Plumbing the Arduino

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(and a cast of thousands, including Matt Jadud, Christian Jacobsen, Omer Kilic, Carl Ritson...)

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A brief history lesson

- In the 1980s, INMOS created the Transputer
- … and an unusual programming language, called occam
- Further developed at Kent in the 1990s and 2000s: occam-pi
- Here's what it looks like...

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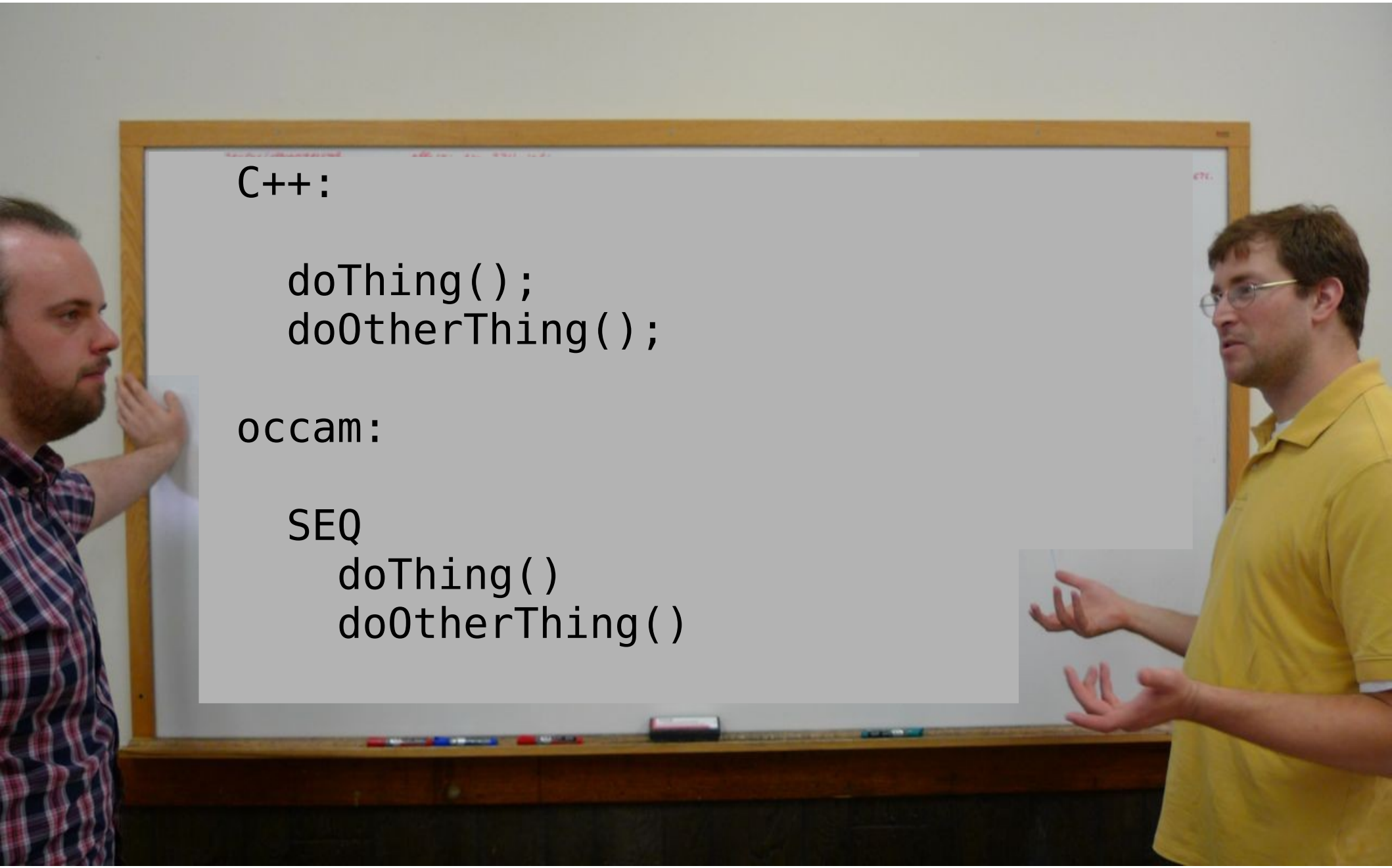
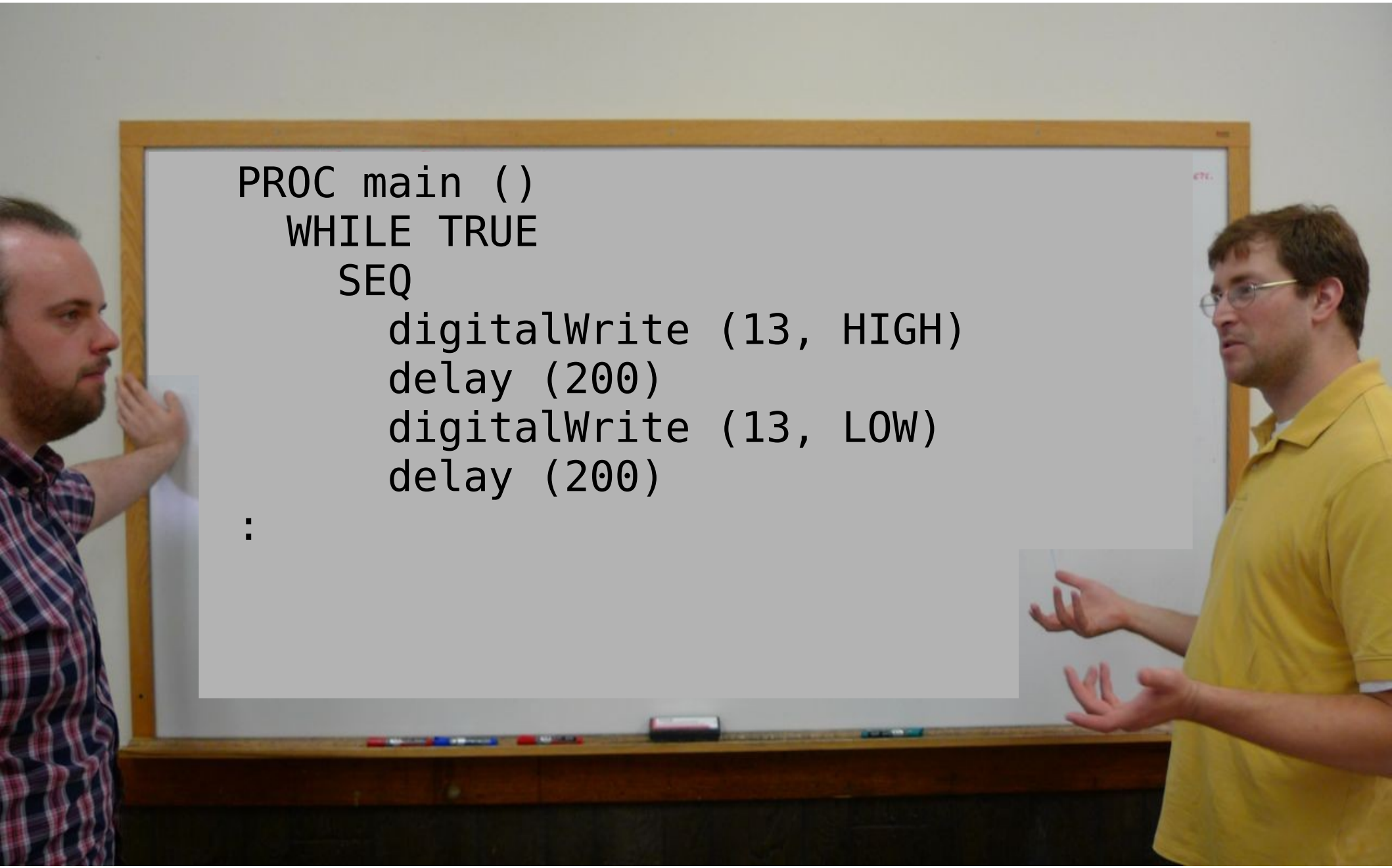
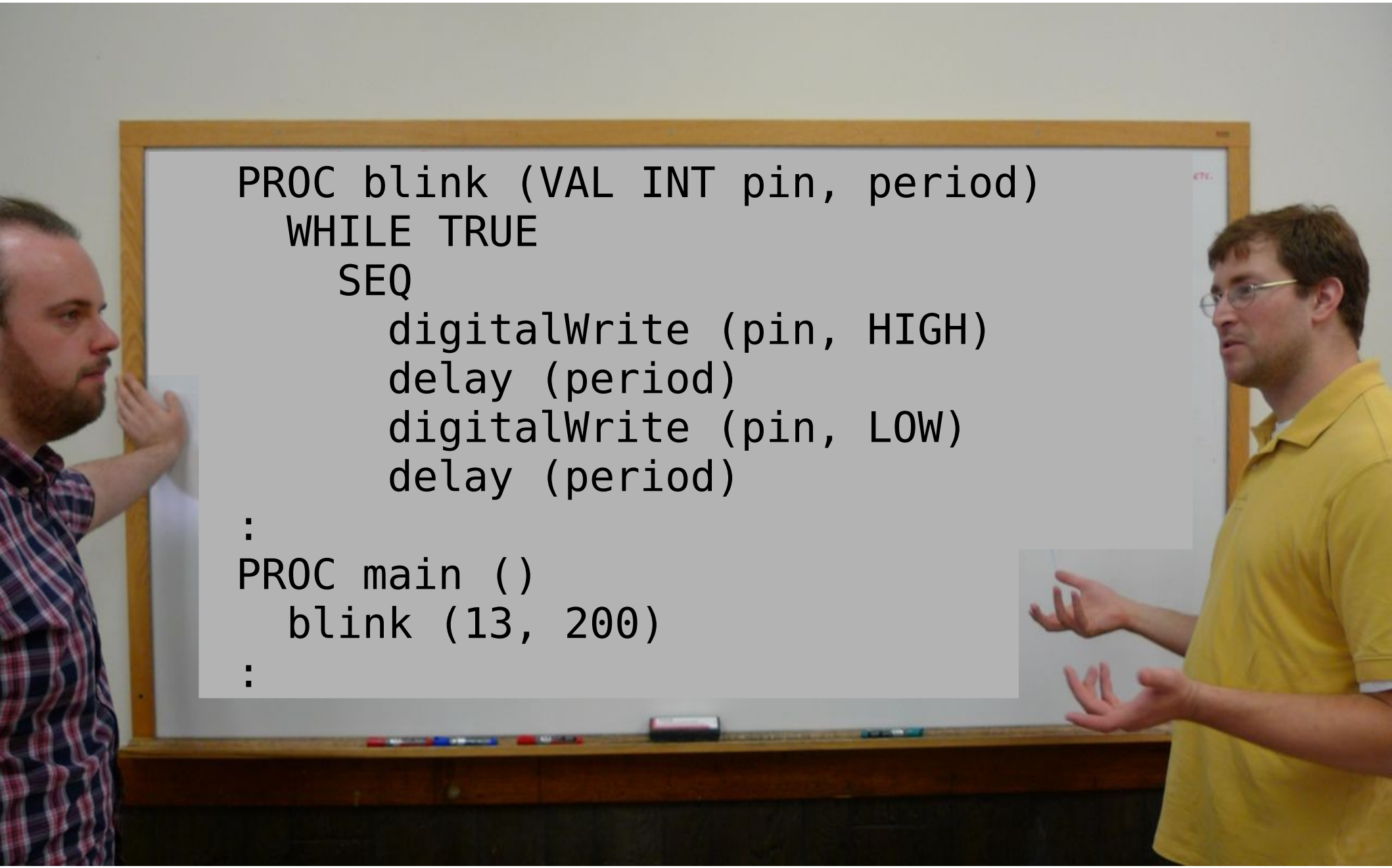
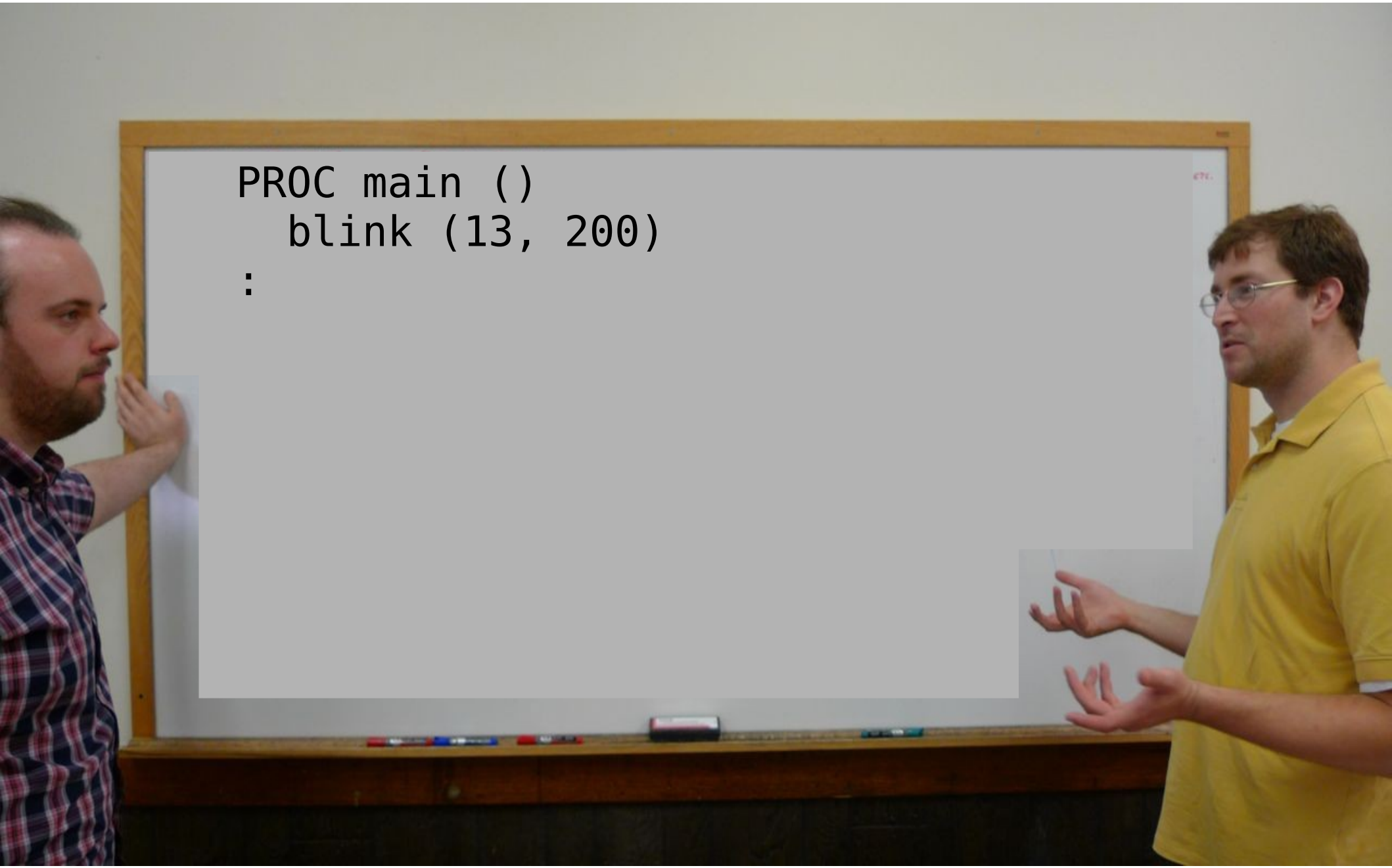
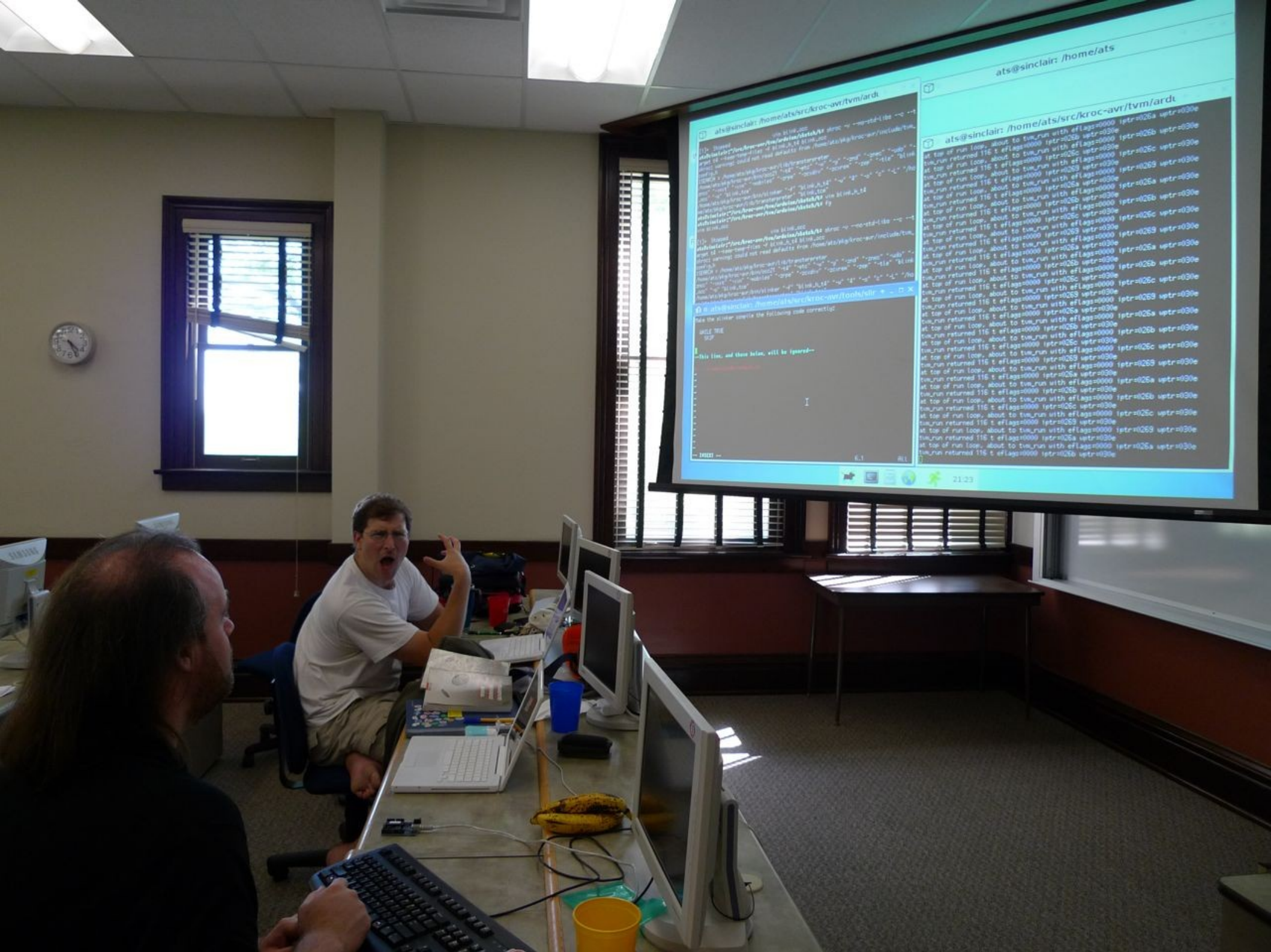
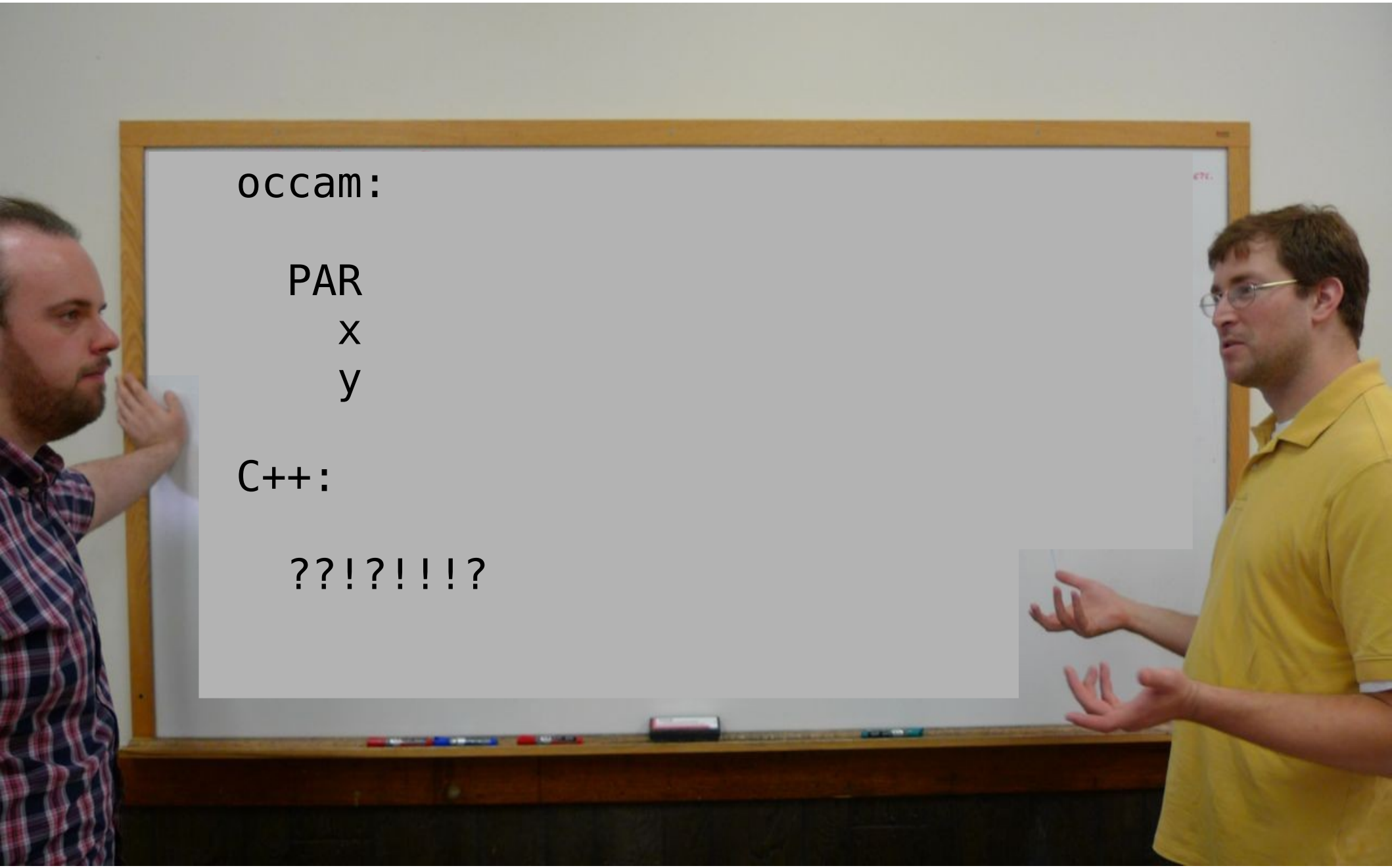

