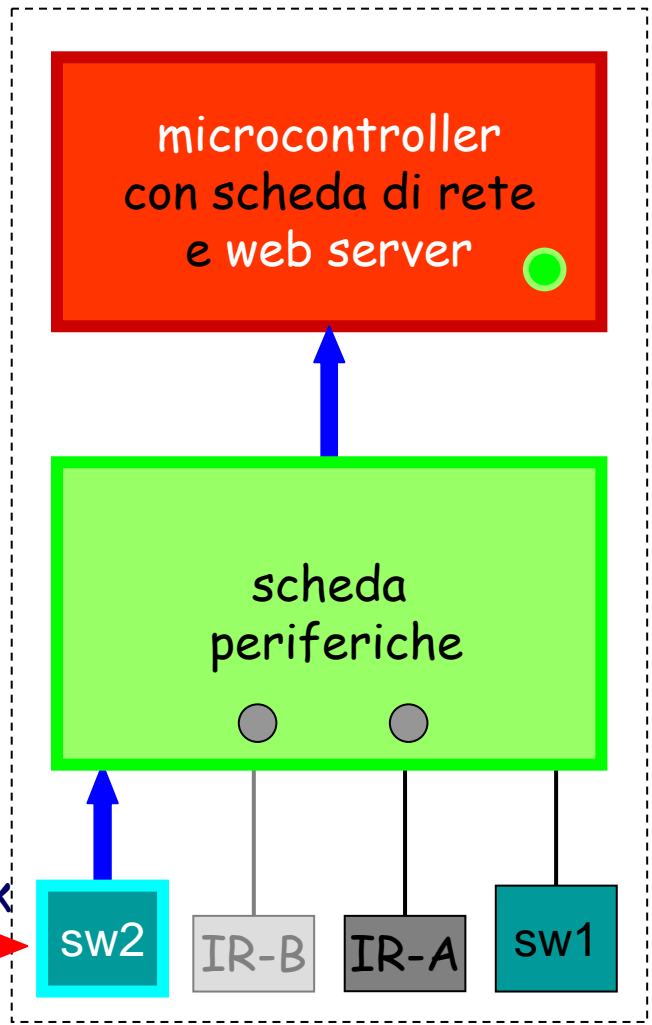


scelta 2
"tempi di passaggio"



dispositivo Wi-Fi
con browser



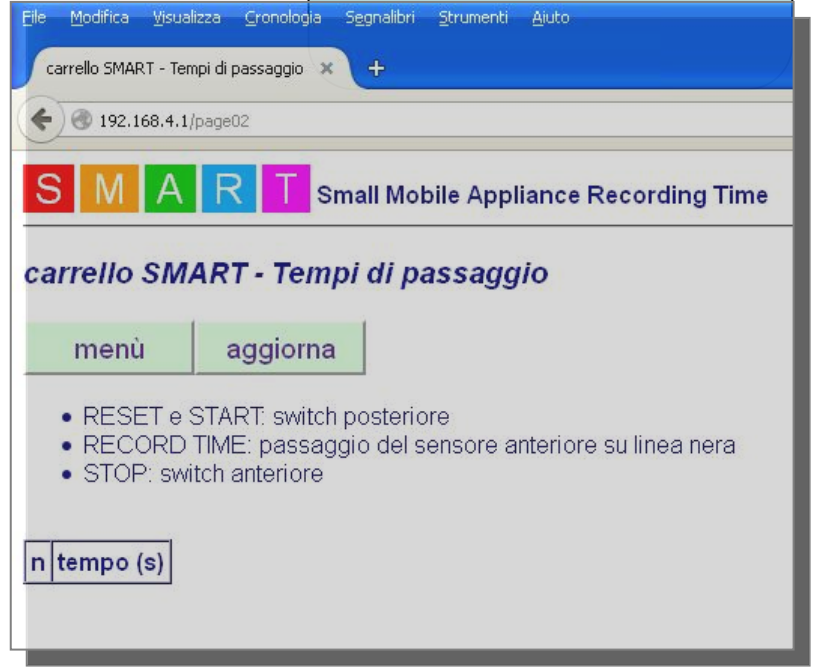


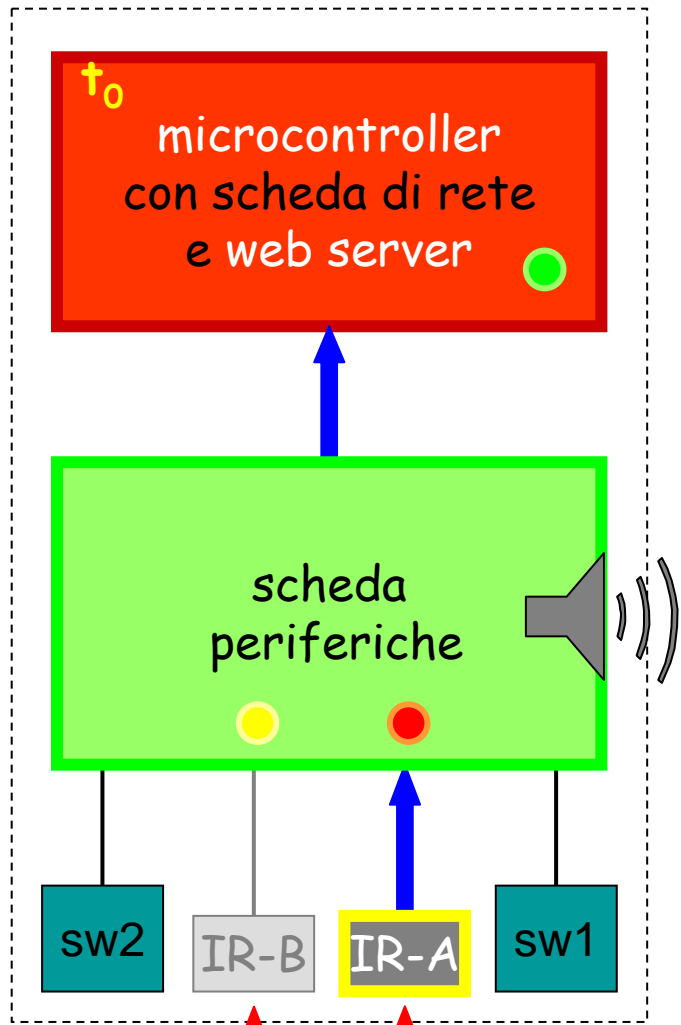
click

(per avviare esperimento)

