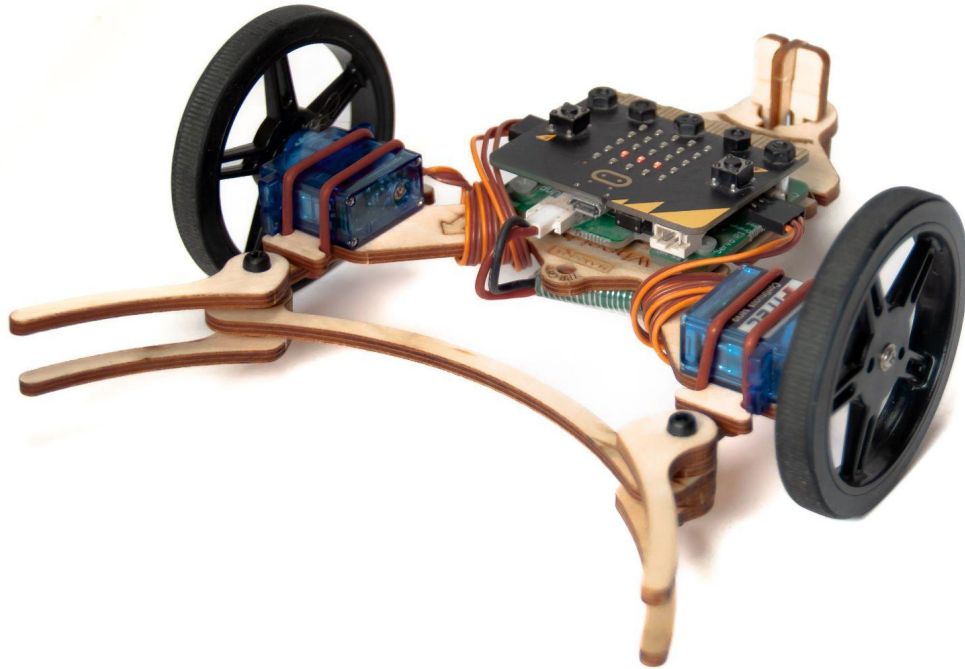
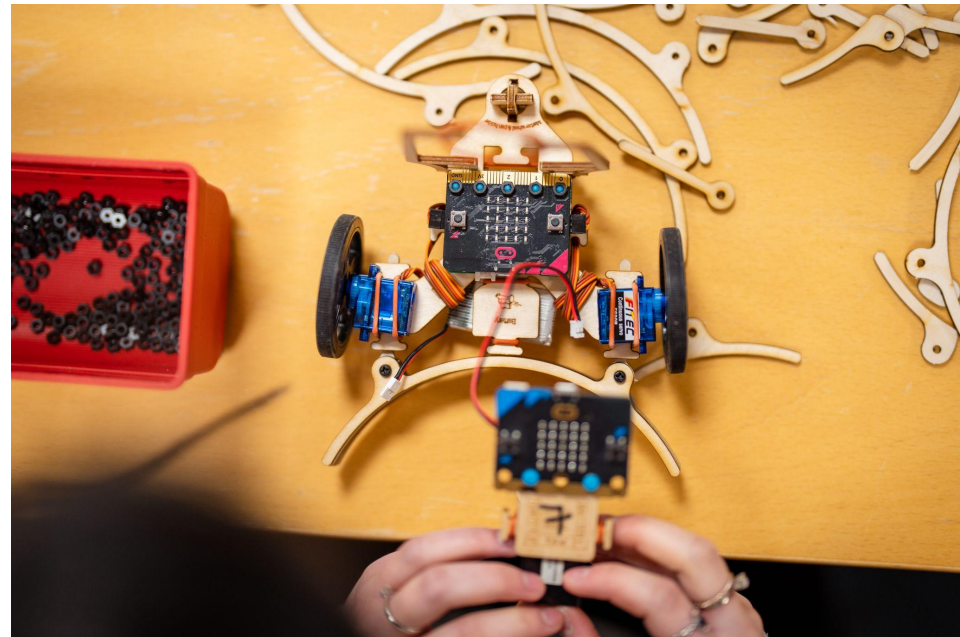
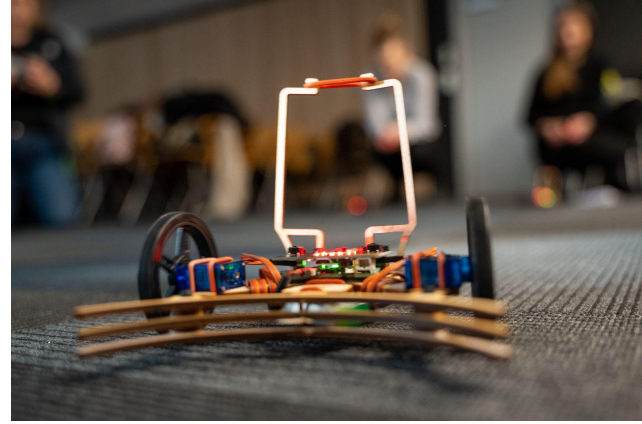


1 Wheel:bit



2 Inspiration



3 STEAM Learning

Wheel:bit is an interdisciplinary and practical program that includes programming, science, crafts and mathematics. The scheme is suitable from 4th grade and is intended for classes that have some experience with micro:bit from for. Wheel:bit reuses cardboard and other materials and can be taken apart and repaired.

The most important learning elements:

Science

Servomotors: electrical forces and energy
Technological systems with transmitter and receiver
Acceleration and its effect

Mathematics

Functions and arithmetic with angles, algebra and negative numbers
Exploring mathematical properties and relationships using programming

Arts and crafts

Design, build and experiment with stable structures
Express feelings and opinions in your own works
Using programming to create interactivity and visual expression
Assess the materials' durability and possibilities for repair and reuse

4 Design

1. **Design and construct your own Wheel:bit**

Ask the students to find boxes of cardboard boxes or other packaging at home that can be used to make a stable construction.

2. **Art assignment**

Wheel:bit is designed so that the marble and the attachment at the back can be removed and replaced with a pen or marker. This is how Wheel:bit can become a drawing robot.

The students can be tasked with programming the Wheel:bit to move in different patterns. Put it on top of an A3 sheet and see how it creates a pattern.

5 About the product

Wheel:bit is designed and manufactured in the old premises of Tanberg's Radio factory at Skullerud in Oslo.

We welcome questions and feedback.

Do not hesitate to contact us!

Feel free to use our Facebook chat



www.makekit.no



support@makekit.no



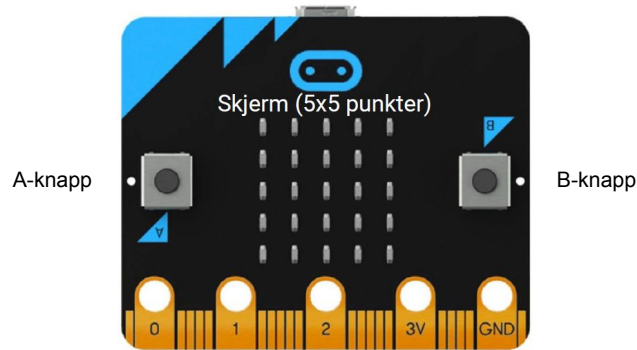
[makekit](https://www.facebook.com/makekit)



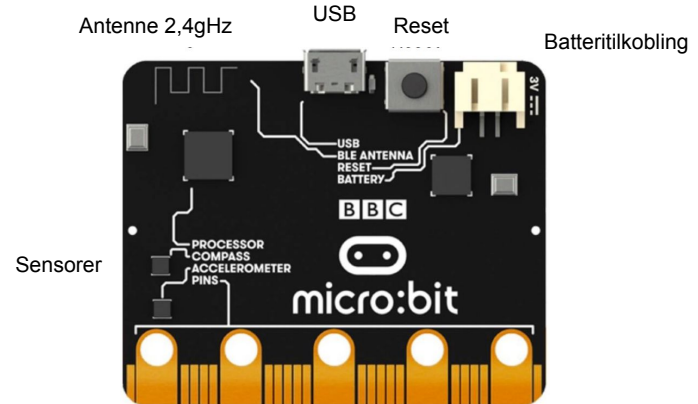
[gomakekit](#) (Insta and twitter)

6 About micro:bit

micro:bit is a small computer with processor, sensors, display and radio. It has the connection where you can connect everything from LEDs to motors and speakers. These are called P0, P1, and P2.