C++:
doThing();
doOtherThing();
occam:
SEQ
doThing()
doOtherThing()

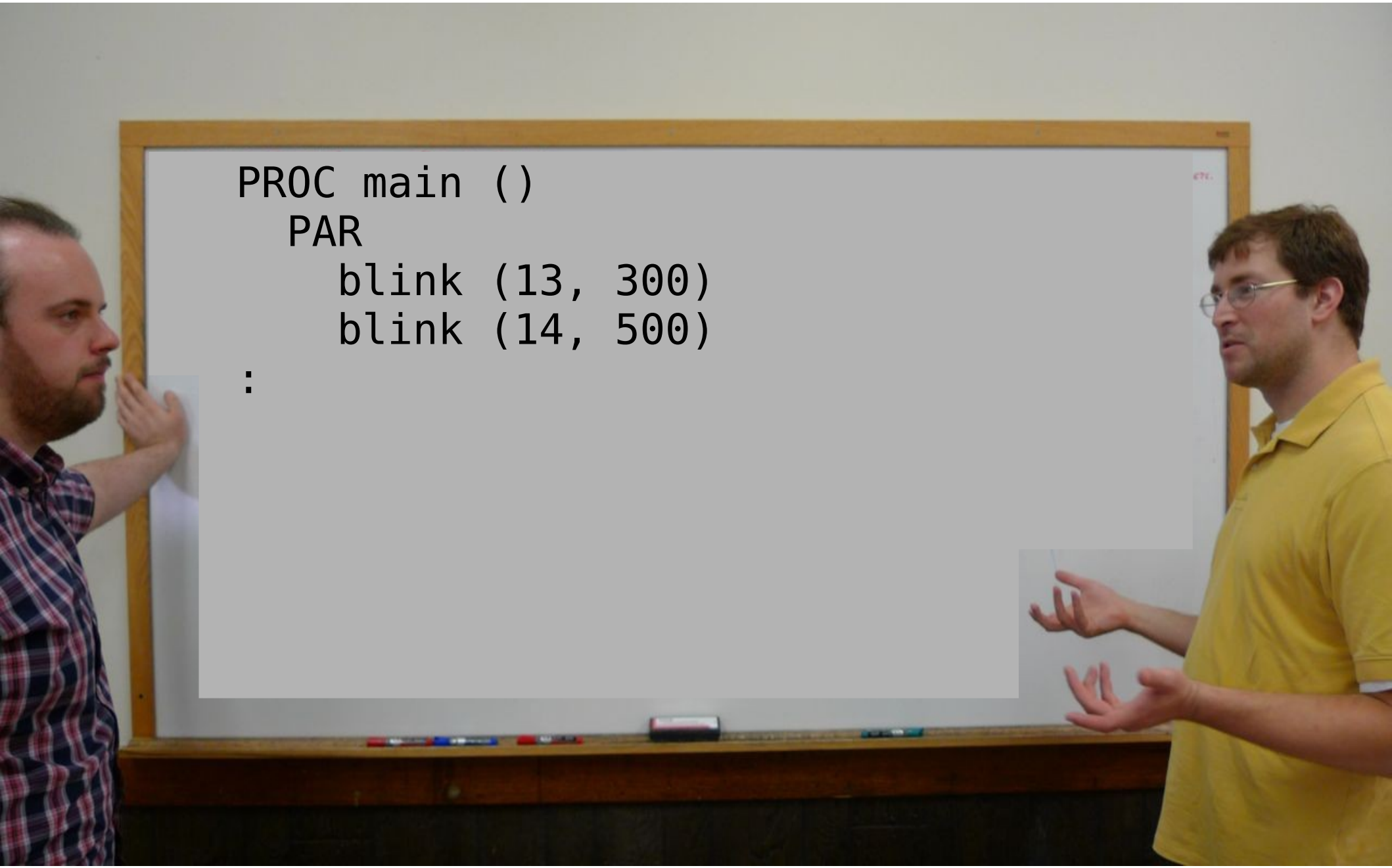

PROC main ()
WHILE TRUE
SEQ
digitalWrite (13, HIGH)
delay (200)
digitalWrite (13, LOW)
delay (200)
:

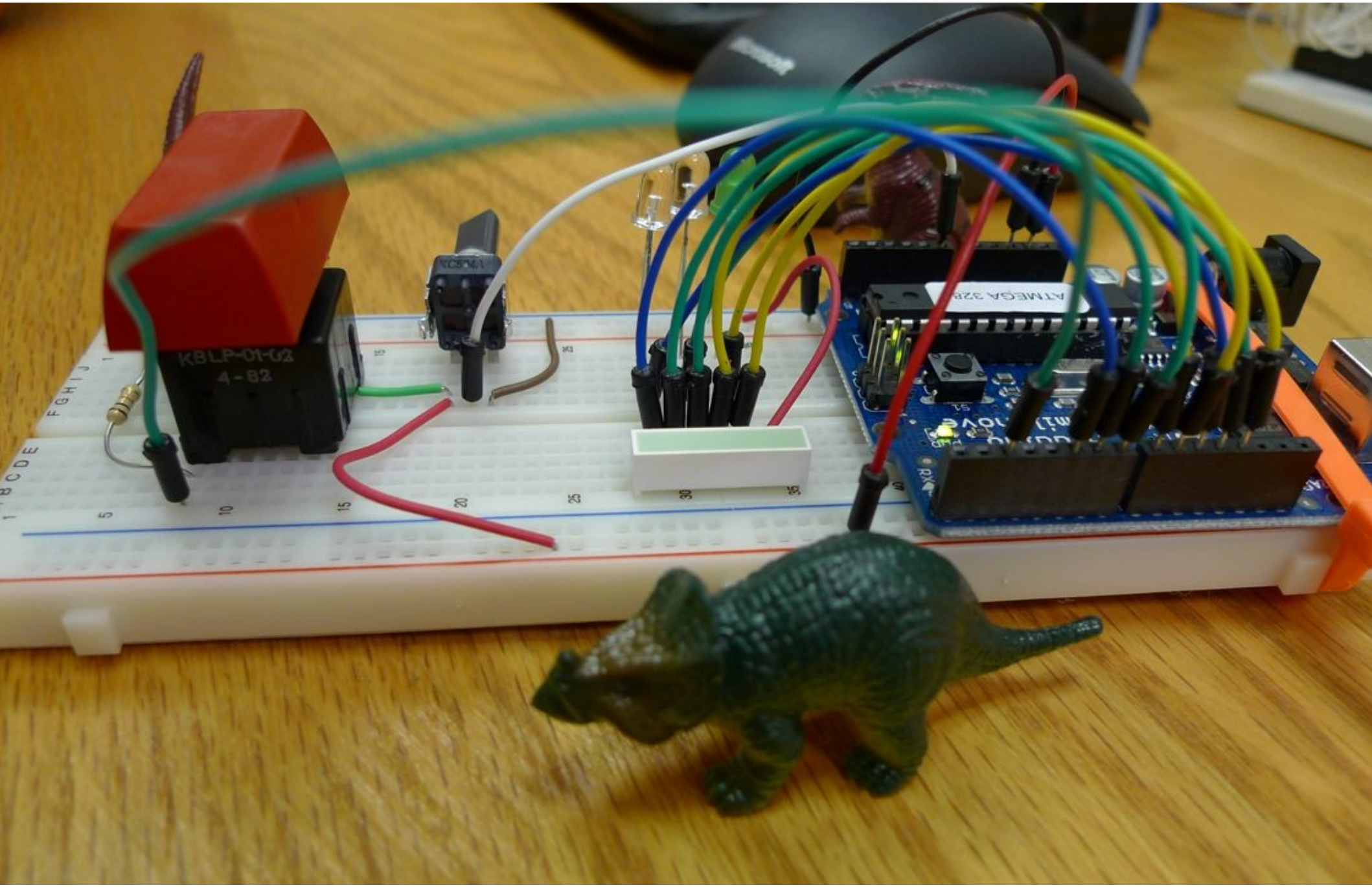

PROC blink (VAL INT pin, period)
WHILE TRUE
SEQ
digitalWrite (pin, HIGH)
delay (period)
digitalWrite (pin, LOW)
delay (period)
:
PROC main ()
blink (13, 200)
:

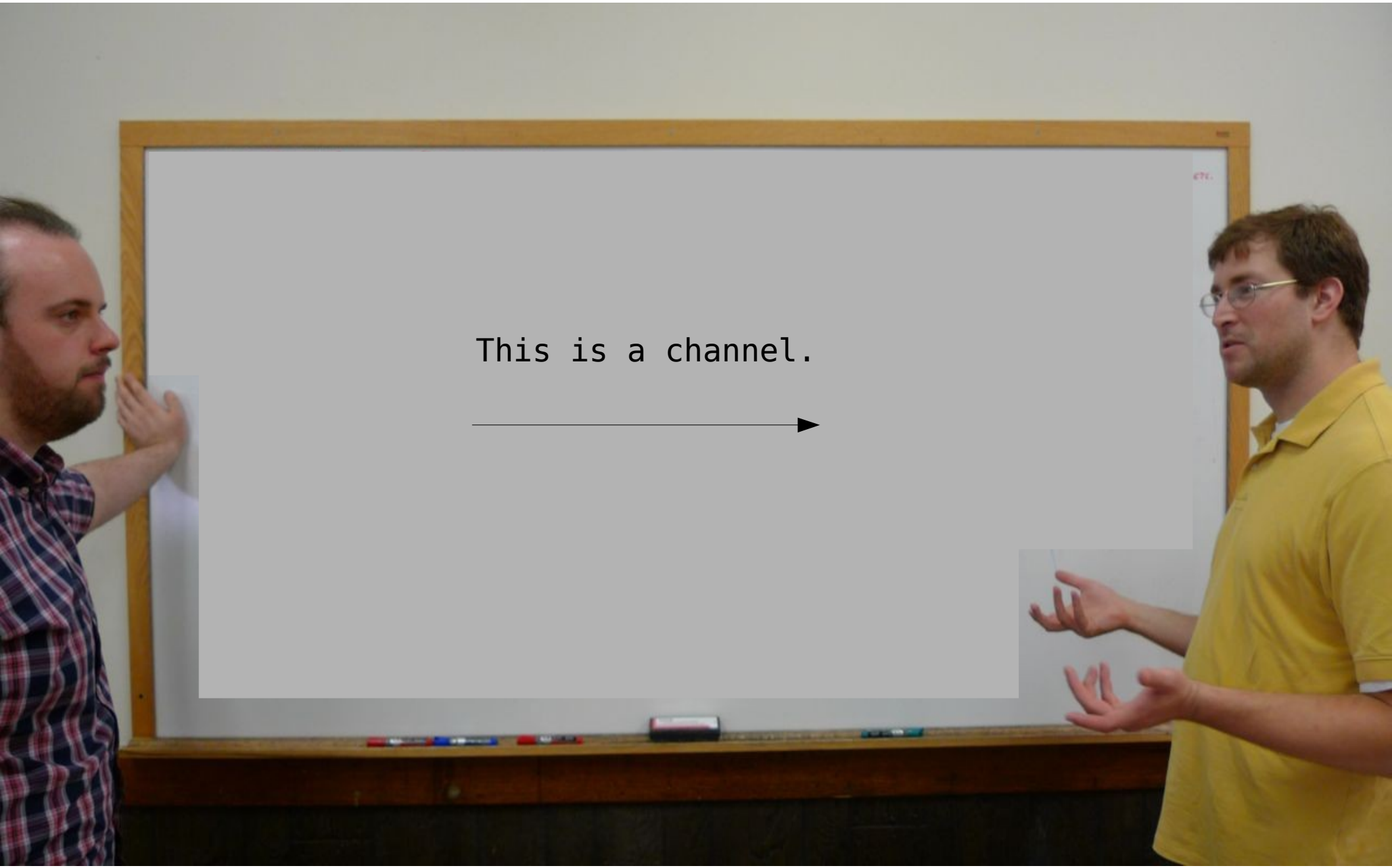

PROC main ()
blink (13, 200)
:

