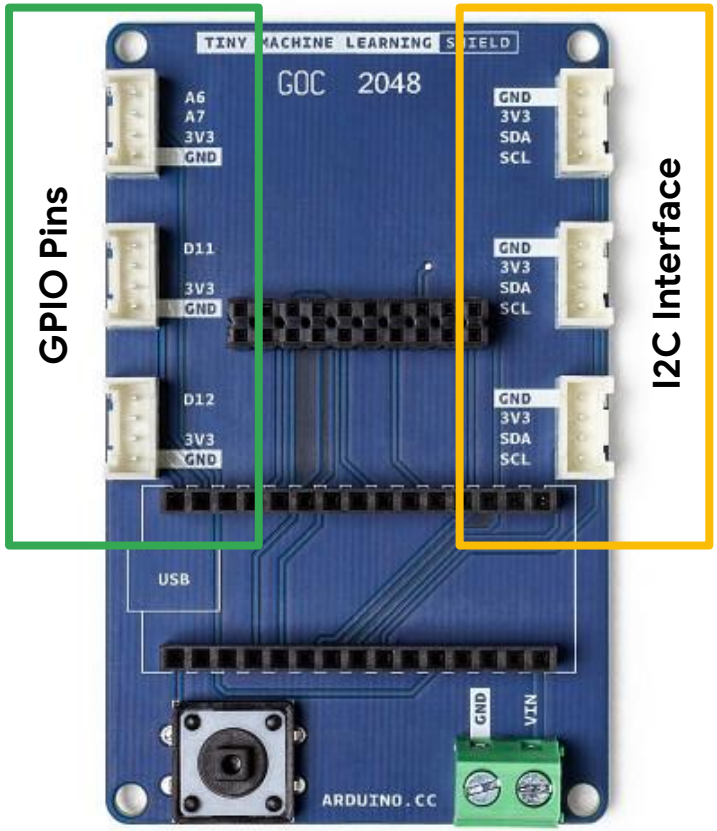
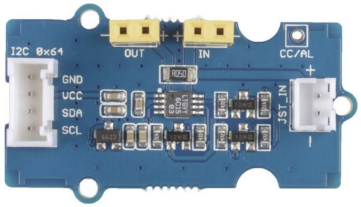
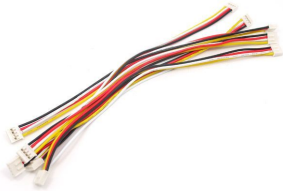
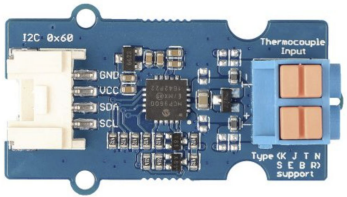
Embedded I/O


GPIO Pins
I2C Interface
TINY MACHINE LEARNING SHIELD
GOC 2048
A6
A7
3V3
GND
D11
3V3
GND
D12
3V3
GND
GND
3V3
SDA
SCL
GND
3V3
SDA
SCL
GND
3V3
SDA
SCL
USB
GND
VIN
ARDUINO.CC