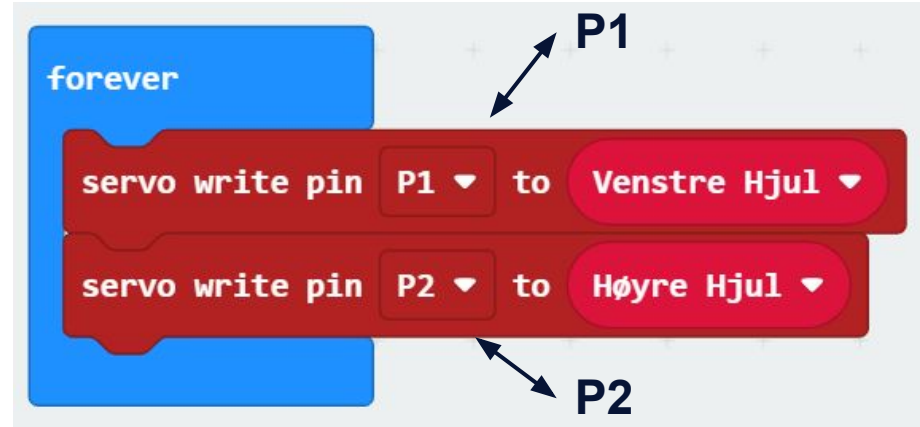
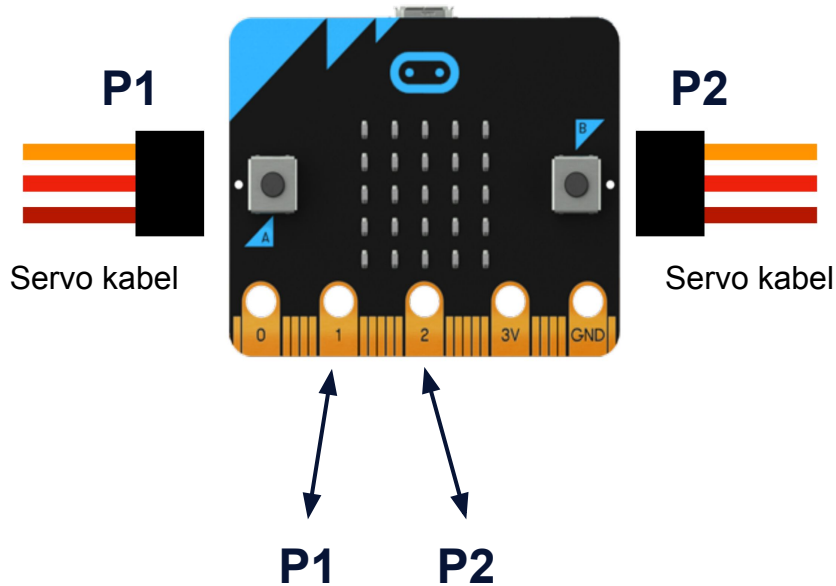
Tilkoblinger P0-P2



(bakside)

7 Wonder:Kit and micro:bit

The code describes that the micro:bit will send servo signals out through P1 and P2. This signal then goes to the WonderKit board where it is amplified and sent out to servo P1 and P2 through the cables.



8 Battery and safety

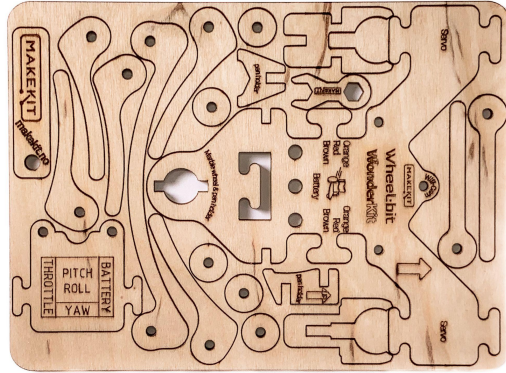


Lithium batteries can release smoke or cause a fire

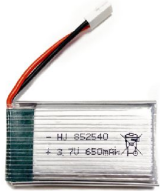
To prevent damage:

- Don't charge the batteries unattended
- Don't use a damaged or punctured battery
- Do not short circuit the battery
- Avoid temperatures below -10 and above 50 degrees celcius.
- Don't use batteries that are colder than 15 degrees celcius
- Always have a plan for what to do in case of a fire: If you are indoor, open a window and get the battery outside to prevent smoke or fire.
- Do not open or modify the battery in any way.
- For optimal performance, store the battery at around 30% capacity and between 10 and 20 degrees celcius
- Follow airport regulations for carrying lithium batteries on airplanes. (Usually hand luggage only)

9 Wheel:bit Parts



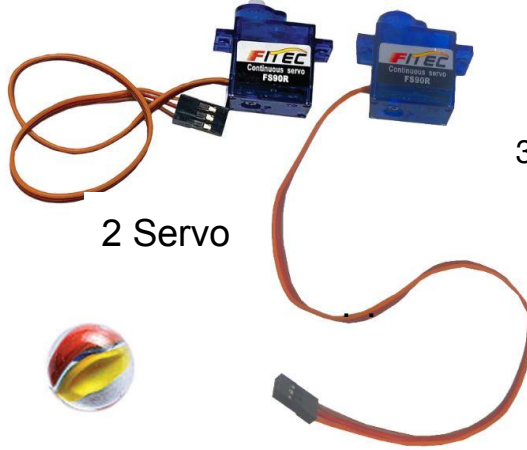
Wooden parts



Battery



Charger



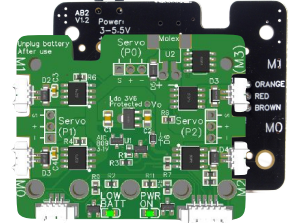
2 Servo



Marble



3 Large o-rings



WonderKit
Green or black



2 Wheels



2 Screws



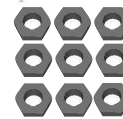
5x m3x12
nylon screws



2x m3x15
nylon screws



2x m3x12
white nylon
screws



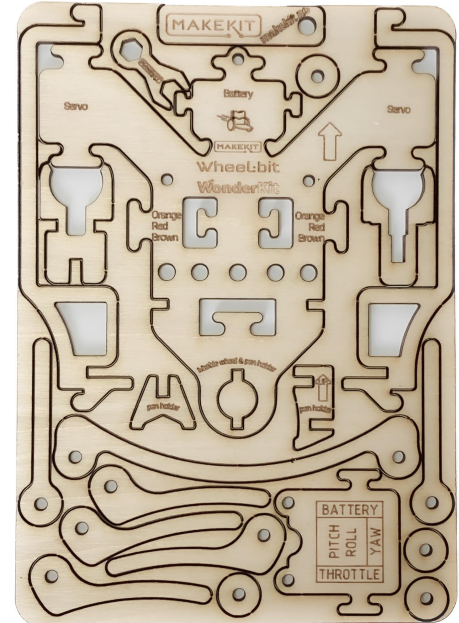
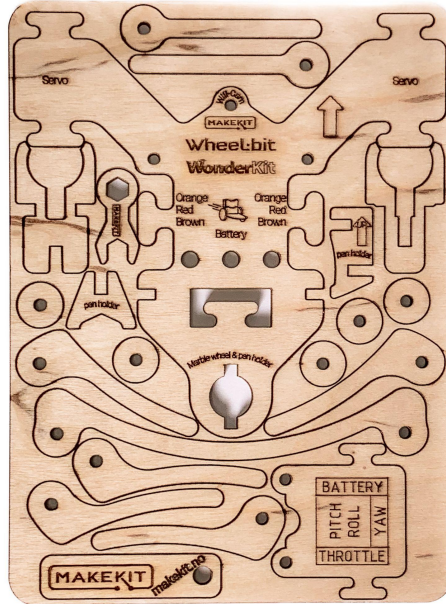
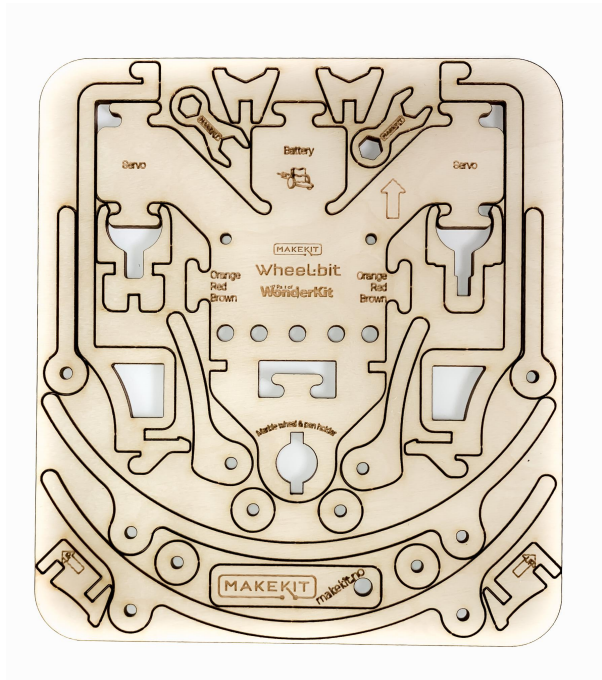
9x nylon
nuts