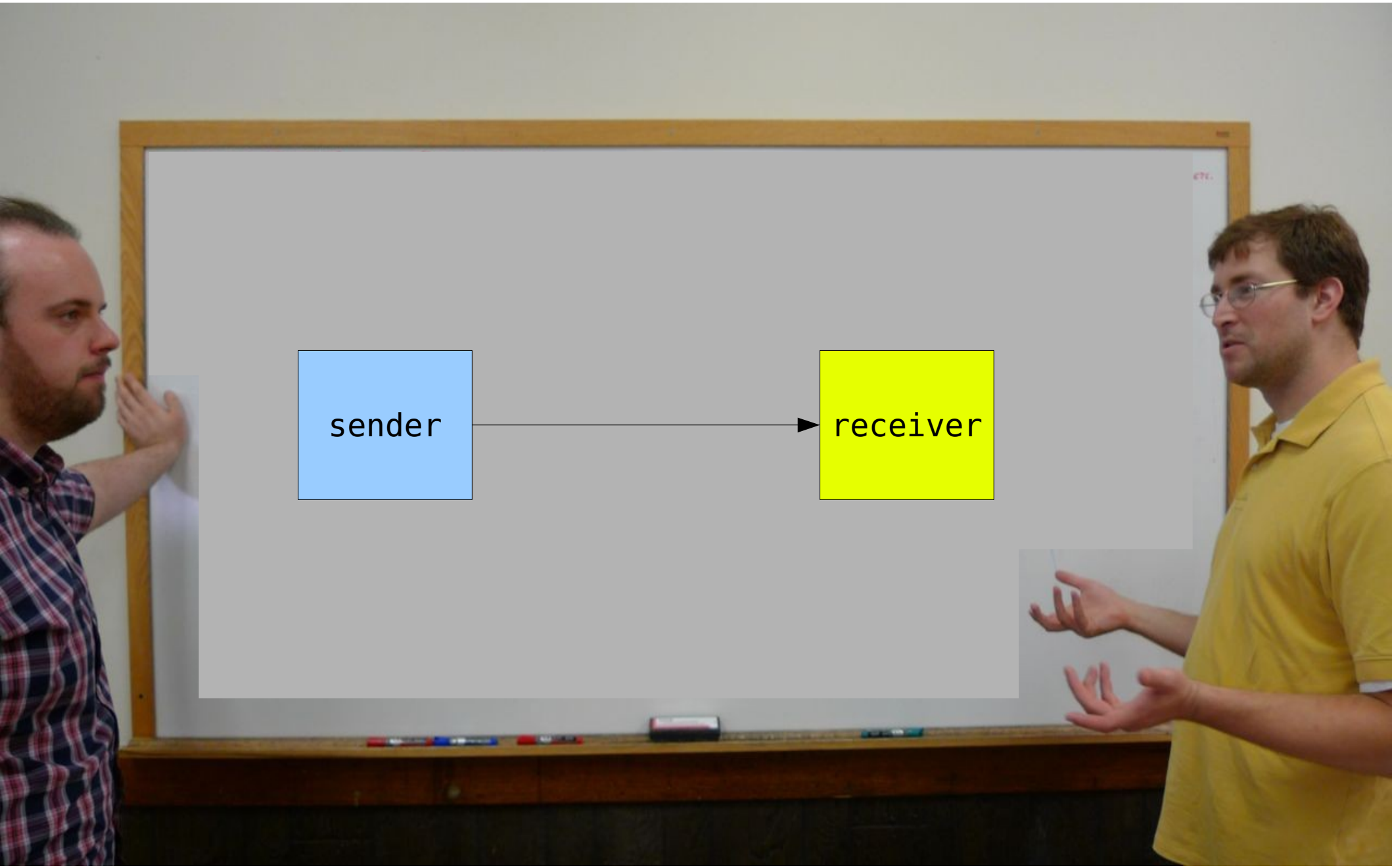

ats@sinclair: /home/ats
ats@sinclair: /home/ats/src/kroc-avr/tvm/ardu

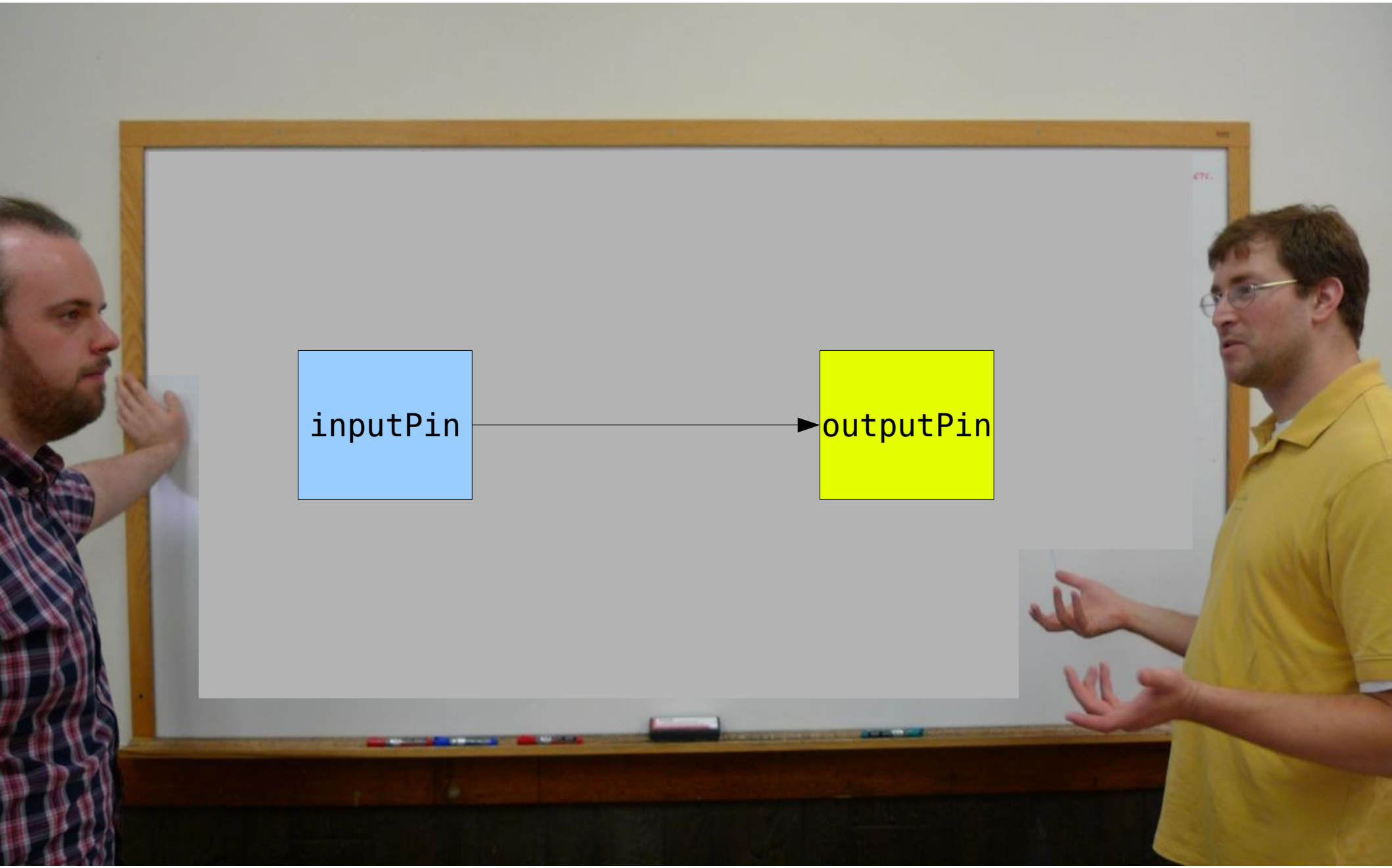

occam:
PAR
x
y
C++:
??!?!!!?

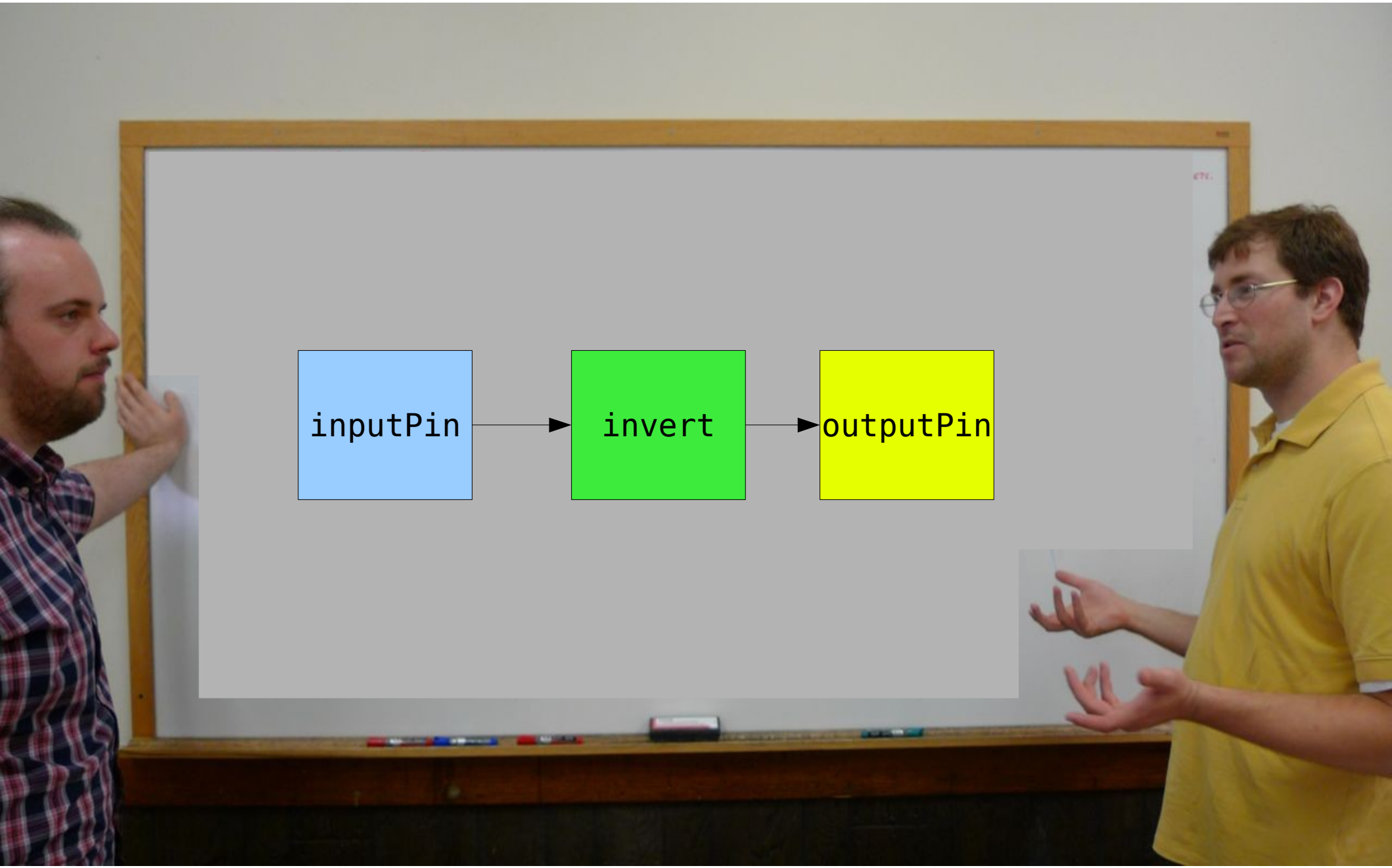

PROC main ()
PAR
blink (13, 300)
blink (14, 500)
:


KBLP-01-G2
4-82
ATMEGA 328


This is a channel.

