Overall Mechanical Design 2/23

Ping Sensor Mount

Pixy 2 Cam

Servo

DAGU

DAGU

Arduino Uno

IR Sensor mount

Top View

T = screws

Caster wheel

Side View

Pixy 2 Camera + Servo mount

Arduino Uno

Ping Sensor

DAGU

IR mount

Caster wheel

DAGU motor w/ wheel mount

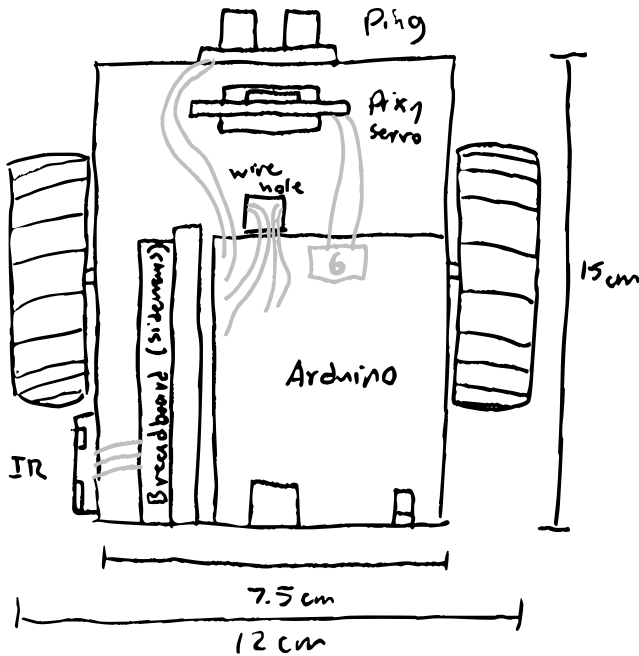(not to scale)
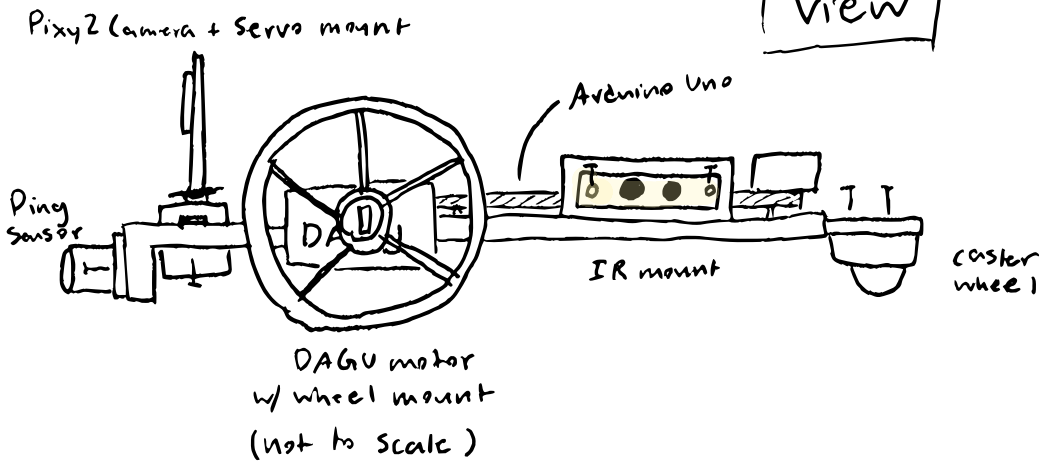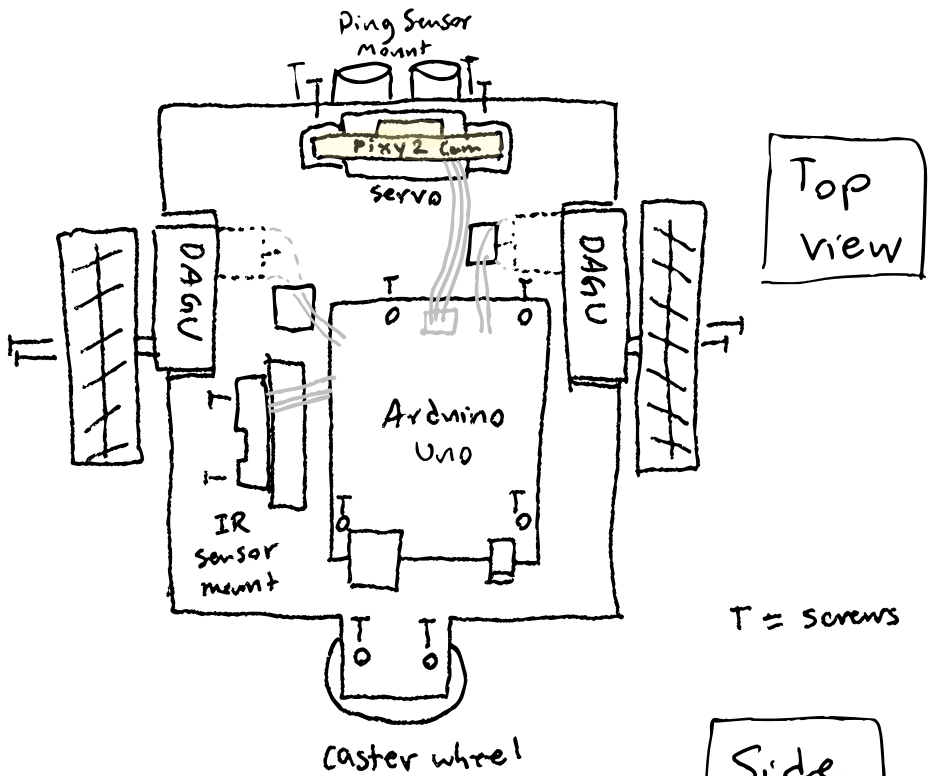
Revised Mechanical Design   2/24/21