5x spacers,
aluminium

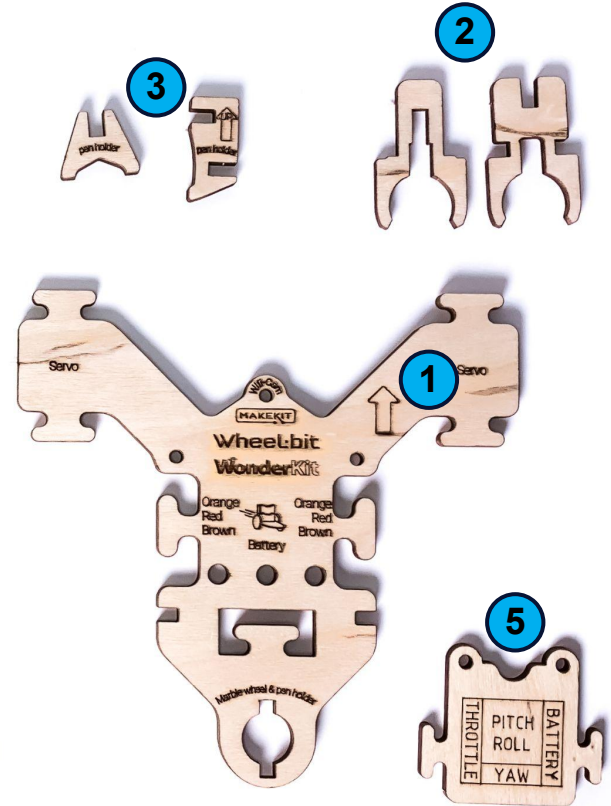
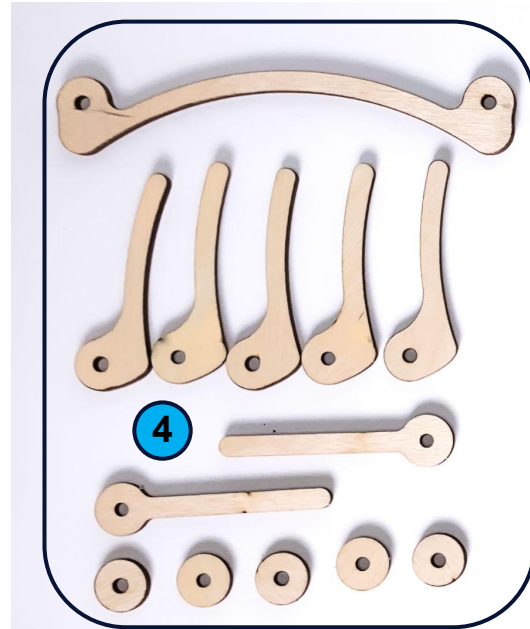
10 Different versions

There are different versions, they all work great, and are assembled in the same way.



11 Deler og forklaring

1. Wheel:bit Plywood Frame
2. Marble wheel holder
3. Pen holder
4. Wheel:bit Scoop
5. Remote control holder
6. MakeKit Key ring
7. Mini tool



12Tools

The only tool you need



13 Charging with WonderKit

For class kits with the Quattro Micro Battery Charger



Take the fast charger from the box and charge the battery. The fast charger must be connected to an outlet and the battery must be connected to the fast charger with a charging cable.

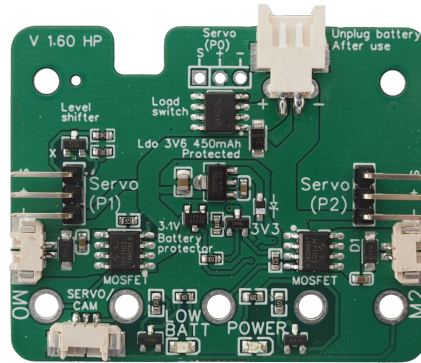
Set the rotary switch to 1A for fast charging.

Hold the button for one second until it lights up red.

14 Control boards

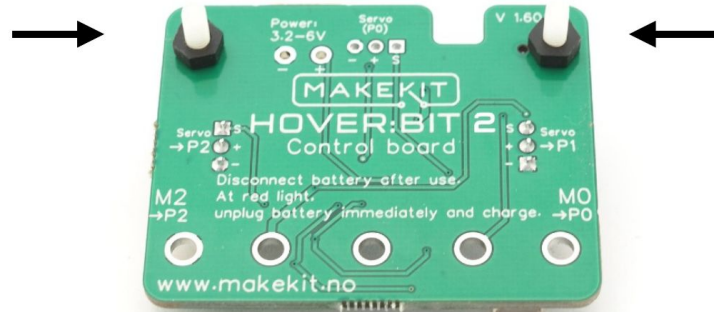
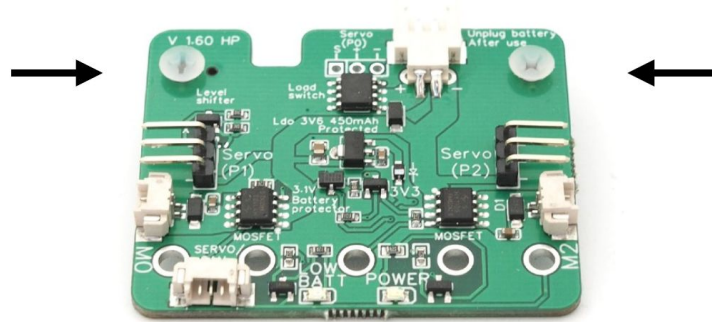
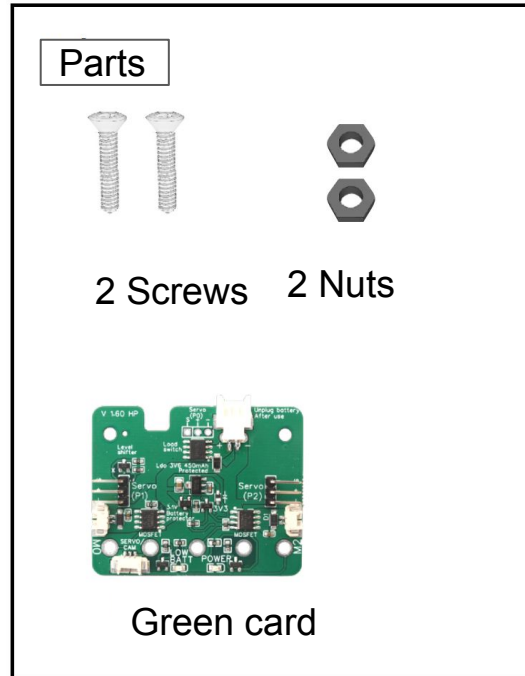
There are different control boards that all work with Wheel:bit.

All boards are assembled in the same manner.