page02 HTML
tabella tempi vuota

dispositivo Wi-Fi con browser

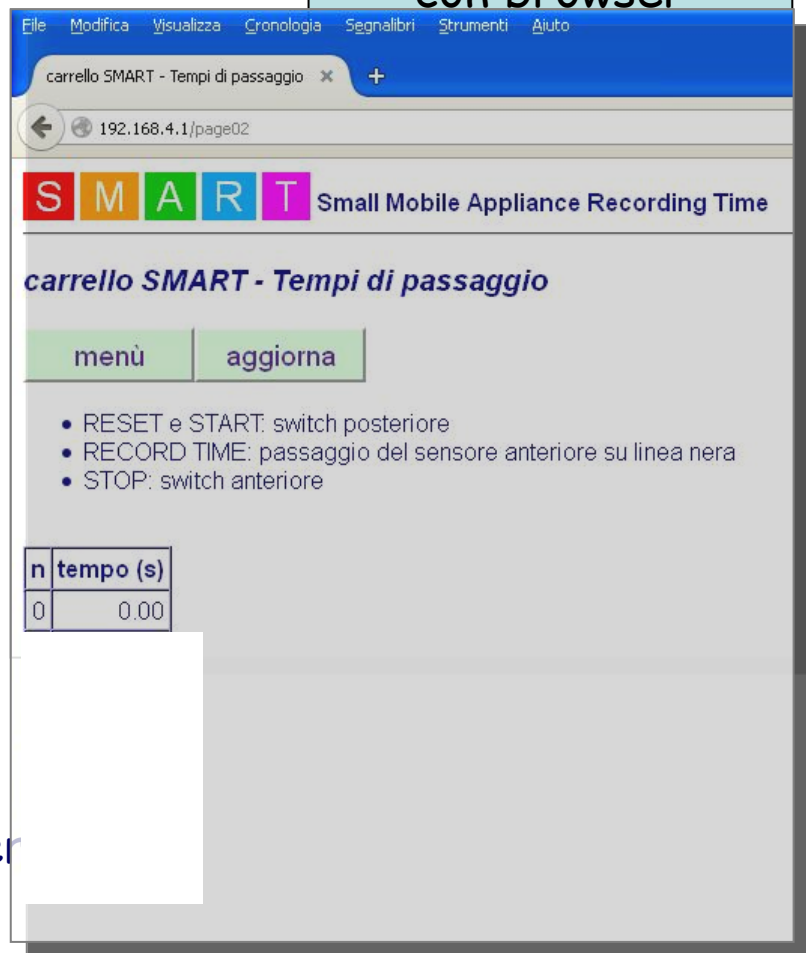




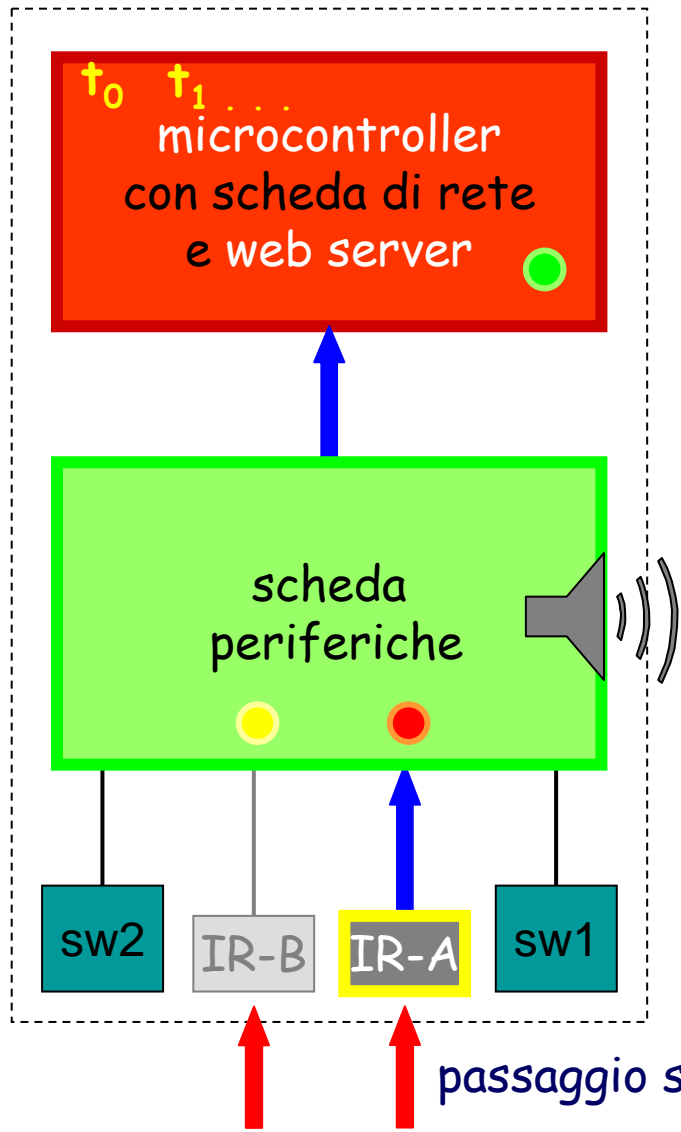
aggiorna page02 HTML
tabella tempi



dispositivo Wi-Fi