Previous design flaws:
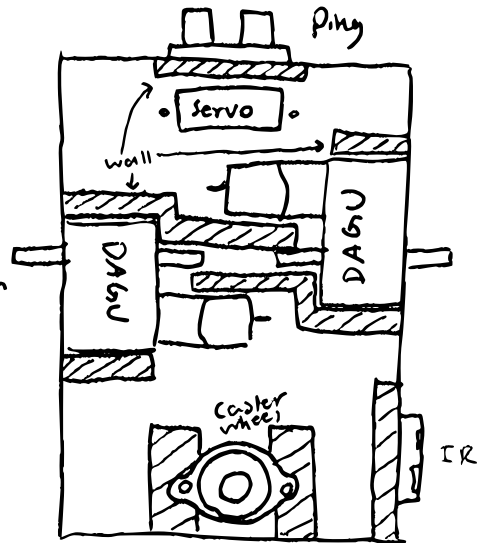
- No breadboard space → wire management issues

- old motor arrangement with spindle-to-spindle
  setup makes overall width >15 cm

New design:

| Top View |

| Bottom View |
no wheels

Top View:

Ping

Pix1
servo

wire
hole

6

(camera)

Breadboard

Arduino

IR

15cm

7.5 cm

12 cm

Bottom View:

Ping

Servo

wall

DAGU

DAGU

caster
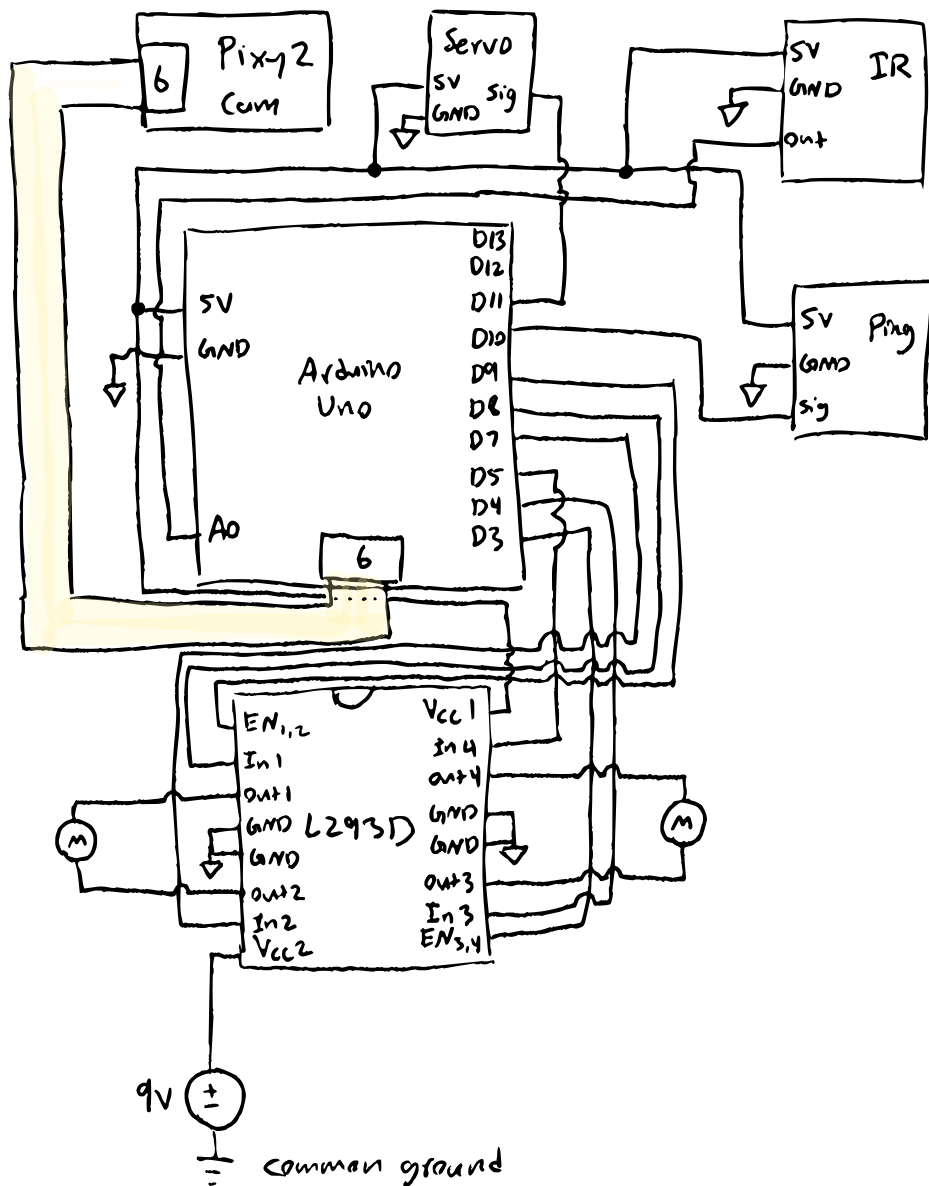wheel

IR

Improvements:

- narrower & compact

- centralized weight over
  axes

- includes breadboard
  mount

Circuit Design for Robot Sensors & Actuators

Pixy2 Cam

6

Servo
5V
GND Sig

5V IR
GND
out

5V Ping
GND
Sig

Arduino Uno
5V