15 Assembling control card (Green card)

Average size screwdriver, wooden tool



Insert the screws from above.
Screw the nuts on the underside

Tip: The back has a smooth surface without components

16 Assembling control card (Green card)

Tool; Medium Screwdriver

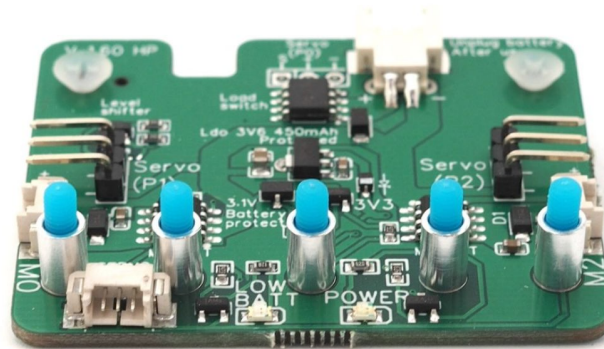
Parts



5 Screws



5 Aluminum Spacers

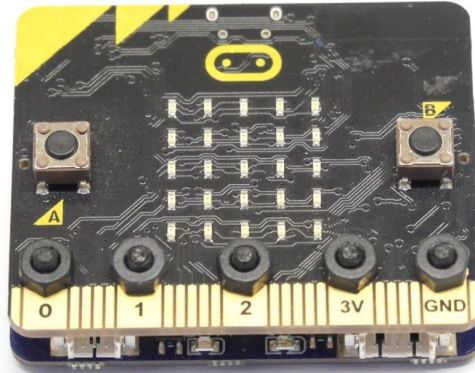
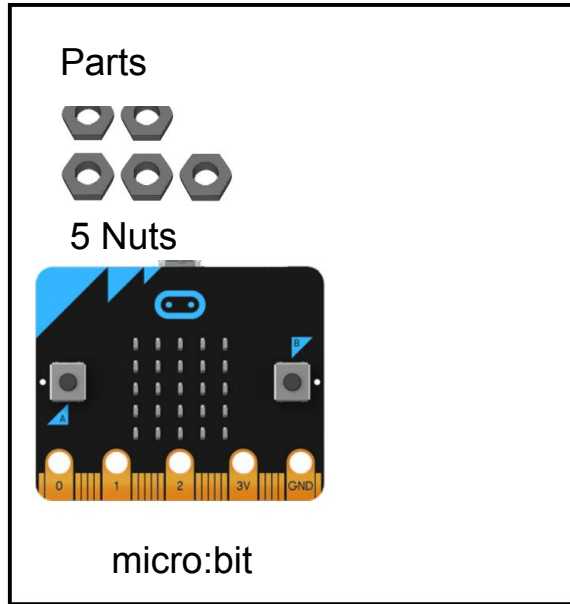


- From the back, place 5 screws in each hole
- Place the 5 aluminum spacers

Insert five screws, pointing up.
Thread an aluminum spacer on
each screw.

Tip: Use a finger to hold over the screws when you turn the card over and place it on a table

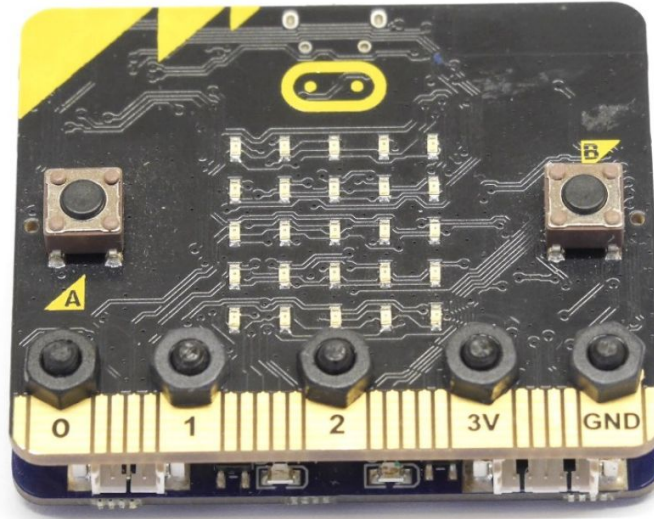
17 Assembling control card (Green card)



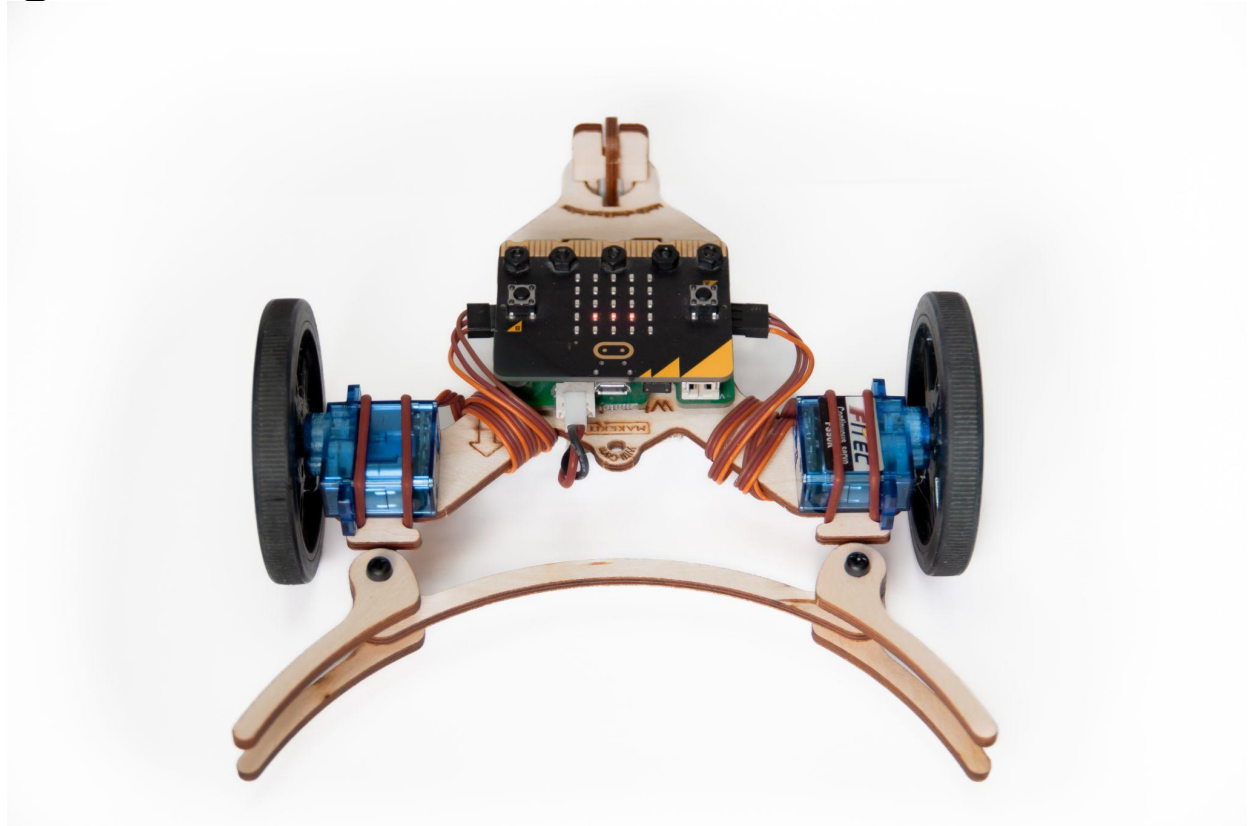
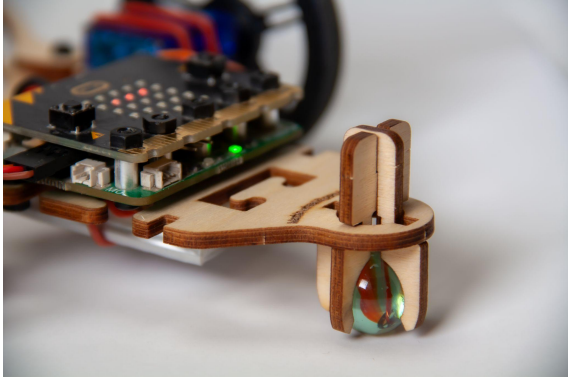
- Place micro:bit on top of aluminum spacers
- Screw a nut on top of each screw

Tip: Do not need to tighten any more than the aluminum spacer sleeve fits well and is in contact with both cards.