con browser



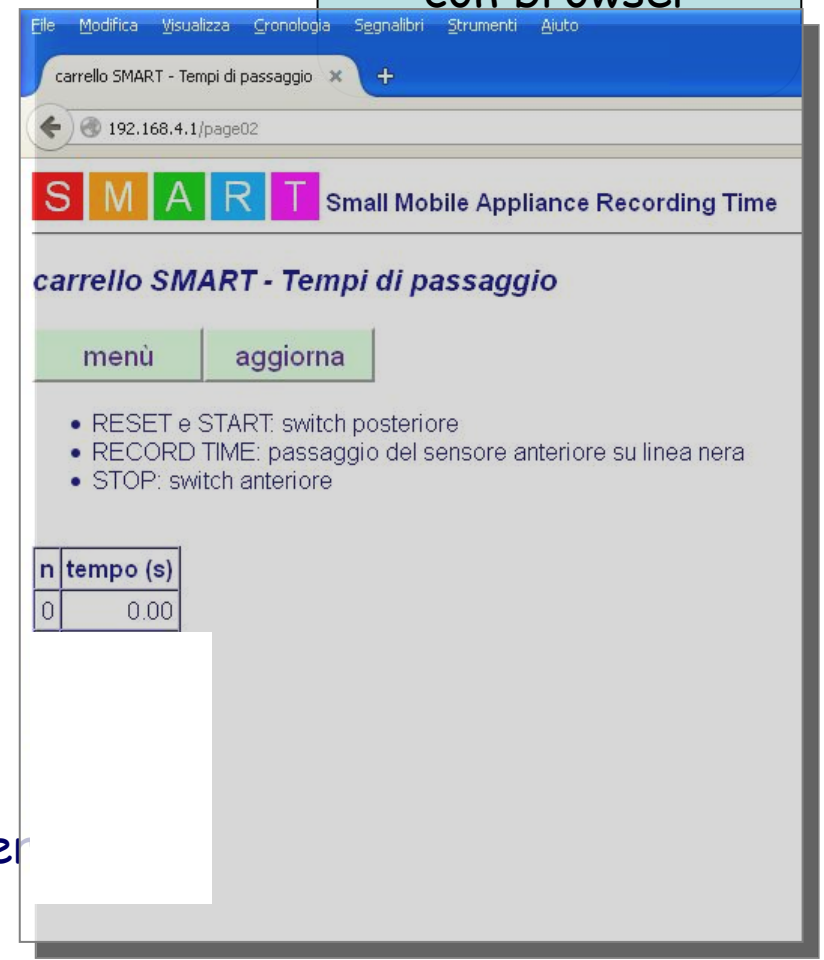
passaggio su tratto nero

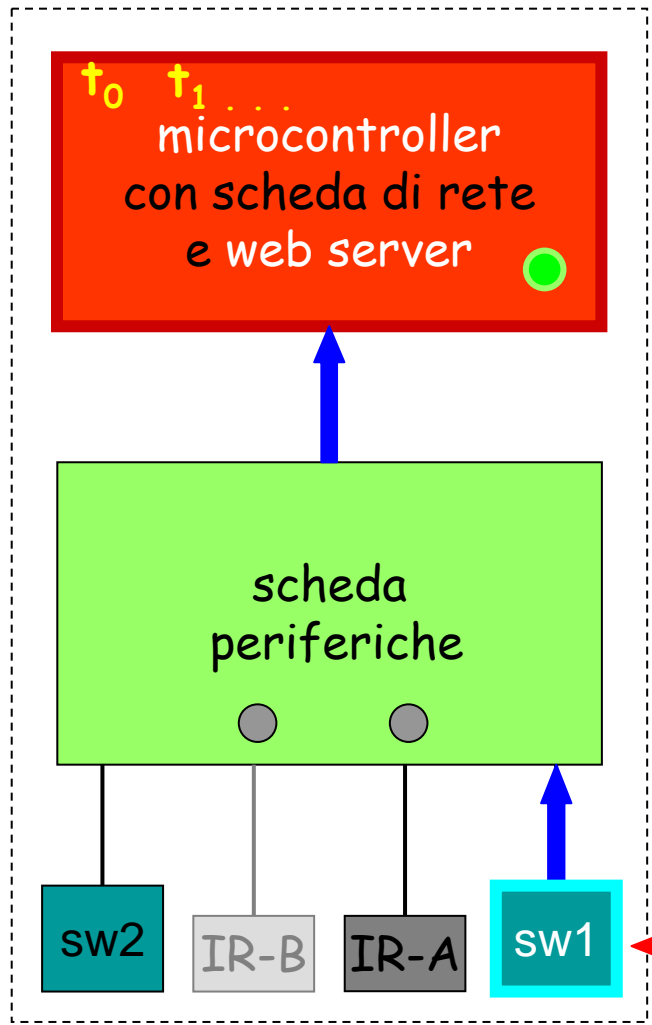


aggiorna page02 HTML
tabella tempi



dispositivo Wi-Fi
con browser

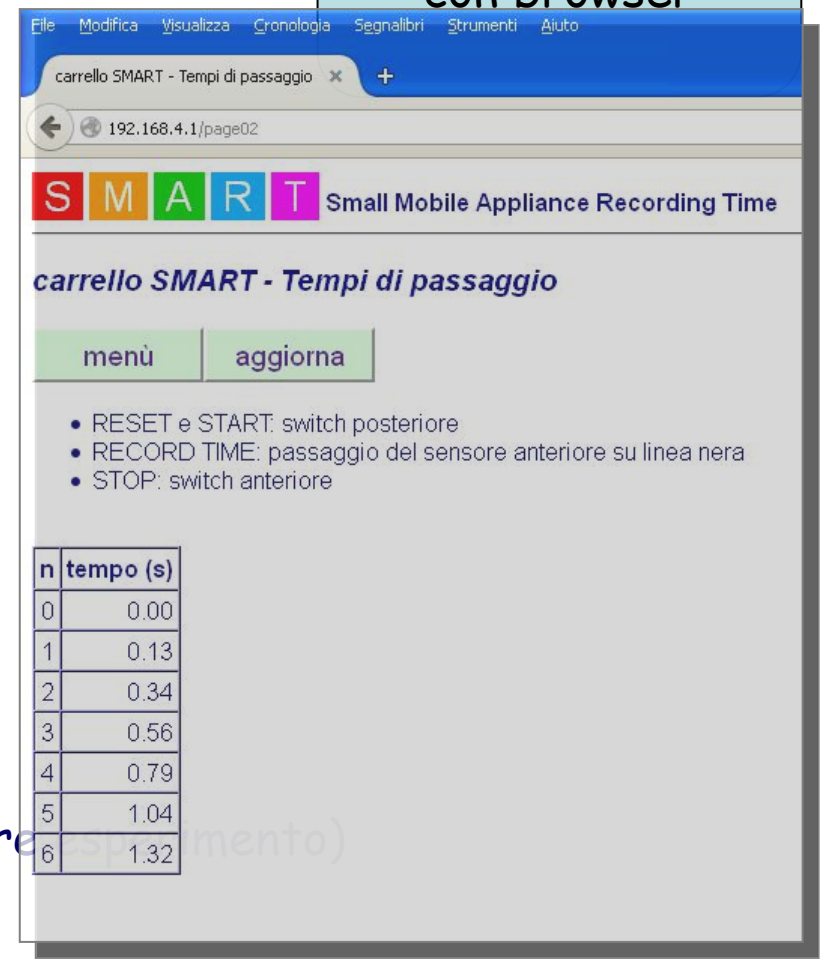