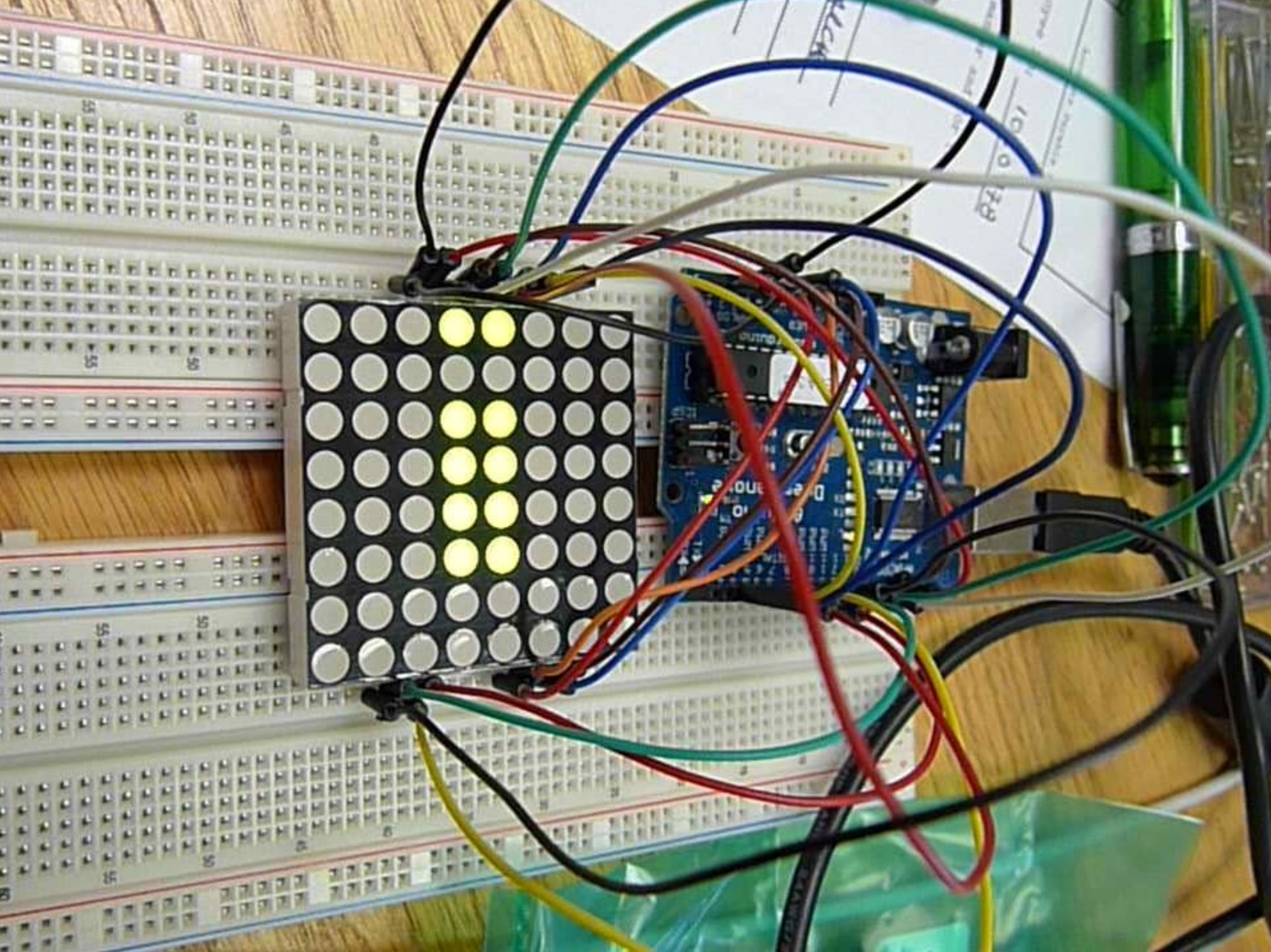

sender
receiver

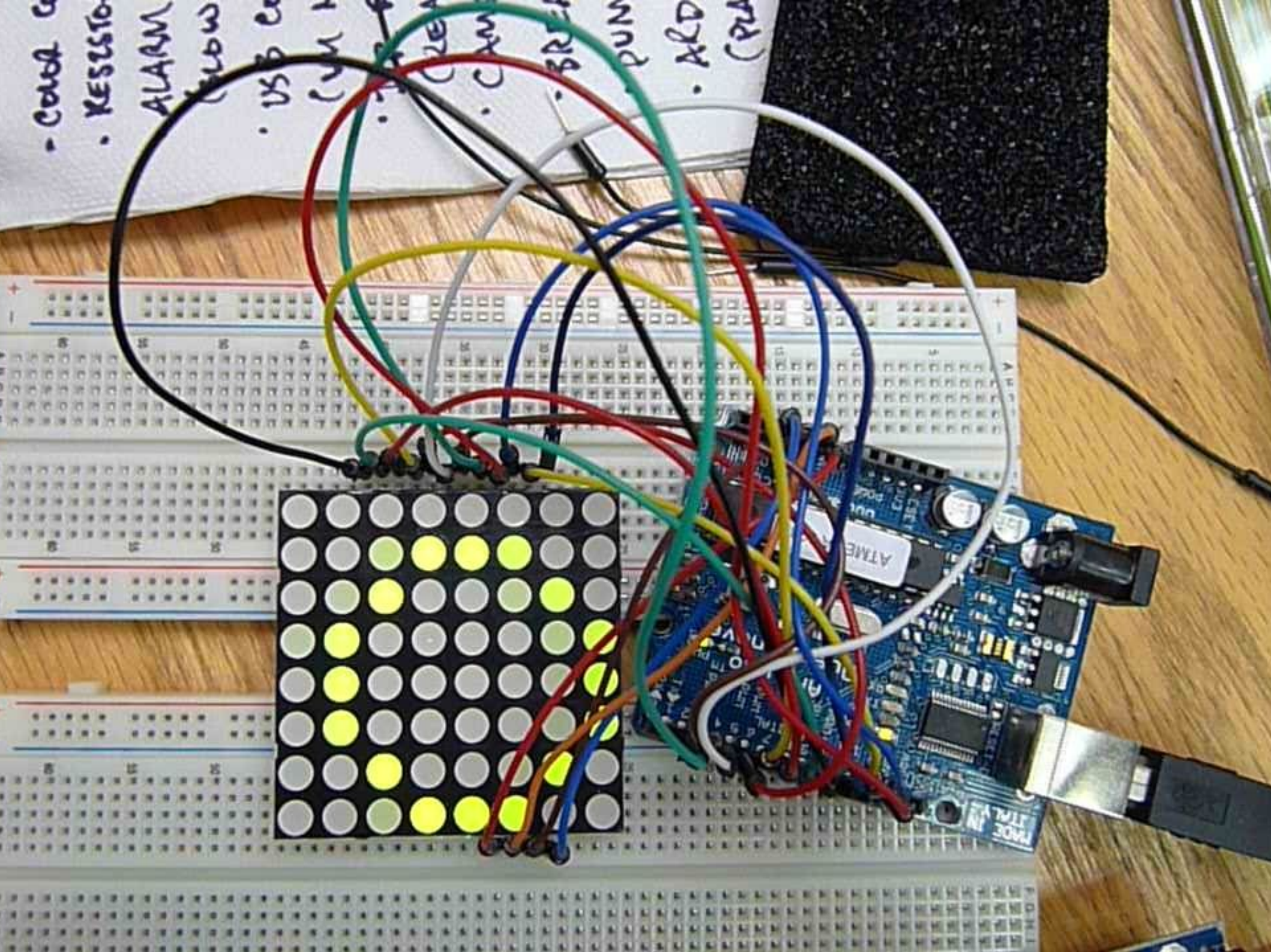

inputPin
outputPin


inputPin
invert
outputPin

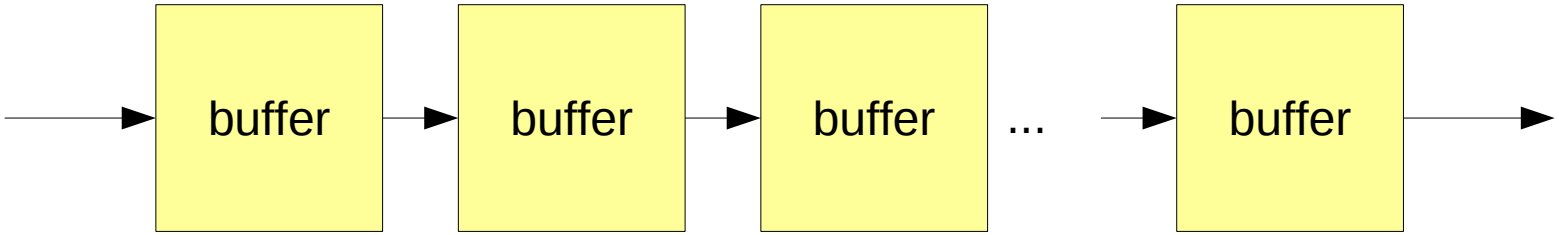
Concurrency in action

- We call this “process-oriented programming”
- Build your program out of little, isolated components, and connect them together
- **Plumbing** is a library of ready-made components (like inputPin, invert and blink) for the Arduino