GND
A0

D13
D12
D11
D10
D9
D8
D7
D5
D4
D3

6

L293D
EN1,2
In1
Out1
GND
GND
Out2
In2
Vcc2

Vcc1
In4
out4
GND
GND
Out3
In3
EN3,4

M

M

9V ±

common ground

Design Revisions 2/25

Mechanical:

- Replace L-shape motors with straight motors for more optimal spacing
- Shorten chassis length for more centralized weight distribution and mobility
- Add right side IR mount, move both IR sensors to the front and angle 45°
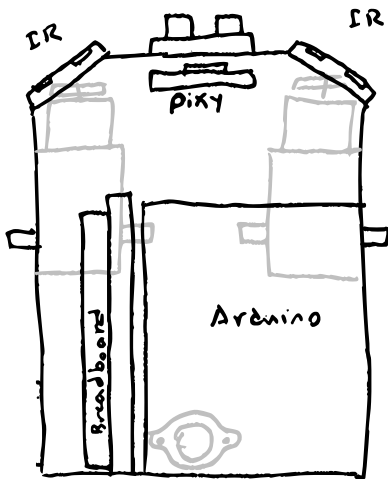
Electrical

- Added 1 more IR sensor
- Removed servo from Pixy camera
- Using encoder pins on the Arduino

D3	EN$_{3,4}$
D4	IN3
D5	IN4
D7	IN2
D8	IN1
D9	EN$_{1,2}$
D10	Ping
D11	Enc$_1$
D12	Enc$_2$
A0	IR1
A1	IR2
ICSP	Pixy2