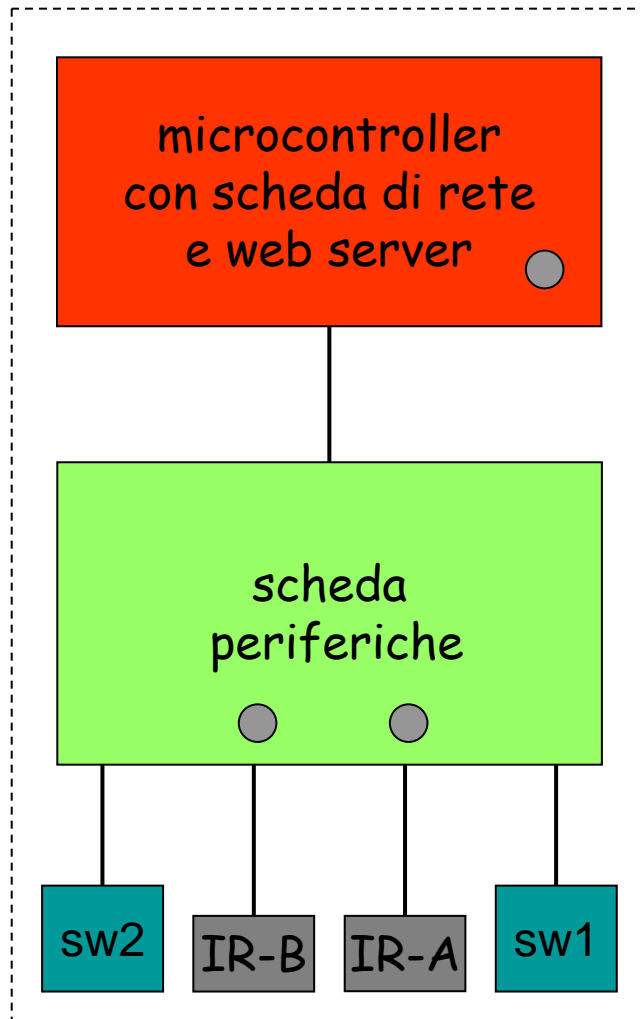
aggiorna page02 HTML
tabella tempi



dispositivo Wi-Fi
con browser



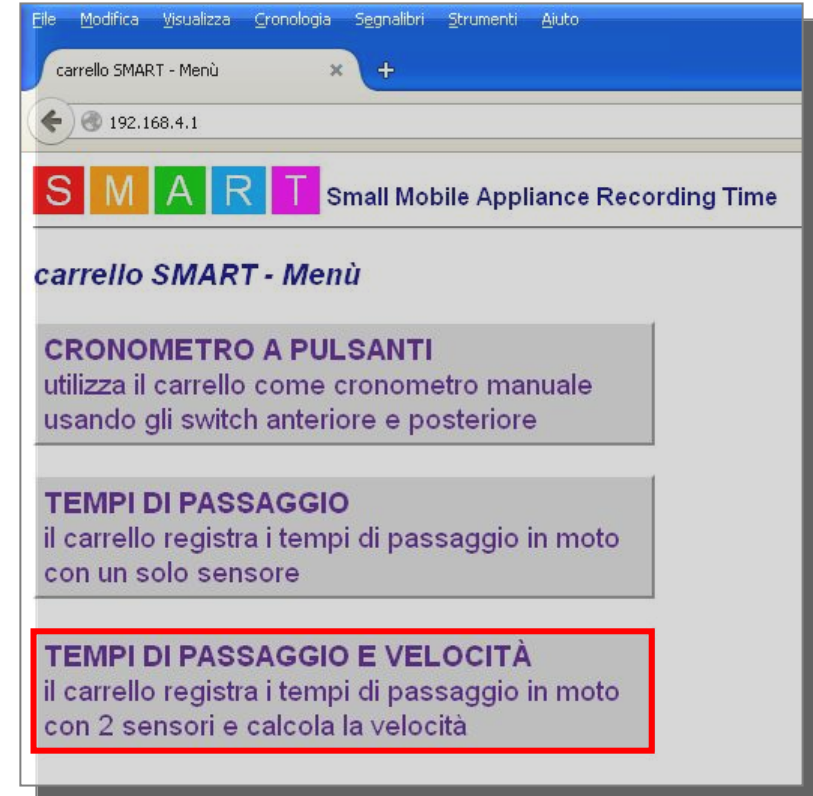
click
(per fermare l'aggiornamento)