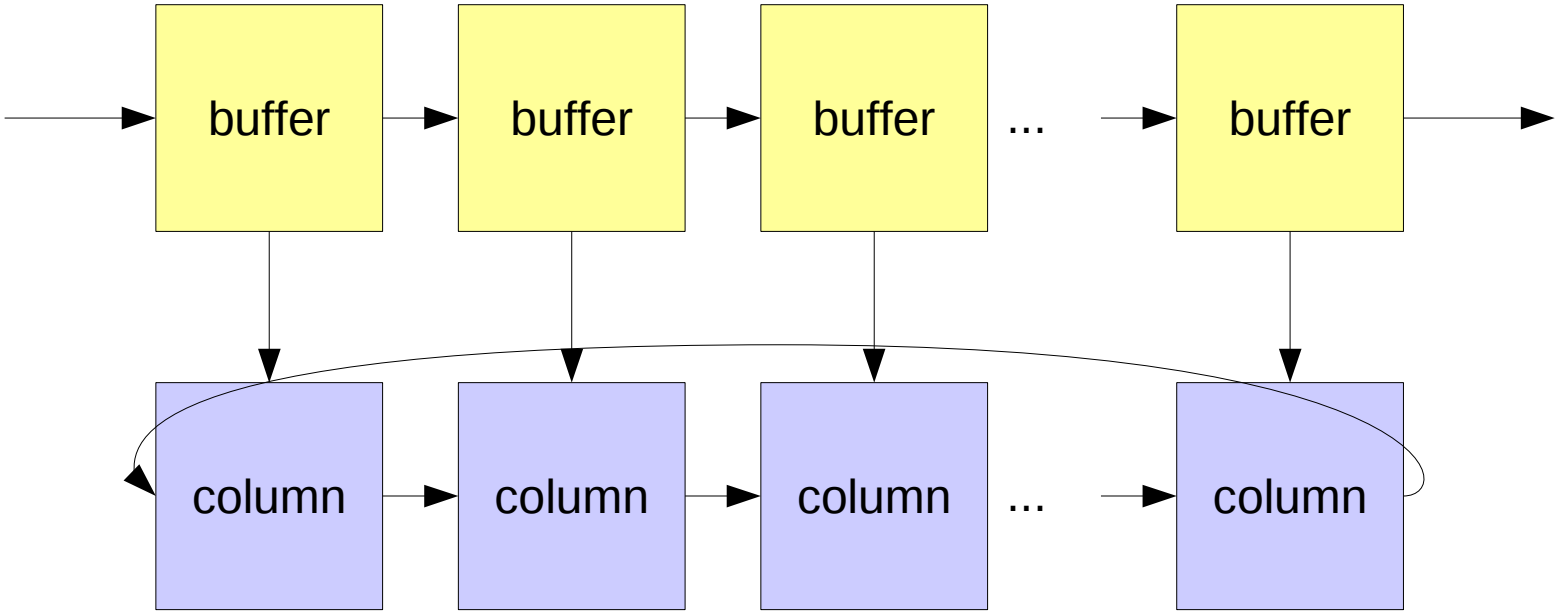



ATMEL

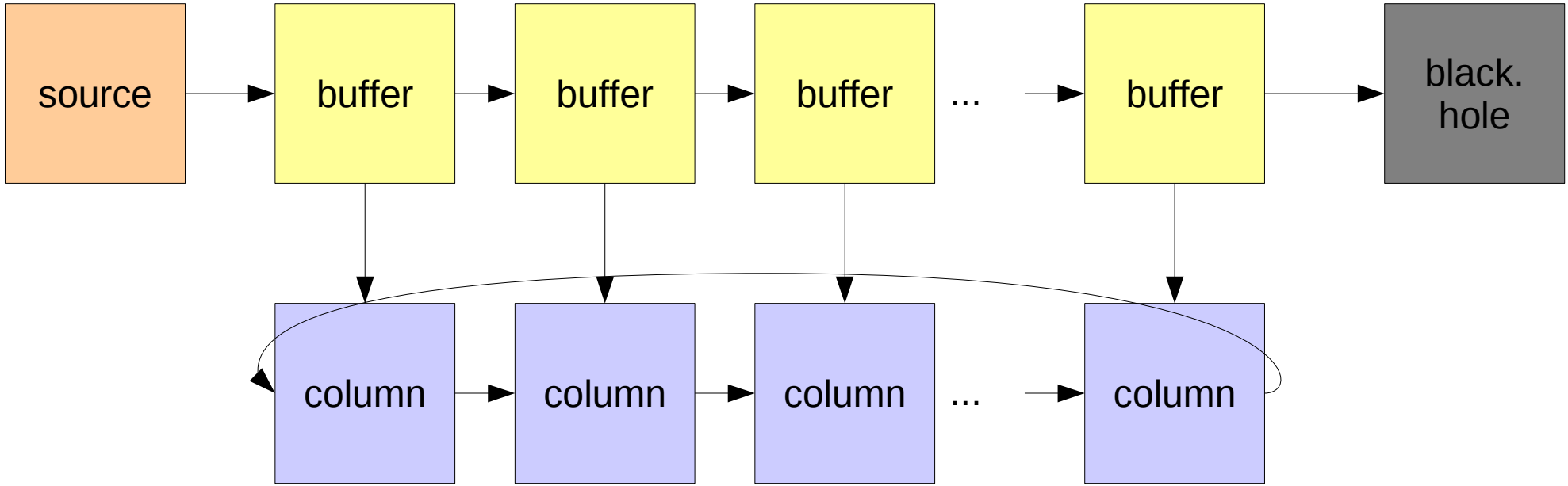
How does that work?



How does that work?



How does that work?



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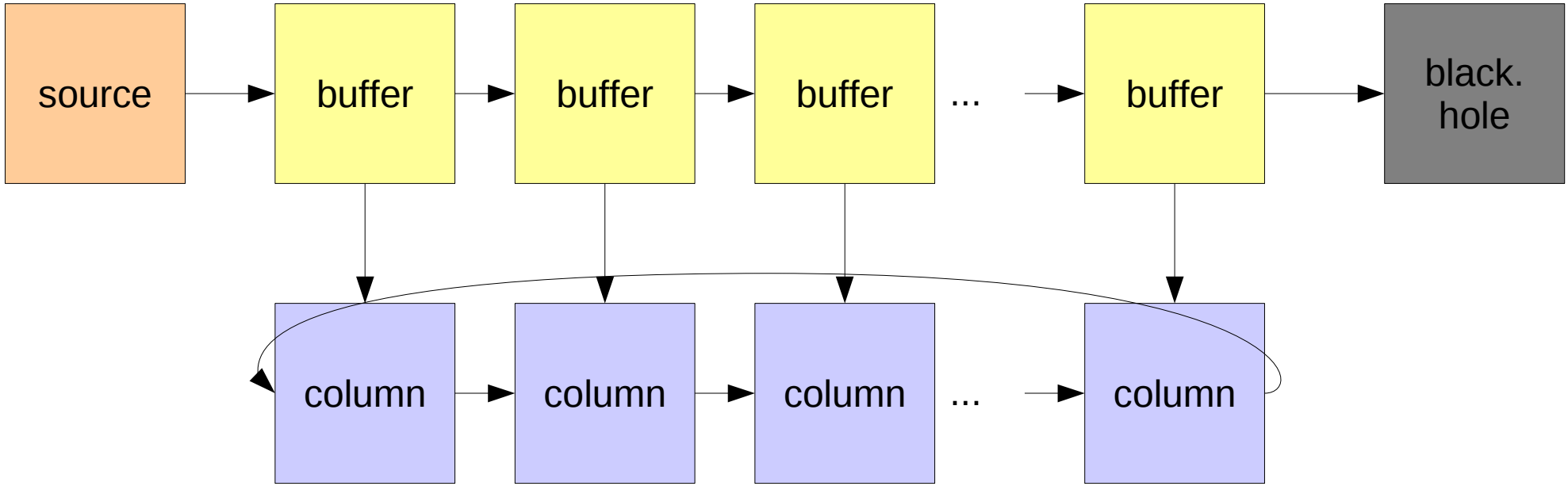
Distributed embedded system



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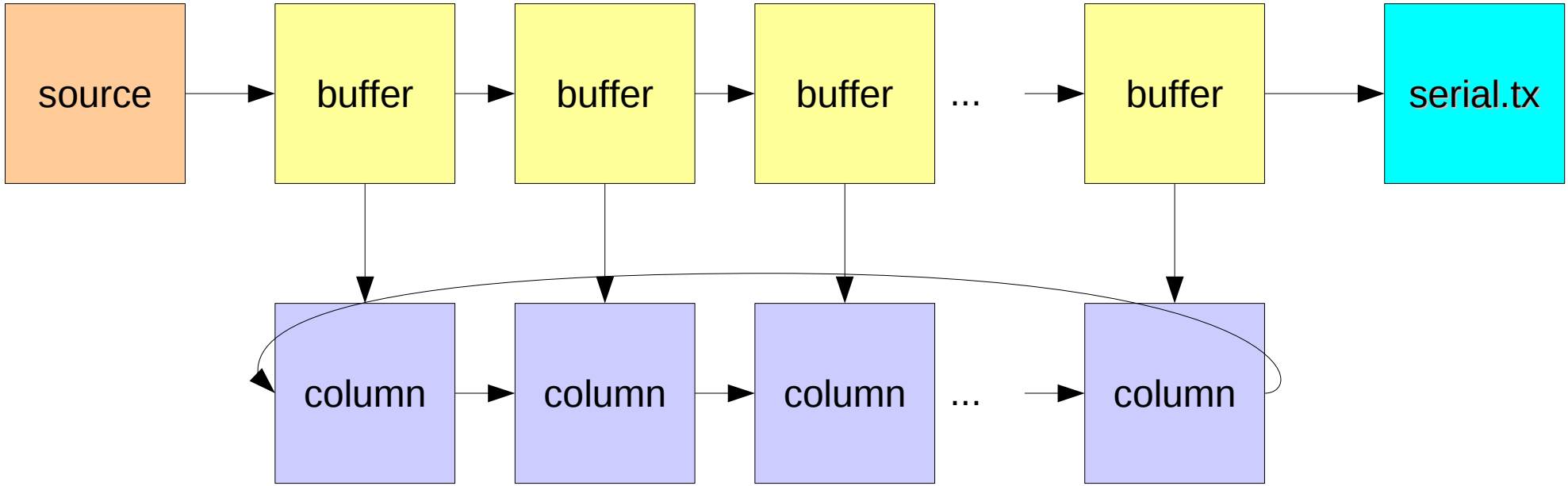
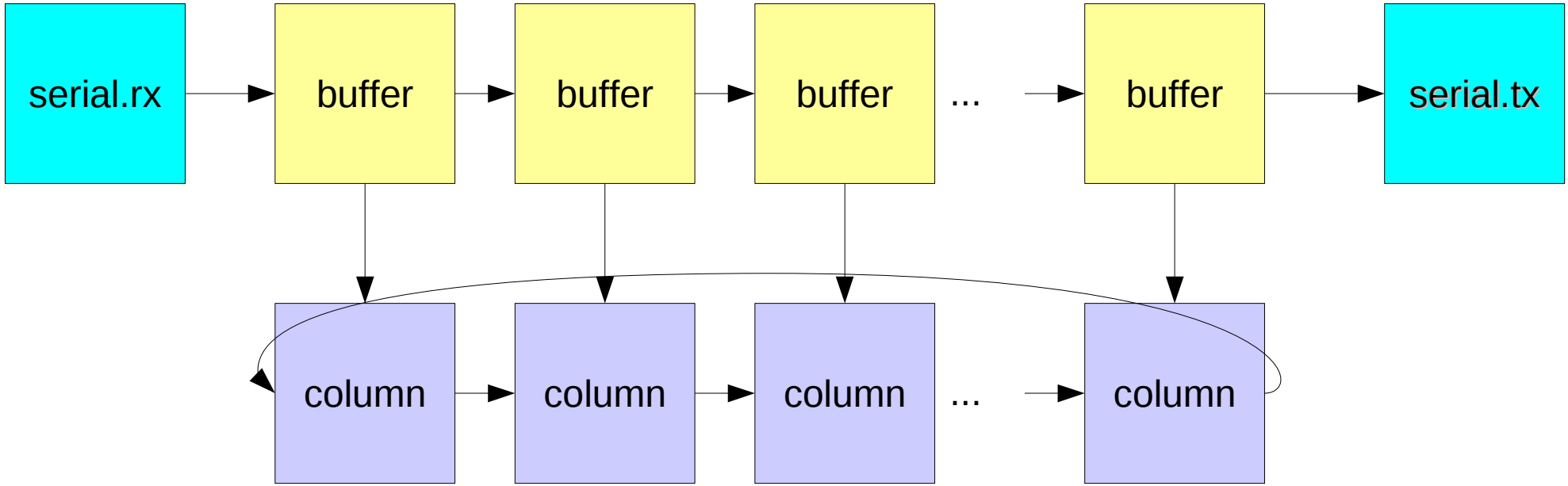
First node