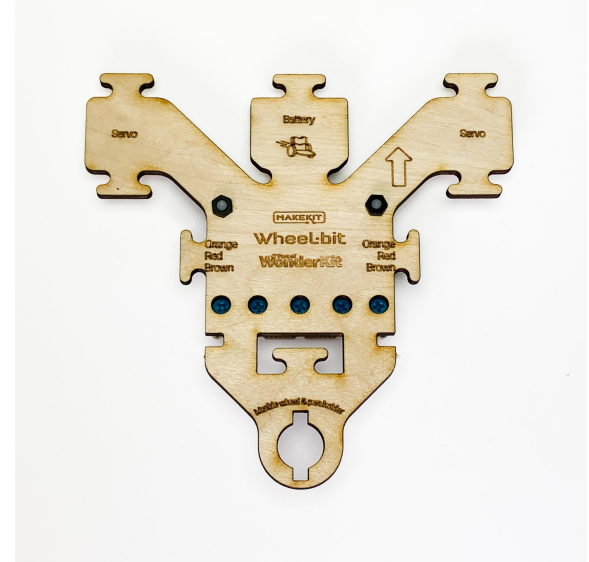
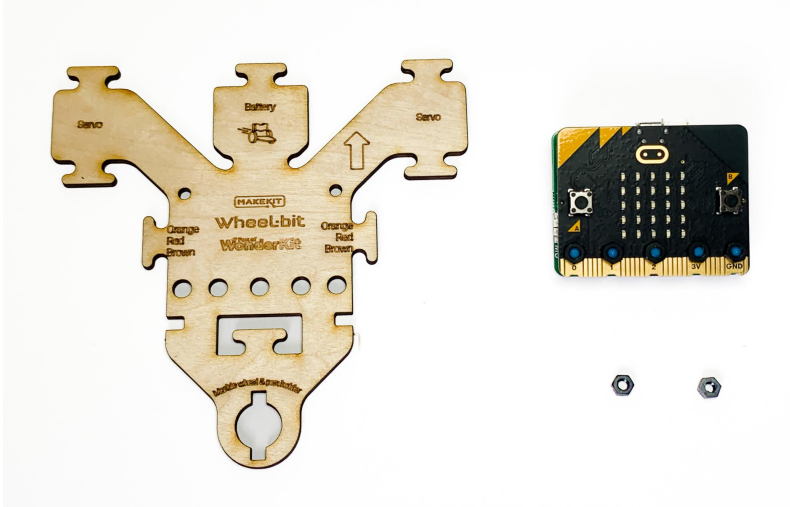
18 You are ready (Green card)



19 Assembling Wheel:bit



20 Assemble WonderKit & micro:bit



21 Install the marble wheel



Assemble the
marble holder



Place in the frame



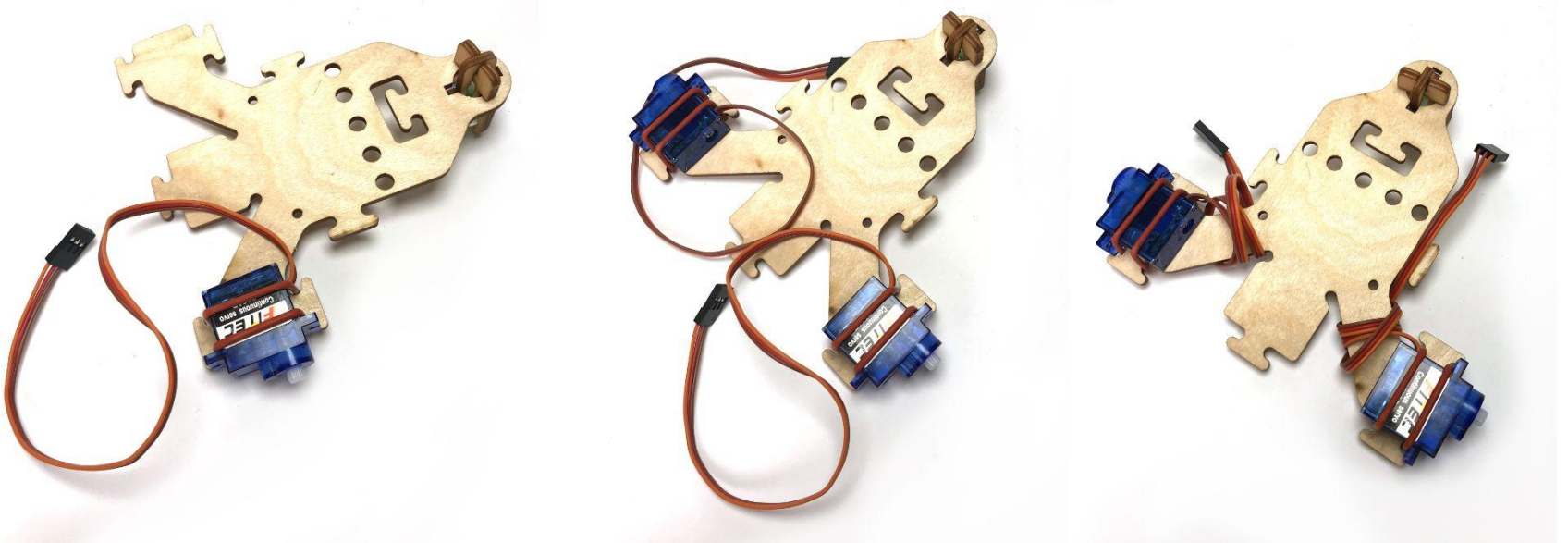
Turn 90 deg, like a
key



Push the marble in
place

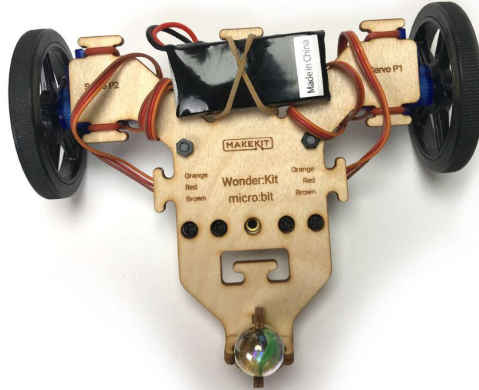
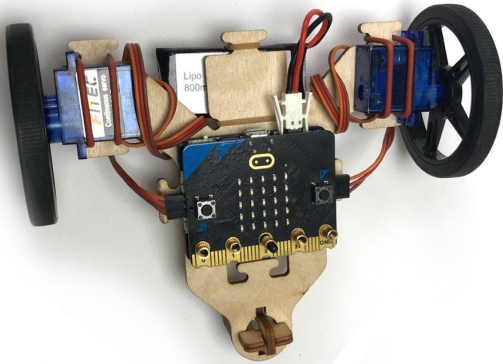
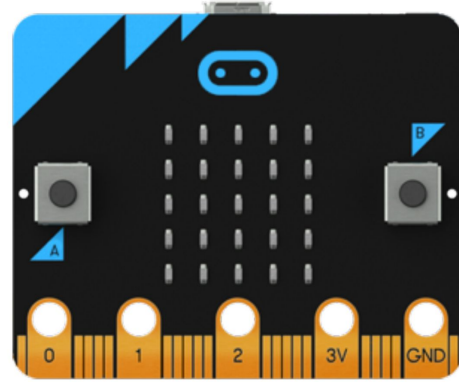
22 Install servos

Tip: Hold the servo motor with one finger, while you extend the elastic from one holder and pull over the servo to the other side.