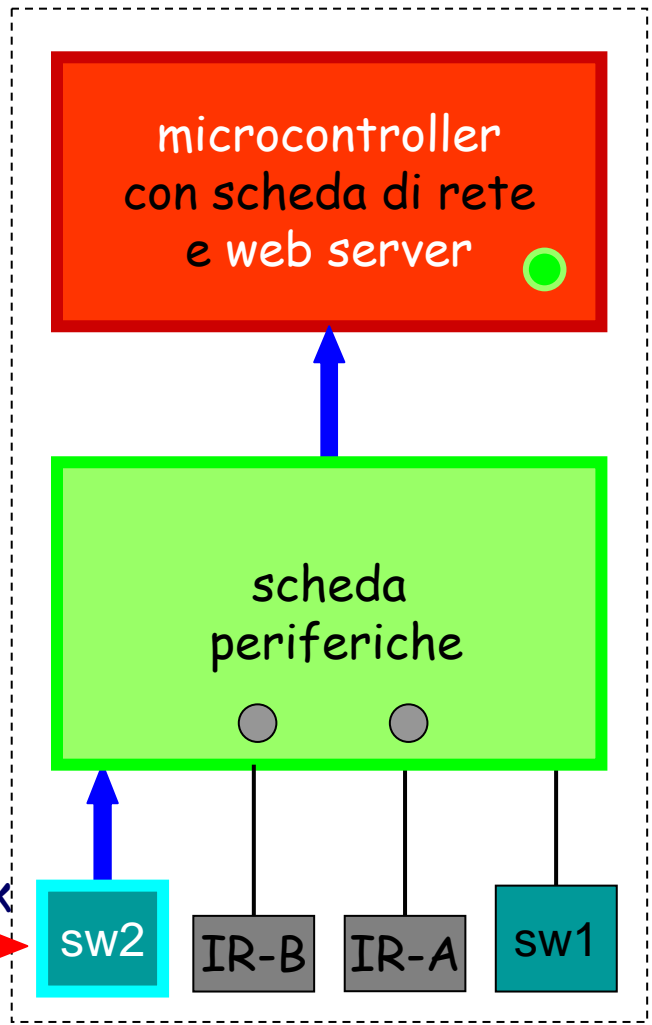


scelta 3
"tempi di passaggio
e velocità"



dispositivo Wi-Fi
con browser





(per avviare esperimento)

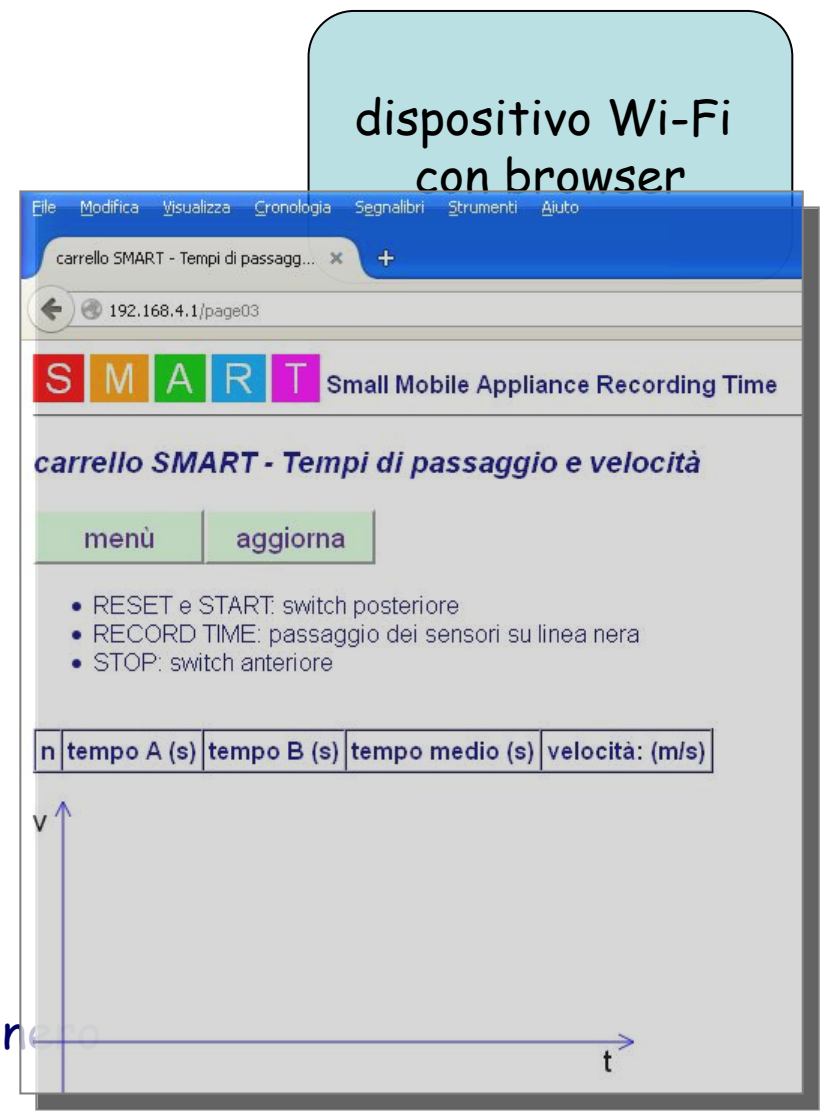
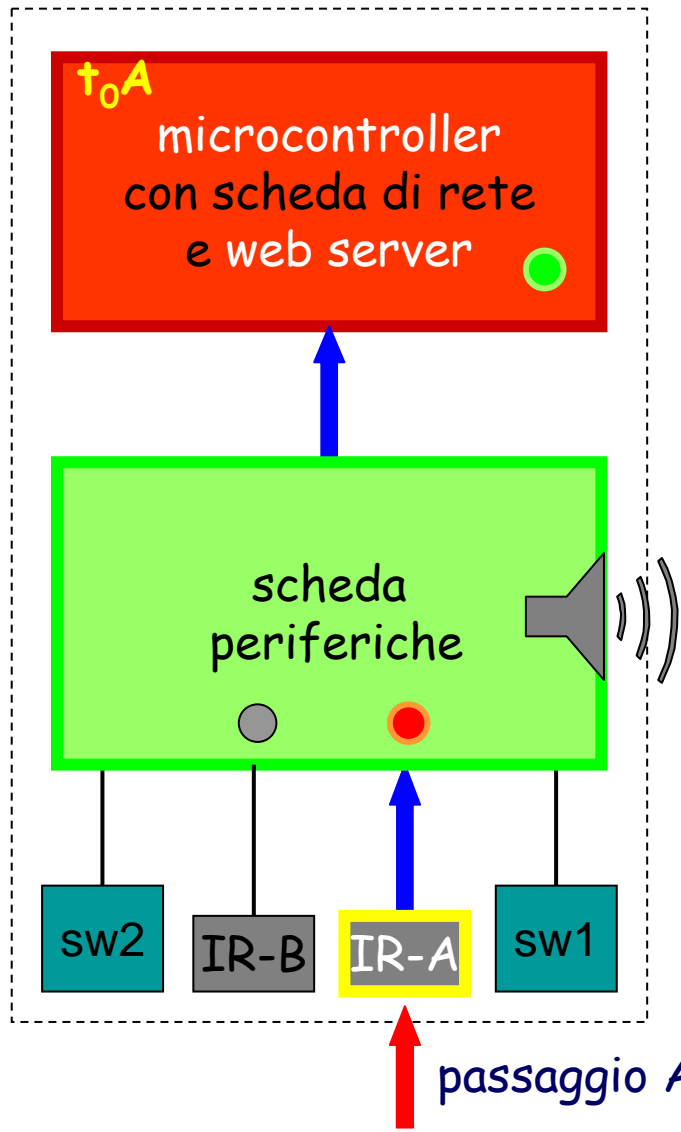
page03 HTML
tabella vuota