Labyrinth Design

yellow

orange

orange

orange

yellow

yellow

orange

pink

A

B
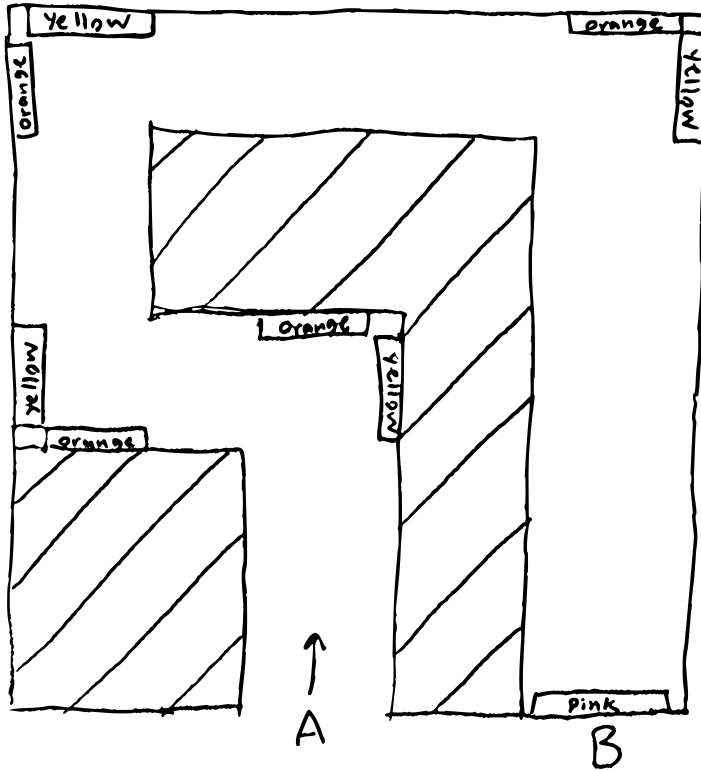
Top View

Sticky note color codes:

yellow: turn $90°$ right

orange: turn $90°$ left
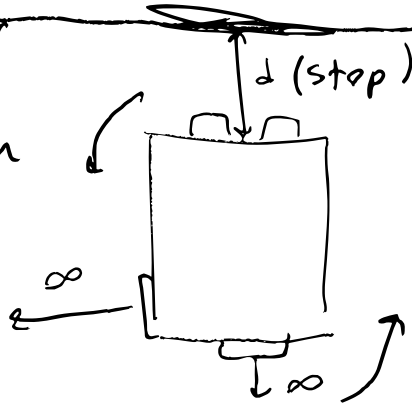
pink: U-turn $(180°)$

Expected Path:

$A \rightarrow L \rightarrow R \rightarrow R \rightarrow R \rightarrow B(UT) \rightarrow L \rightarrow L \rightarrow L \rightarrow R \rightarrow A$

Sticky

d (stop)
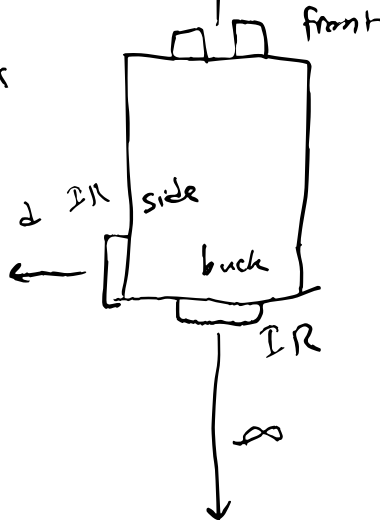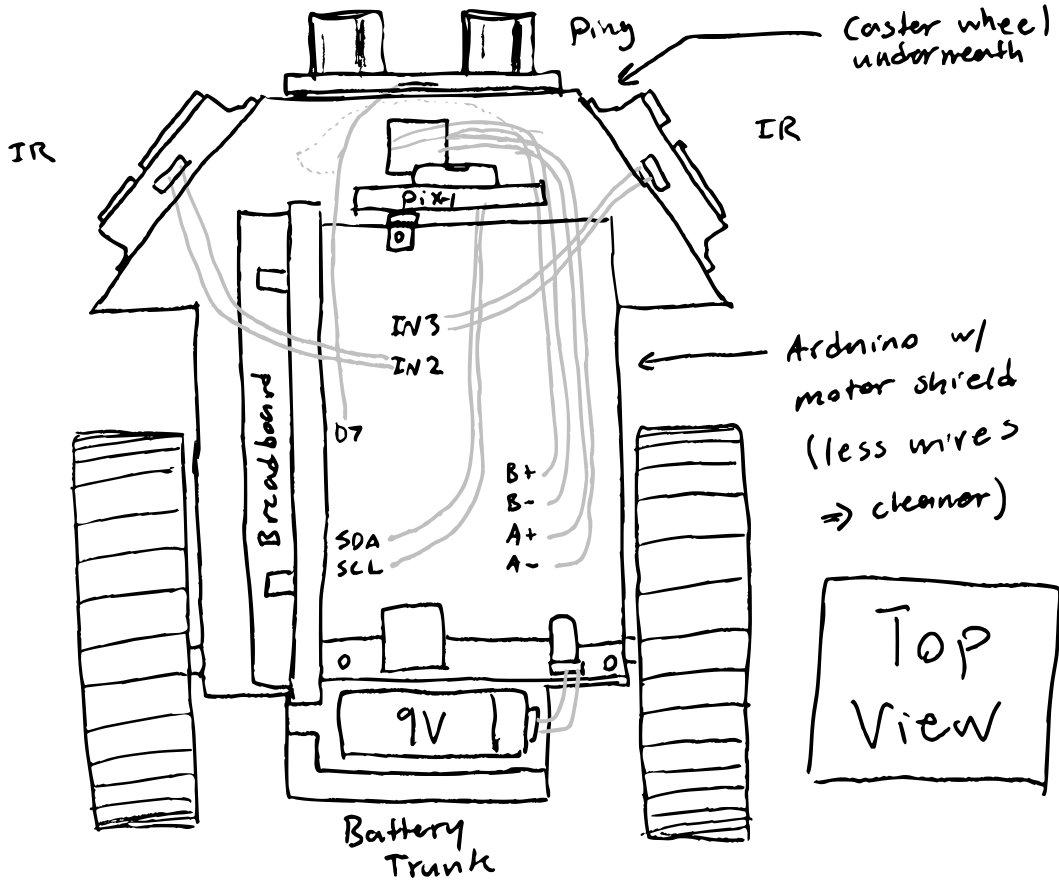
Stop moving when
front = d