source
buffer
buffer
buffer
...
buffer
serial.tx
column
column
column
...
column

Other nodes



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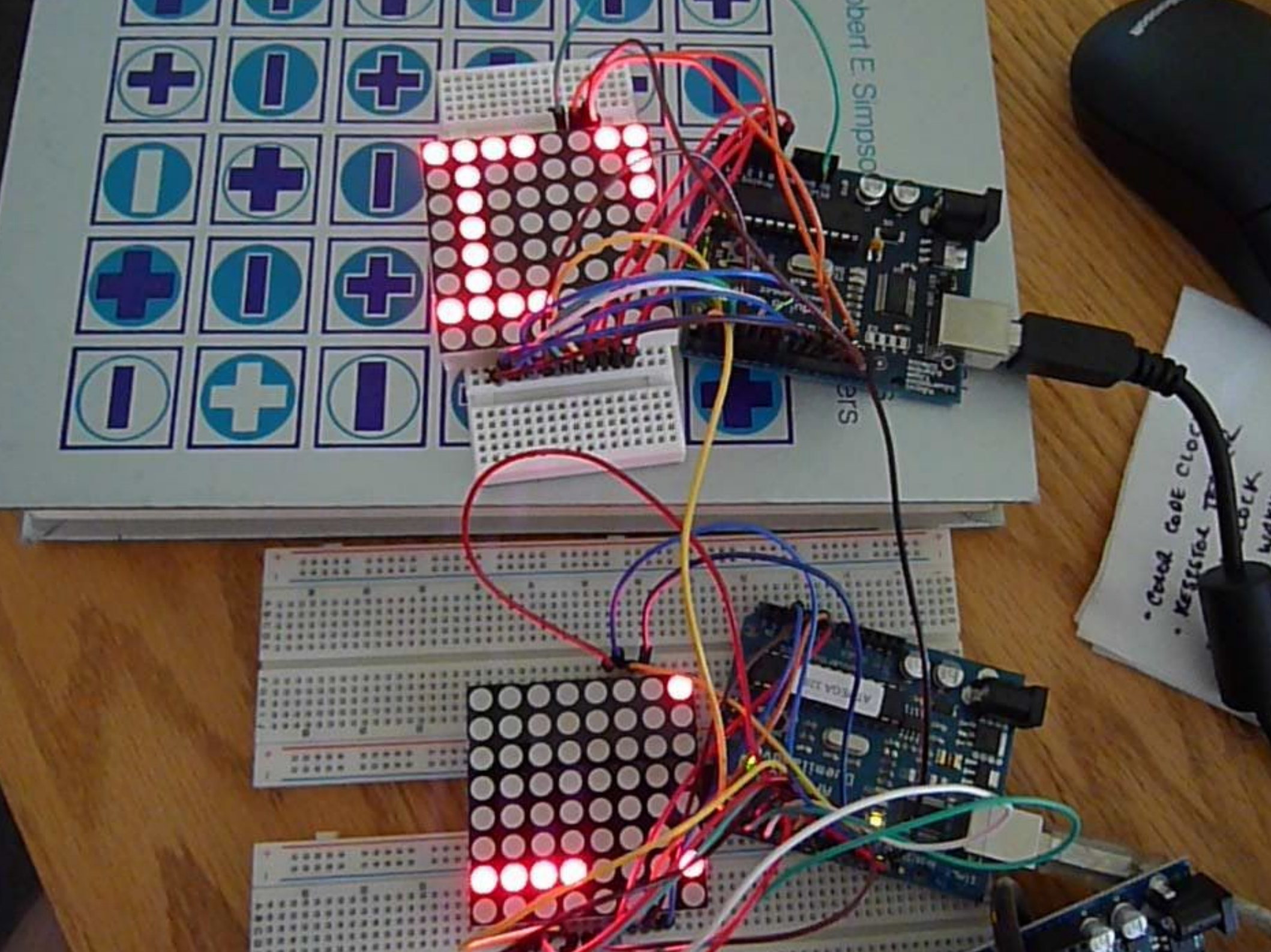
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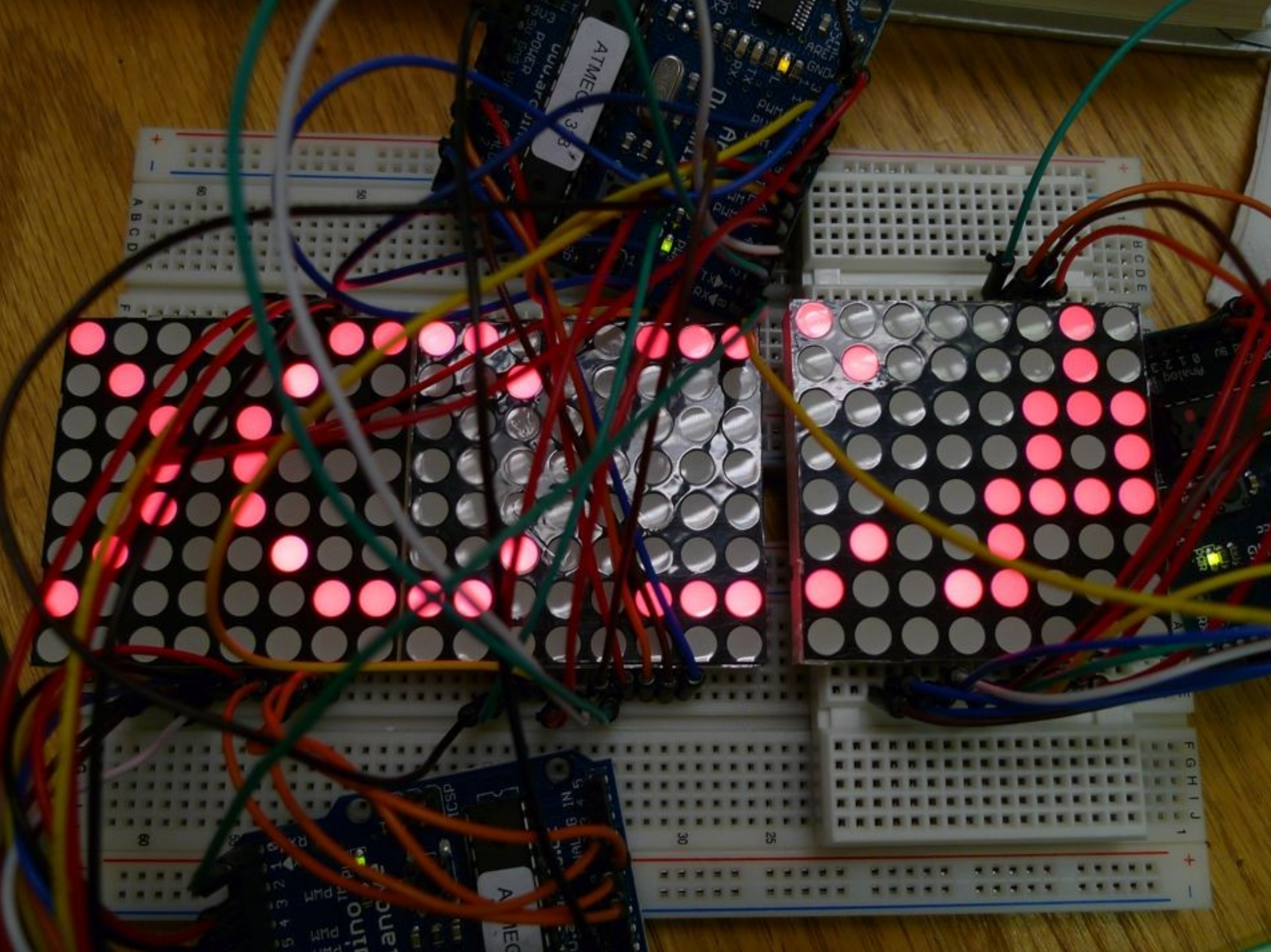
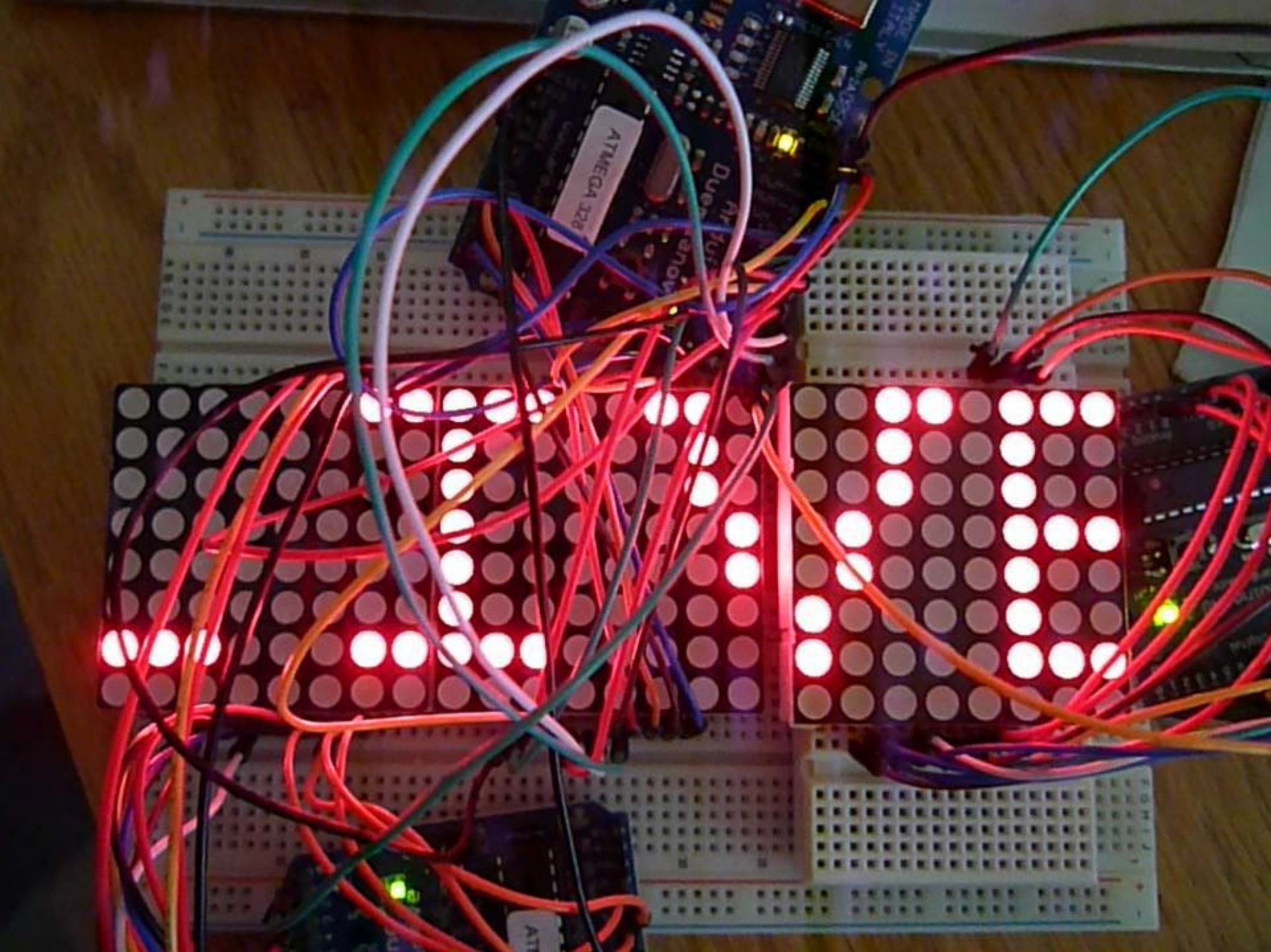
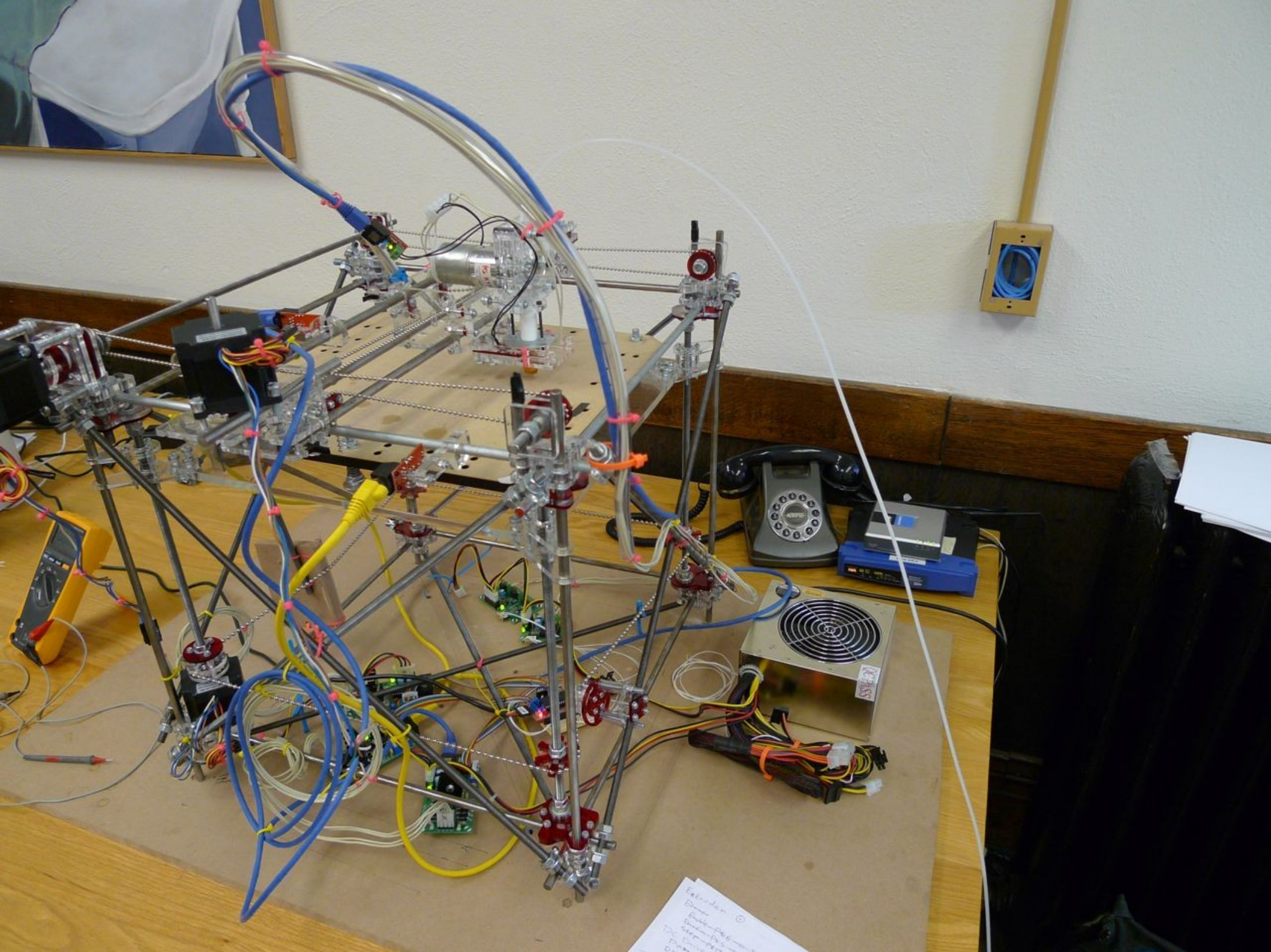