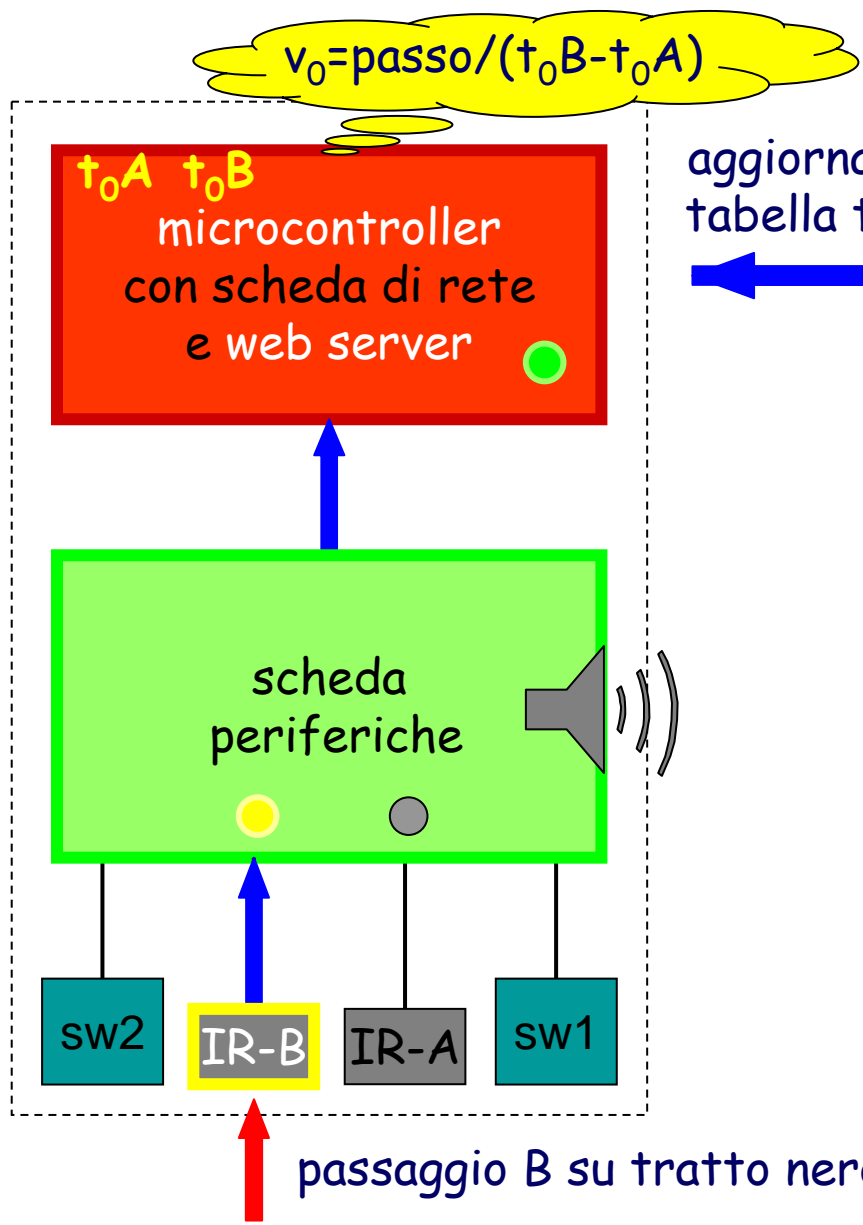
dispositivo Wi-Fi
con browser

The screenshot shows a web browser window with the following content:

- Browser title: carrello SMART - Tempi di passagg...
- Address bar: 192.168.4.1/page03
- Page title: SMART Small Mobile Appliance Recording Time
- Section: carrello SMART - Tempi di passaggio e velocità
- Buttons: menù, aggiorna
- List:
 - RESET e START: switch posteriore
 - RECORD TIME: passaggio dei sensori su linea nera
 - STOP: switch anteriore
- Table:

| n | tempo A (s) | tempo B (s) | tempo medio (s) | velocità: (m/s) |
|---|-------------|-------------|-----------------|-----------------|
| | | | | |
- Graph: A coordinate system with vertical axis 'v' and horizontal axis 't'.





aggiorna page03 HTML
tabella tempi e velocità



dispositivo Wi-Fi
con browser

carrello SMART - Tempi di passaggio e velocità

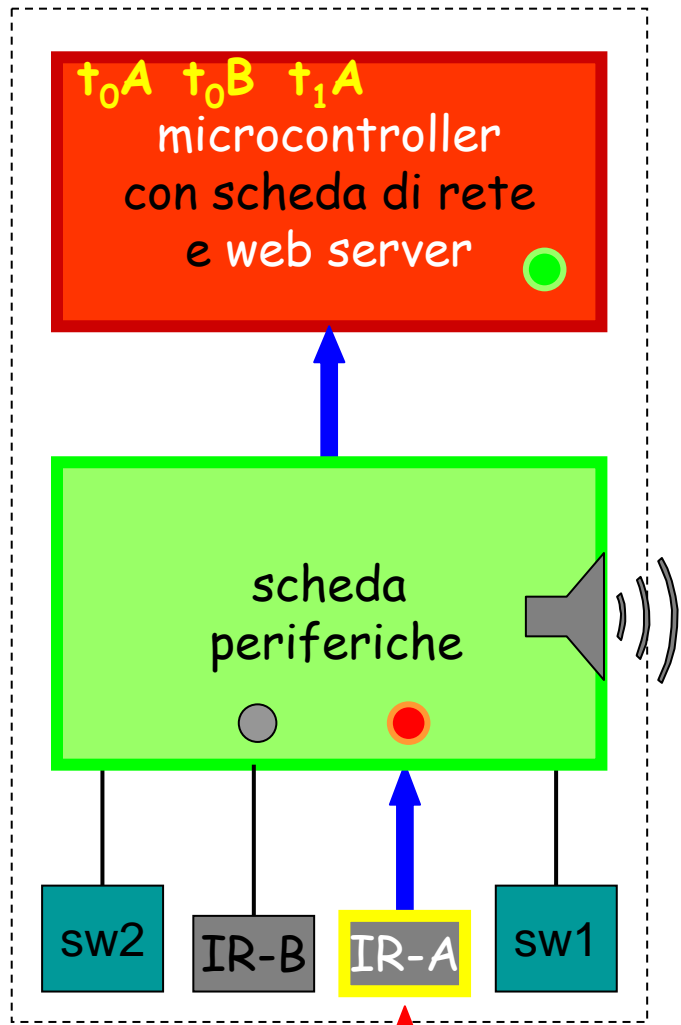
menù aggiorna

- RESET e START: switch posteriore
- RECORD TIME: passaggio dei sensori su linea nera
- STOP: switch anteriore

| n | tempo A (s) | tempo B (s) | tempo medio (s) | velocità: (m/s) |
|---|-------------|-------------|-----------------|-----------------|
| 0 | 0.00 | 0.08 | 0.04 | 0.12 |

v

t



passaggio A su tratto nero

dispositivo Wi-Fi
con browser

carrello SMART - Tempi di passaggio...