∞

∞

Sequence:

1. move forward when
front > d

2. Stop moving when
front = d

3. Start turning

4. Stop turning when
back = d

front

q

d IR side

back

IR

∞

U turn:
1. move when f > d
2. Stop when f = d
3. Start turning
4. delay
5. turn until s = d

Ping

Caster wheel underneath

IR

IR

Pixl

Breadboard

IN3
IN2

D7

B+
B-
A+
A-

SDA
SCL

Arduino w/
motor shield
(less wires
⇒ cleaner)

Top
View

9V

Battery
Trunk
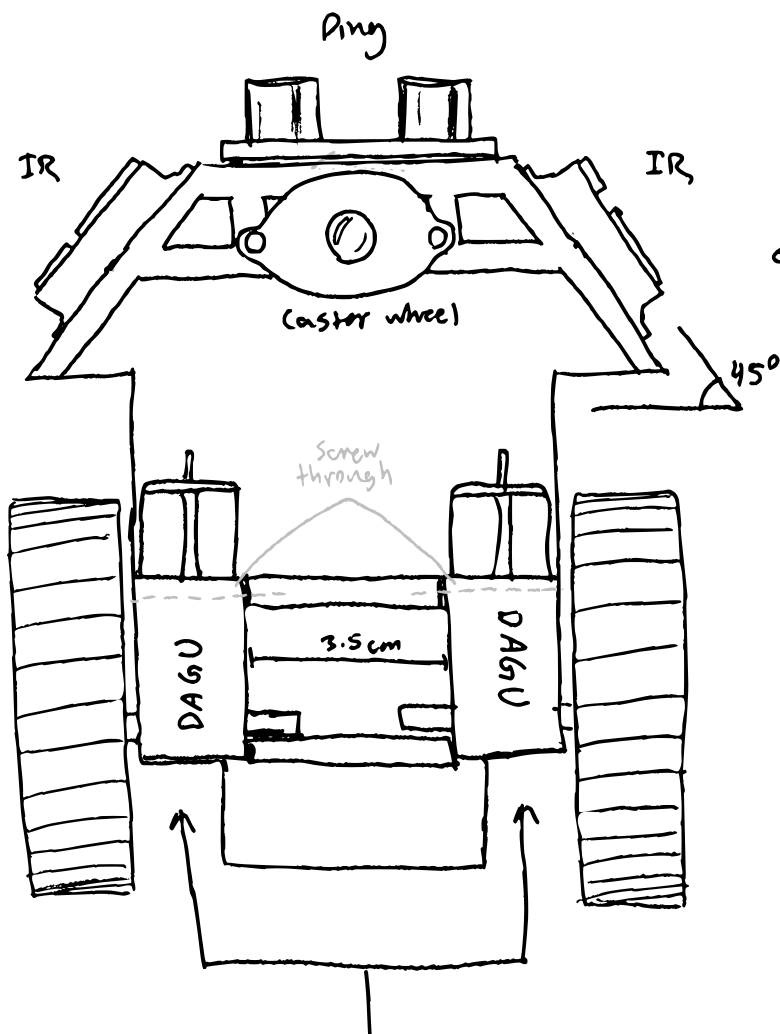
- Sideways mounted breadboard saves
horizontal space and makes use of
the +/- rails