Place the servo on both sides and fasten with rubber bands

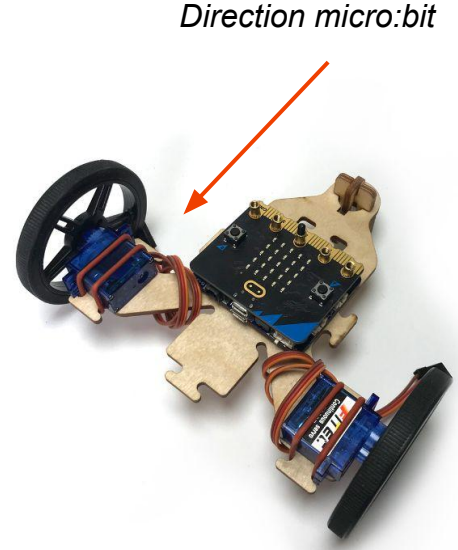
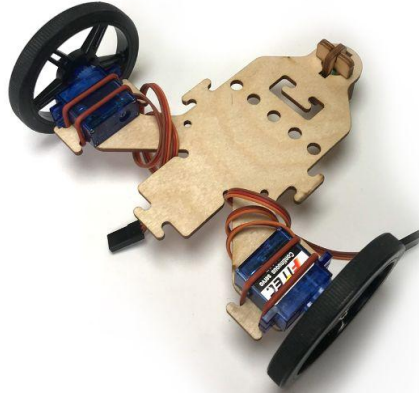
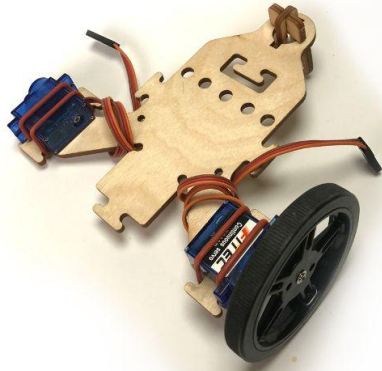
23 Connect the servos



Tip: the cables on the servo are colored yellow, red and brown. The rule to remember is; Yellow goes up and Brown goes down.

Connect the servo to the micro:bit.
NB: look under Wheel:bit it says:
Orange, Red Brown. That's how we
have to place the link the right way.

24 Install the wheels



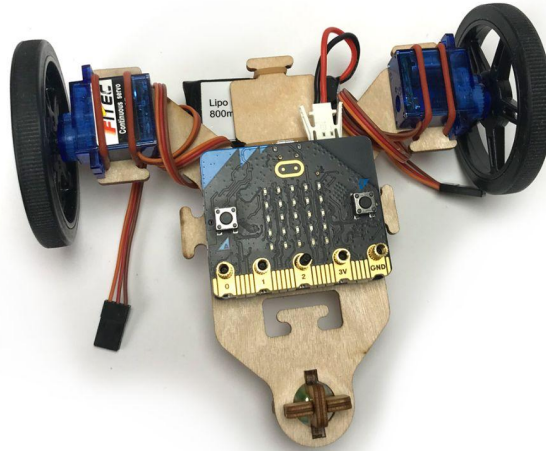
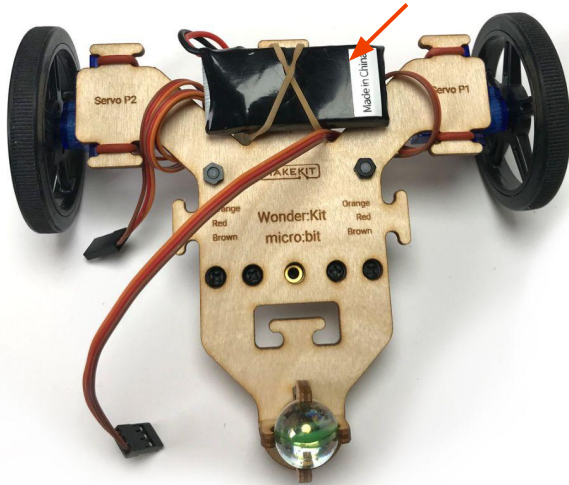
The holes must be pressed on before using a screwdriver to secure them with a small screw.



Placing wheels and microbit. Fasten with screws.

25 Install batteri

Battery must be placed on the opposite side of micro:bit

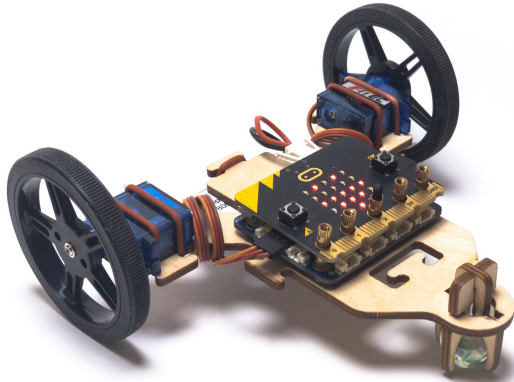


Place battery, attach with natural rubber ring and connect to micro:bit

26 Congratulation!!!

You have now mounted your own Wheel:bit, you are now ready to enter code.

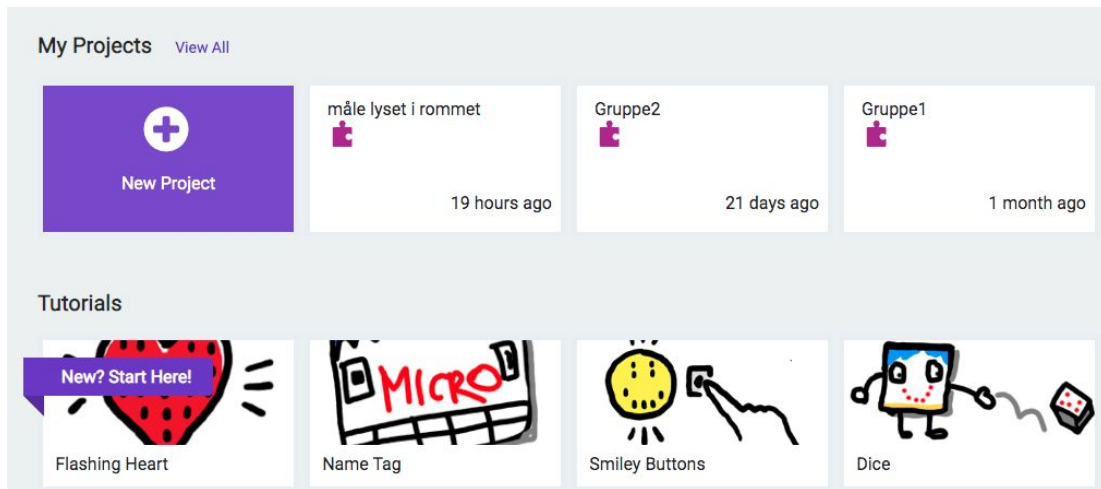
It should look like this when you're done:



27 Let's start Coding

When the control board is ready, we can start coding.

Go to: <https://makecode.microbit.org/> Chrome is recommended for a better connection to micro:bit



If you have a BLACK or a BLUE board, start with downloading the correct code from makekit.no/docs/

If you have a GREEN card select “New project” and name it: “Wheel:bit”

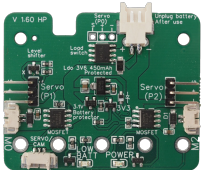
28 Code (Green card)

You will now program continuous servos that go from 0 to 180. This means that 90 is the zero point and the servo stands still.

We recommend using values between 10 and 170 so that the servo motors do not have maximum load.