ATMEGA328
POWER
AREF
GND
PWM
TX
RX
ICSP
A
MEGA
PWM
PWM

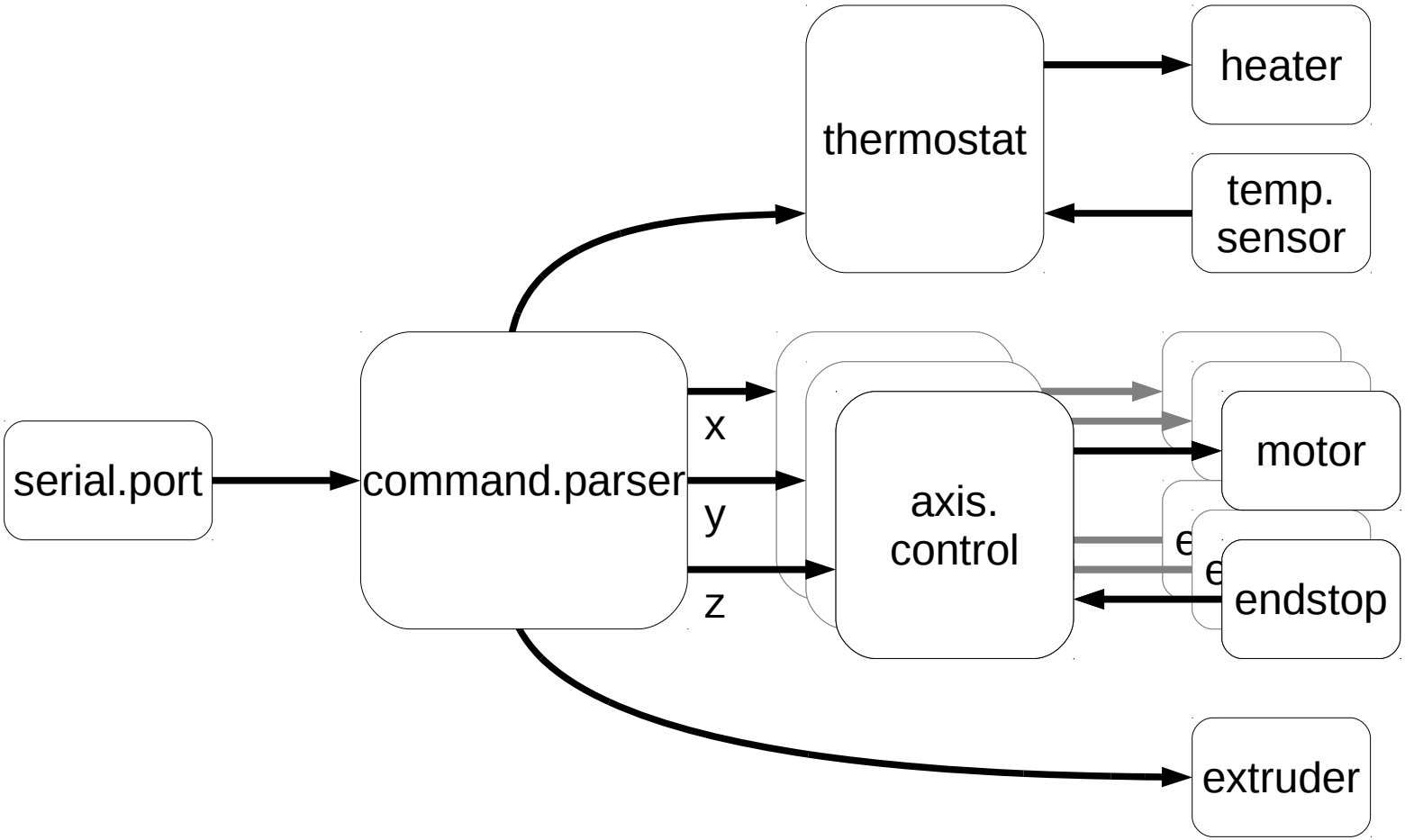

ATMEGA 328



The RepRap

- X, Y and Z axes with steppers and endstops
- Print head with heater, temperature sensor and extruder motor
- Serial interface to accept commands from a host computer

Plumbing the RepRap



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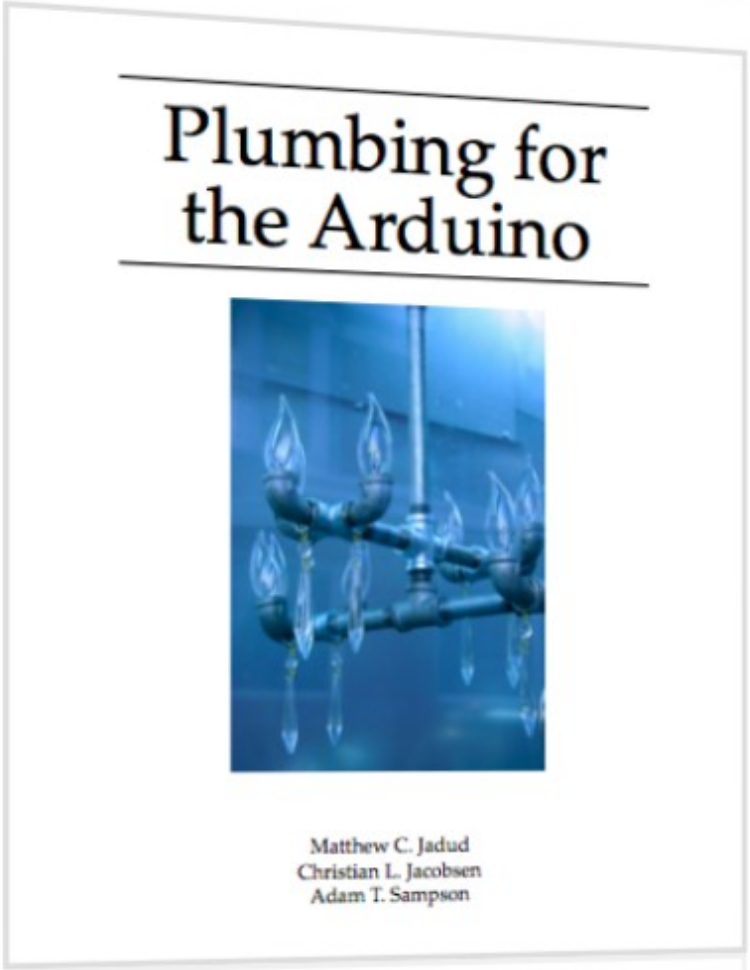
How do I learn more?

- Read the book!
- Available from our web site along with the software (all open source): http://concurrency.cc/
- For more about occam-pi: http://occam-pi.org/
- Thanks – any questions?



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