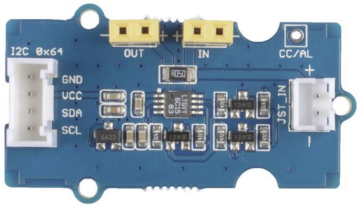

I2C 0x64
OUT
IN
CC/AL
GND
VCC
SDA
SCL
JST_IN



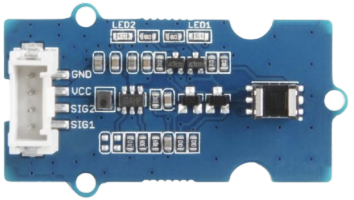
Systems Engineering—Module Integration



Thermocouple Amp



Coulomb Counter



Rotary Encoder

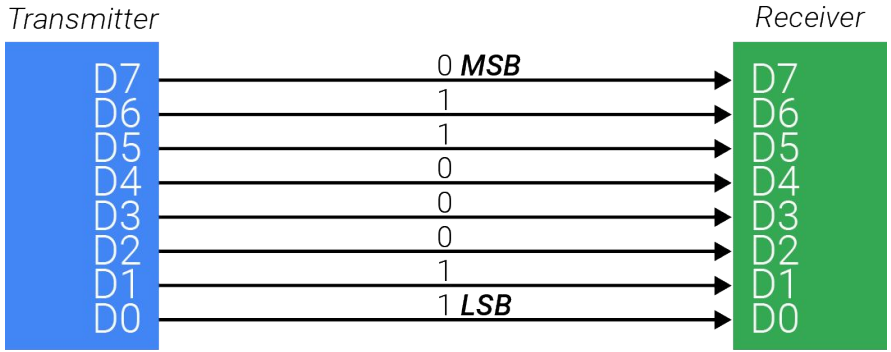
Grove Sensors

Large catalog of sensors, actuators available at seeedstudio.com

Method of Communication

MSB → most significant bit
LSB → least significant bit

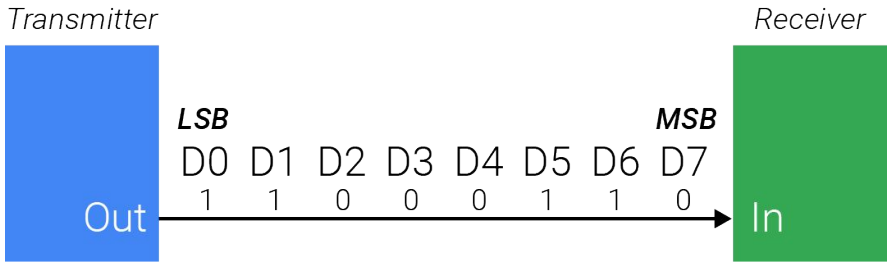
Option 1: use ***parallel*** interface to connect elements



Method of Communication

MSB → most significant bit
LSB → least significant bit

Option 2: use ***serial*** interface to transmit binary data in sequence



This approach **reduces number of wires**

Serial Communication Protocols

UART

universal asynchronous receive-transmit

no shared clock
for synchronicity

slower

simple wiring

I2C

inter-integrated circuit

shared clock
intermediate speed

bi-directional
but one-at-a-time

simple wiring

SPI

serial peripheral interface

shared clock
high transfer speed

simultaneous
full duplex

complex wiring

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Inter-Integrated Circuit (I2C)