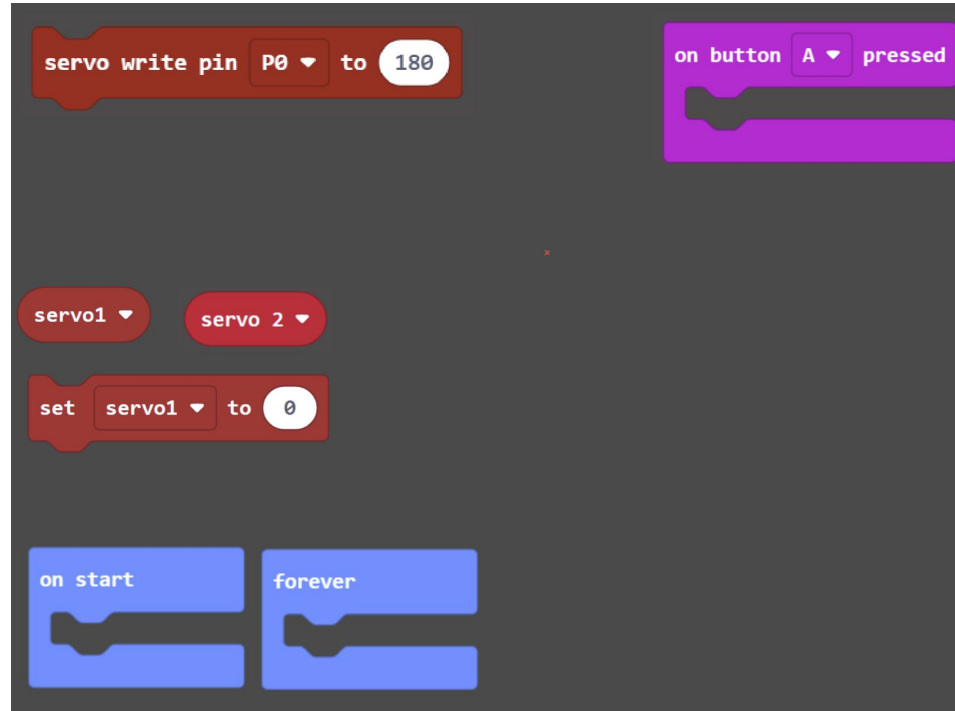
First, try programming the car to go straight ahead.

Here is an example of the code block you can use.



Tip:

The direction you code depends on the assembly of the servos, so test and see if they move in the direction you want.



29 Code (BLACK WonderKit card)

First, try programming the car to go straight.

Here is an example of the code block you can use.

Tip:

The direction you code depends on the assembly of the servos, so test and see if they move in the direction you want.

Wheel:bit go direction

0

at speed

0

on button A pressed

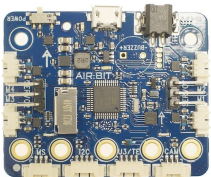


30 Code (BLUE WonderKit card)

You will now program continuous servos that go from 0 to 90. This means that 45 is the zero point and the servo stands still.

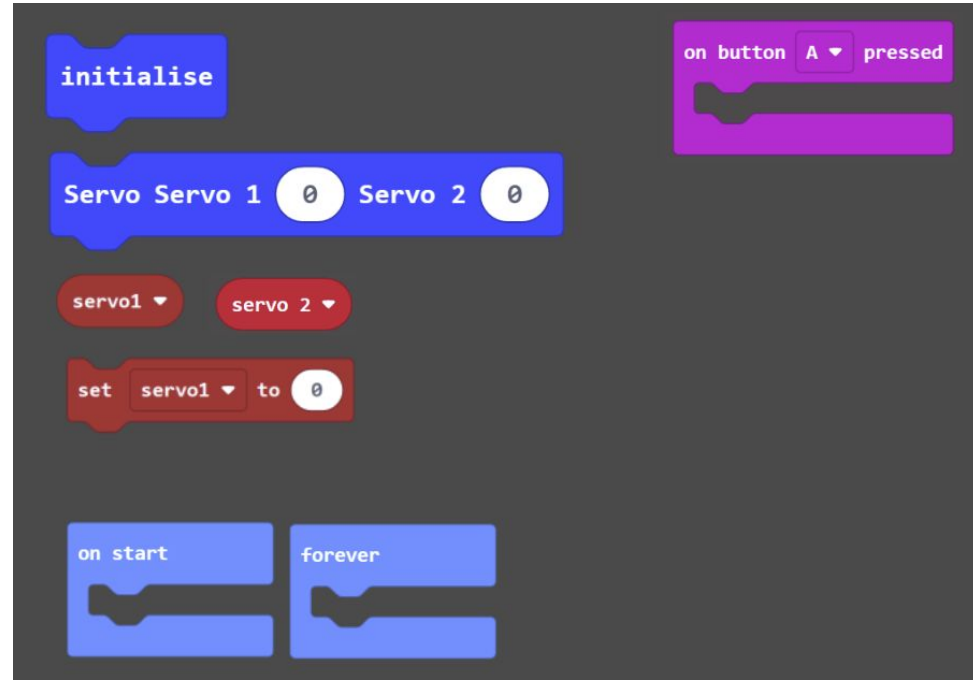
First, try programming the car to go straight ahead.

Here is an example of the code block you can use.



Tip:

The direction you code depends on the assembly of the servos, so test and see if they move in the direction you want.

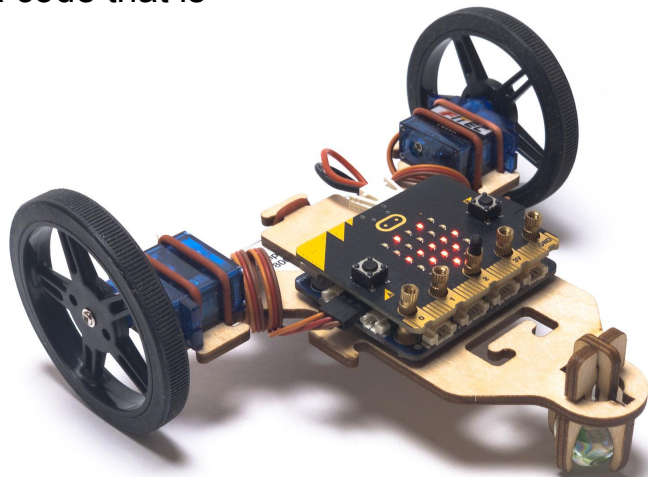


31 Congratulations!!!

You have created your own self-driving car!

Try these things out:

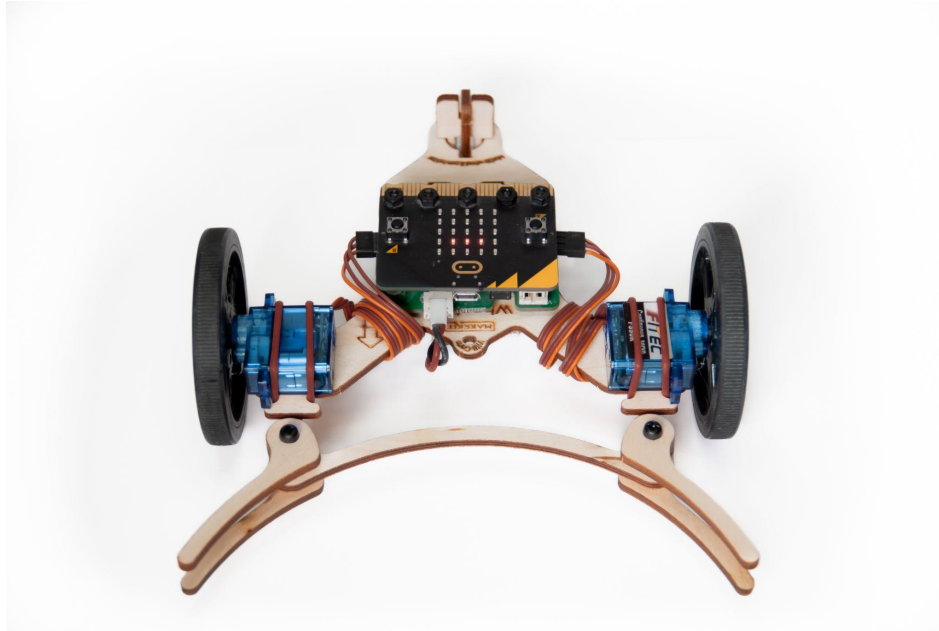
- Make the car have a more advanced driving pattern.
- Try to make the car react to light as well
- Try mounting a pen on the car and create a code that is repetitive. How to create a work of art.