192.168.4.1/page03

S M A R T Small Mobile Appliance Recording Time

carrello SMART - Tempi di passaggio e velocità

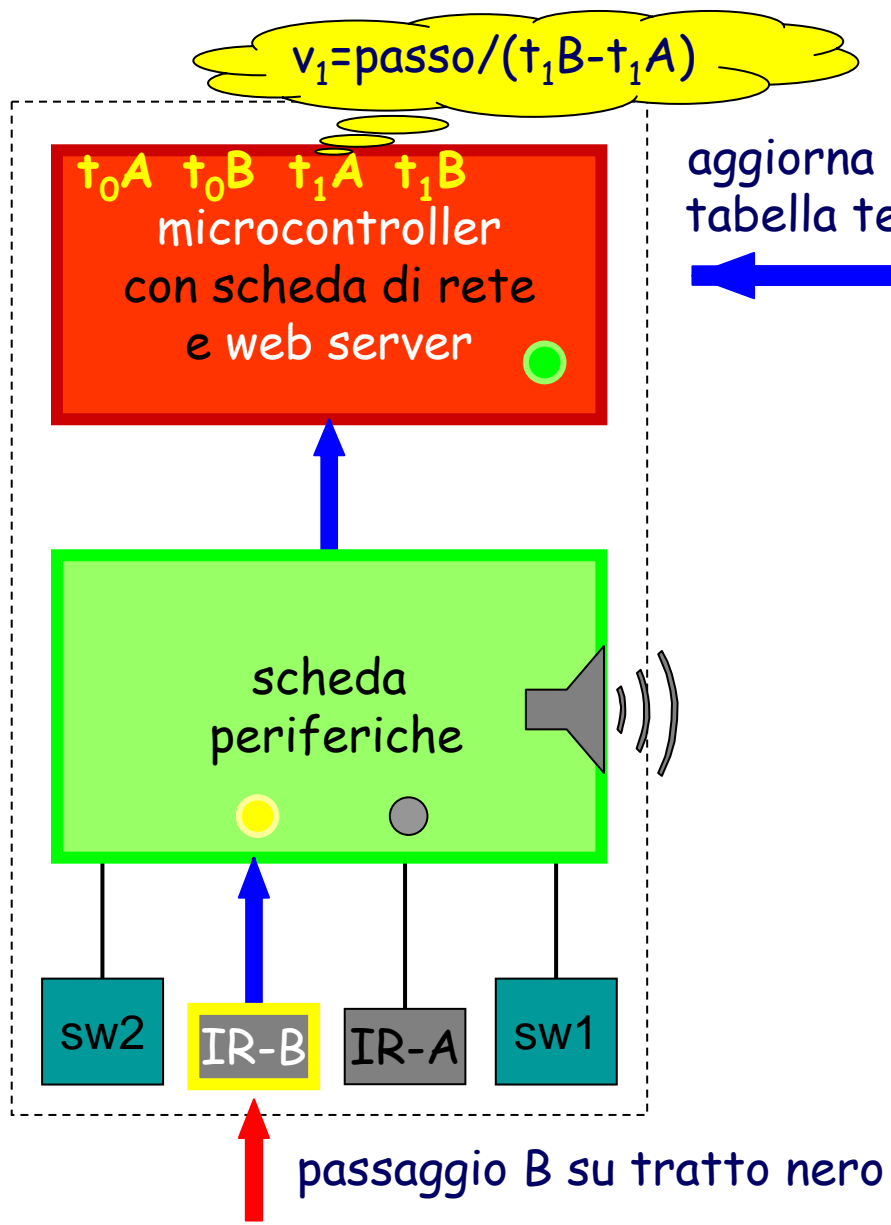
menù aggiorna

- RESET e START: switch posteriore
- RECORD TIME: passaggio dei sensori su linea nera
- STOP: switch anteriore

| n | tempo A (s) | tempo B (s) | tempo medio (s) | velocità: (m/s) |
|---|-------------|-------------|-----------------|-----------------|
| 0 | 0.00 | 0.08 | 0.04 | 0.12 |

v

t



aggiorna pagina
tabella tempo

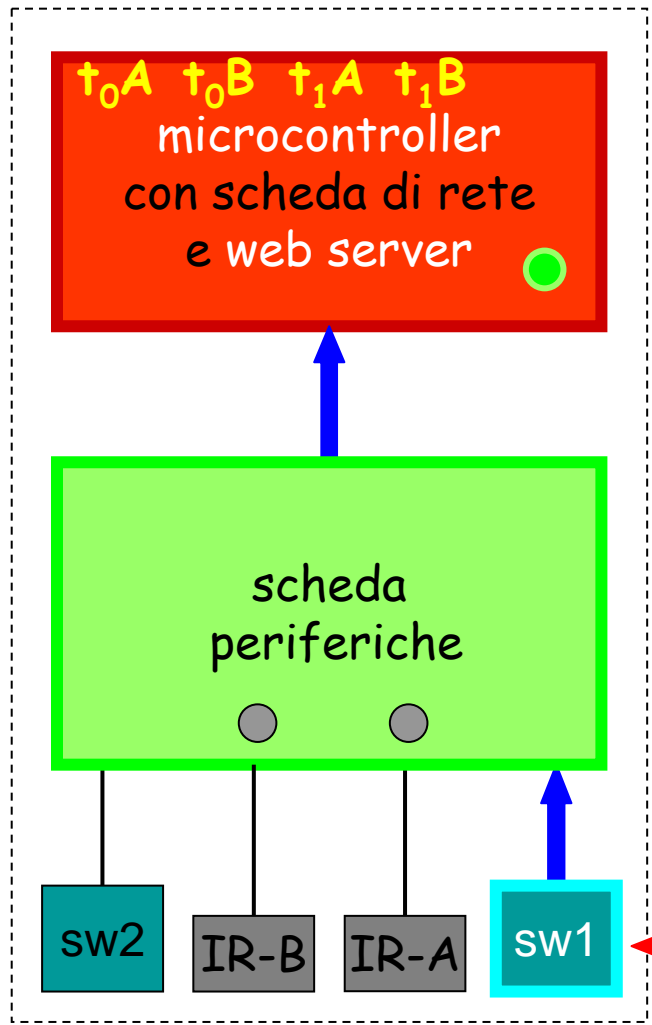
The screenshot shows a web browser window with the URL '192.168.4.1/page03'. The page title is 'carrello SMART - Tempi di passaggio e velocità'. It features a 'menù' button and an 'aggiorna' button. Below the buttons is a list of instructions:

- RESET e START: switch posteriore
- RECORD TIME: passaggio dei sensori su linea nera
- STOP: switch anteriore

 A table displays the recorded data:

| n | tempo A (s) | tempo B (s) | tempo medio (s) | velocità: (m/s) |
|---|-------------|-------------|-----------------|-----------------|
| 0 | 0.00 | 0.08 | 0.04 | 0.12 |
| 1 | 0.14 | 0.19 | 0.17 | 0.23 |
| 2 | 0.36 | 0.38 | 0.37 | 0.38 |
| 3 | 0.58 | 0.60 | 0.59 | 0.56 |
| 4 | 0.81 | 0.82 | 0.81 | 0.67 |
| 5 | 1.06 | 1.07 | 1.06 | 0.77 |
| 6 | 1.33 | 1.35 | 1.34 | 0.91 |

 At the bottom, a graph plots velocity (v) on the y-axis against time (t) on the x-axis, showing a red curve that increases over time.



altro esperimento:
con moto alternato

aggiorna pagina
tabella tempo

| n | tempo A (s) | tempo B (s) | tempo medio (s) | velocità: (m/s) |
|----|-------------|-------------|-----------------|-----------------|
| 0 | 0.00 | 0.06 | 0.03 | 0.17 |
| 1 | 0.11 | 0.15 | 0.13 | 0.24 |
| 2 | 0.32 | 0.35 | 0.34 | 0.33 |
| 3 | 0.60 | 0.63 | 0.62 | 0.33 |
| 4 | 1.54 | 1.50 | 1.52 | -0.28 |
| 5 | 1.81 | 1.78 | 1.79 | -0.33 |
| 6 | 1.99 | 1.95 | 1.97 | -0.28 |
| 7 | 2.06 | 2.02 | 2.04 | -0.23 |
| 8 | 2.84 | 2.91 | 2.88 | 0.14 |
| 9 | 2.98 | 3.04 | 3.01 | 0.18 |
| 10 | 3.28 | 3.32 | 3.30 | 0.23 |



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