- Battery trunk allows Vin access
and axle weight balance

Top view
measurements
(cm)

4.5

4.5   4.5

0.5

1.22   1.22

B

6.8   6.8

1   1
1.5   1.5

5.5

Ping

IR   IR

Castor wheel

45°
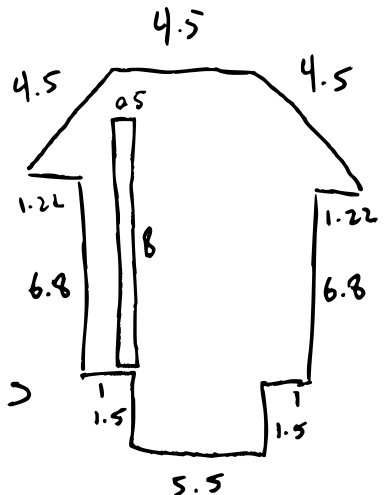
45° mounted IR
Sensors makes it
easier to read wall
distance when
veering

Screw
through

DAGU   3.5 cm   DAGU

Bottom
View

To avoid gluing the motors permanently and
risking damage, two walls 3.5 cm long were used to
mount the motors via their screw-thru mounting
holes. Motors were mounted below the chassis to
save space for board mounting.
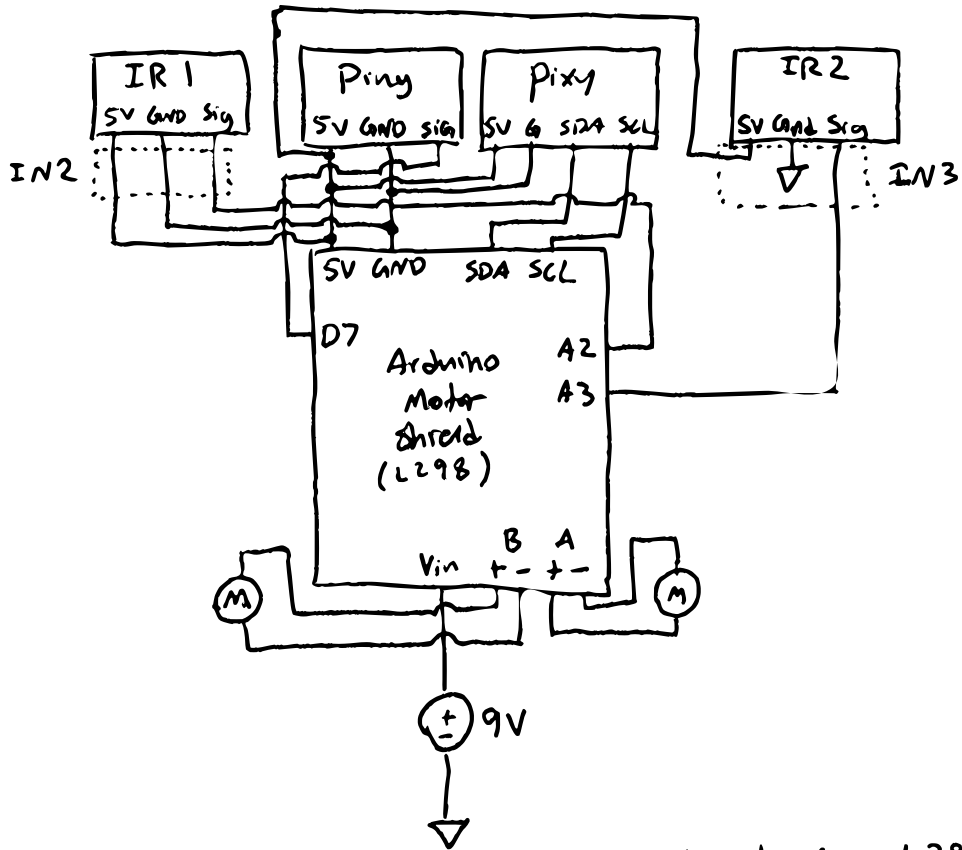
The motor shield comes with a built-in L298
dual H-bridge, whose output pins are linked to
channel A and B on the shield. In addition, it has
analog sensor input channels IN2 and IN3, which
correspond to A2 and A3 pins.