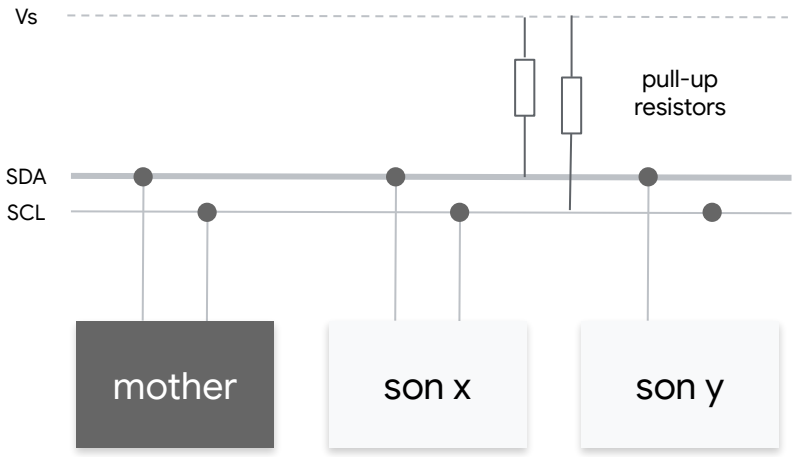
SDA is the serial data channel

SCL is the serial clock channel

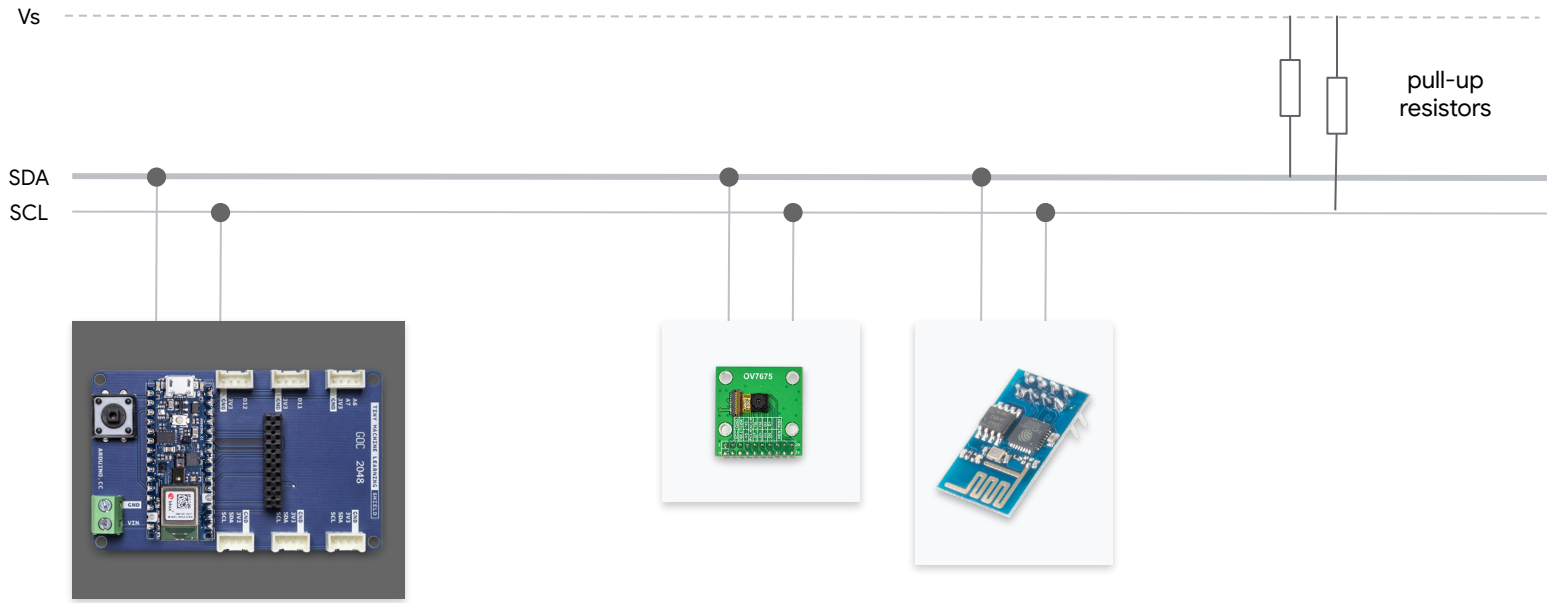
Bus permits addressing of **‘sons’**

Two modes of operation

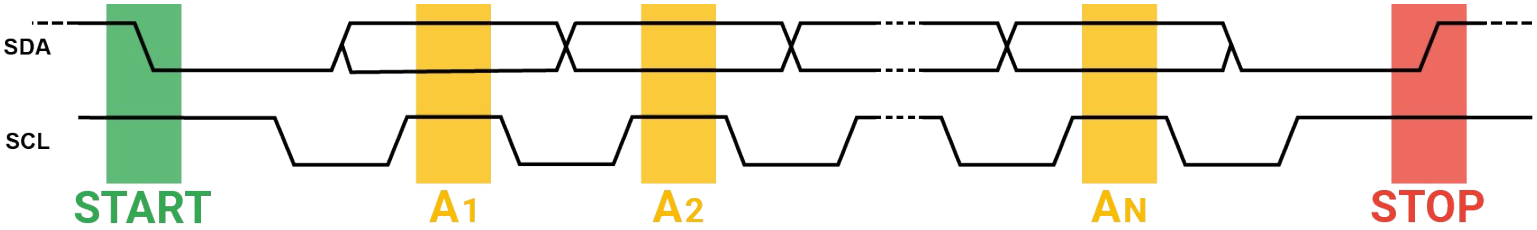
- Mother-transmitter, son-receiver
- Son-transmitter, mother-receiver



set address to son of interest


Vs
pull-up
resistors
SDA
SCL
OV7675


START
ADDRESS
R/W
ACK
DATA
ACK
DATA
ACK
STOP

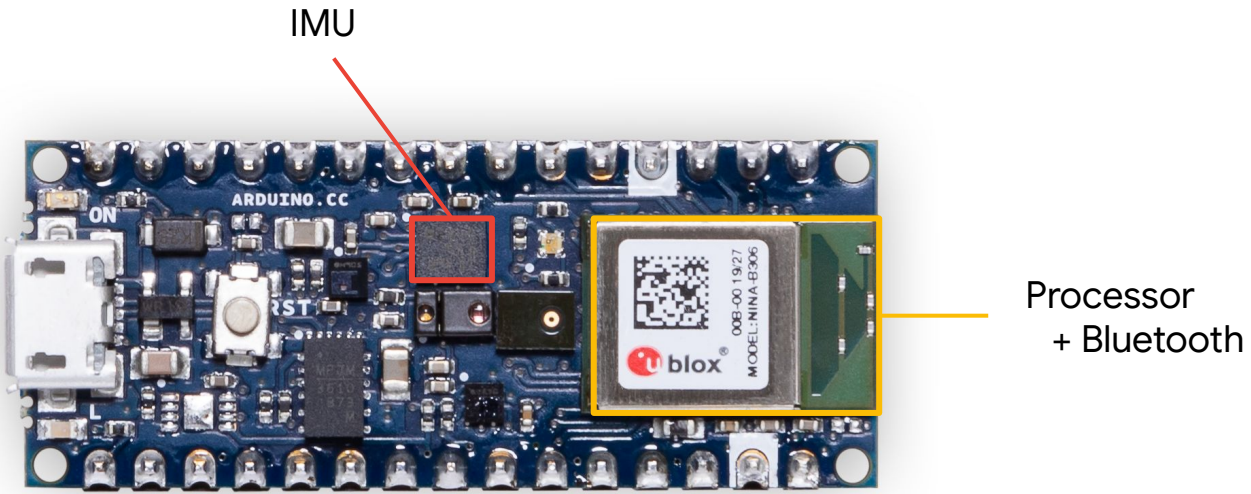

SDA
SCL
START
A1
A2
AN
STOP

I²C in action


OV7675
SUNNY
F009H
VCC
GND
SCL
SDA
VS
HS
PCLK
XCLK
D7
D6
D5
D4
D3
D2
D0
D1
PEN
PDN
2
1
20
19


OV7675
VCC
GND
SCL
SDA
VS
HS
PCLK
XCLK
D7
D6
D5
D4
D3
D2
D0
D1
PEN
PDN
2
1
20
19

I²C in action




ARDUINO
TINY MACHINE
LEARNING KIT
In partnership with:
edX
TensorFlow
OV7675