32 Project 1

Play football or scoop ball

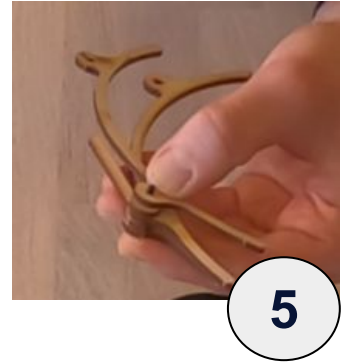
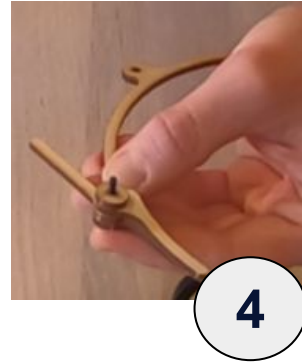
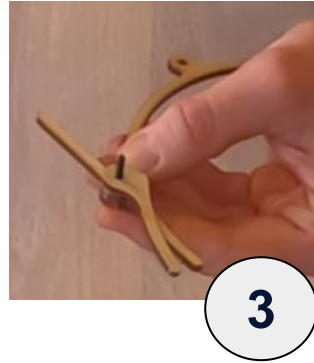
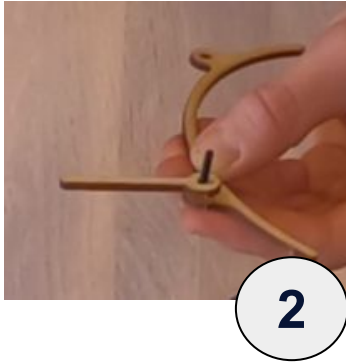
With the half circle in front of the Wheel:bit, you can play football using the Wheel:bit.



33 Project 1

Building the plow.

With this edition you and a friend can use wheel:bit for a simple football match.



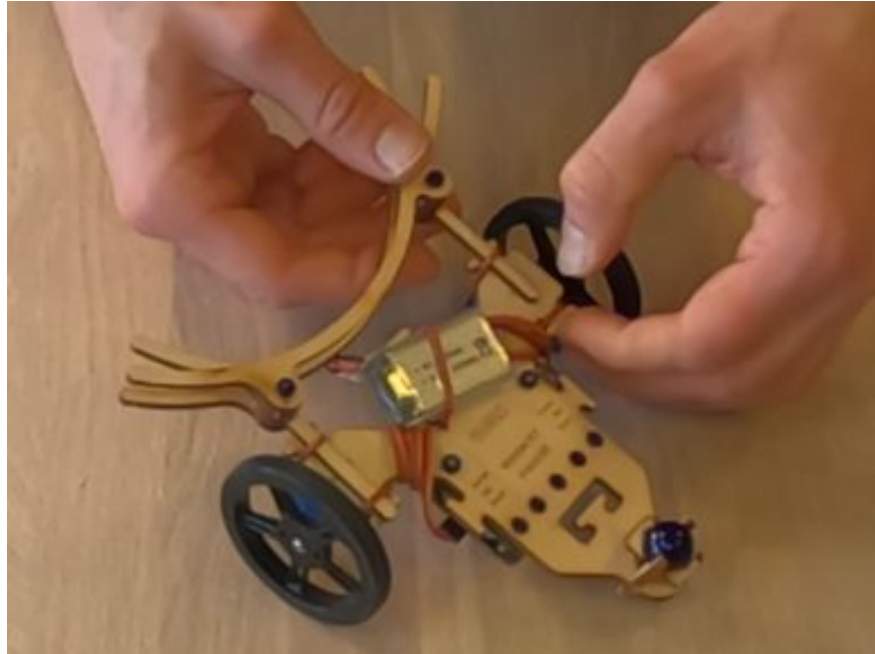
7

Repeat this process on the other side.

34 Project 1

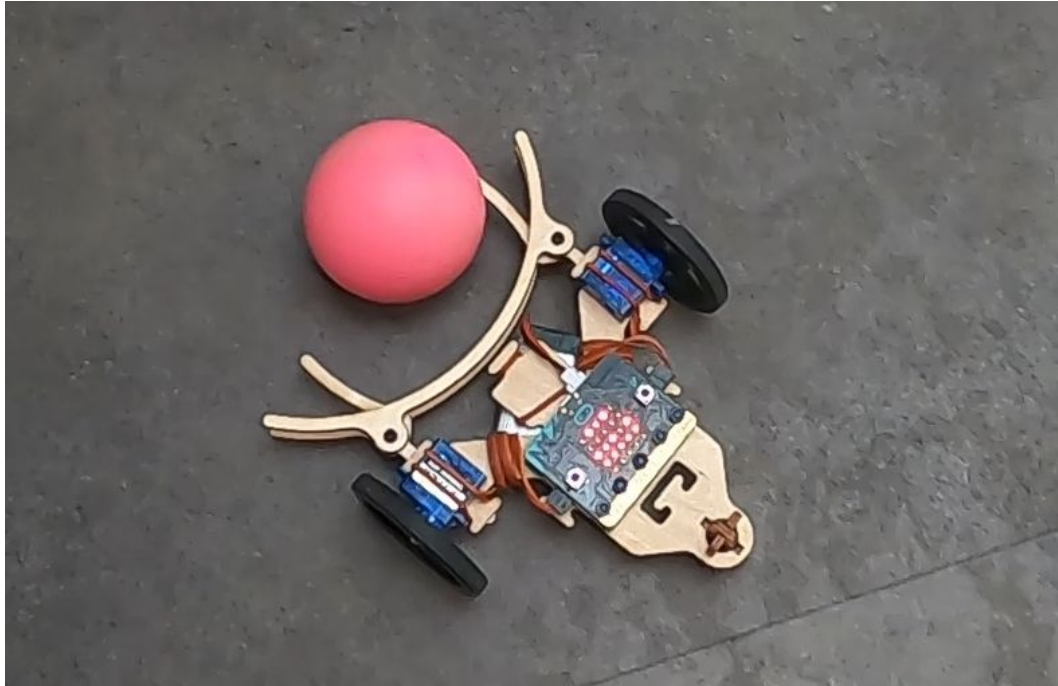
Building the plow.

Mount the plow under the same red elastic bands that are holding the Servo- motors.



35 Project 1

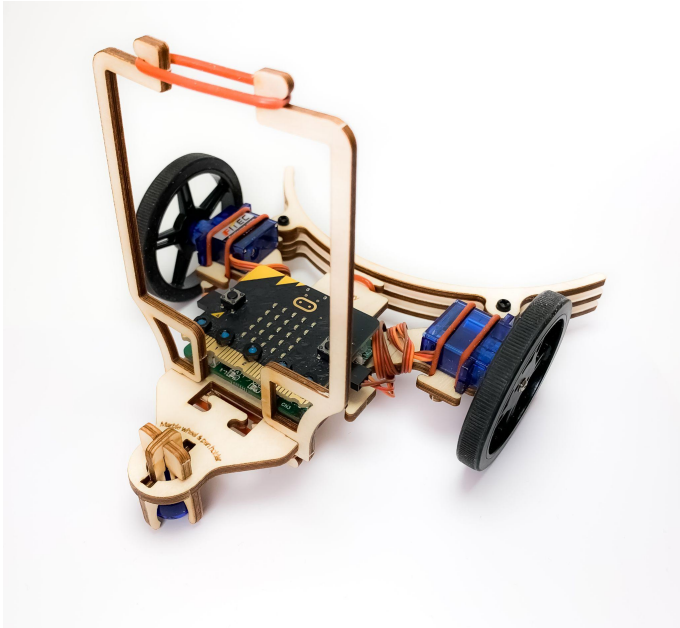
Play football tournament



36 Project 2

Be creative

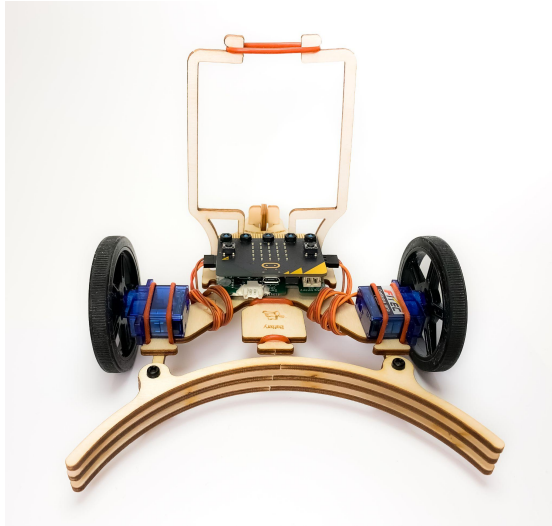
The top mount is made for a 7x7 cm milk carton. This carton can be turned into; dinosaurs, sharks, tigers or robots of the future.



37 Project 2

Make a recycling-robot

Use the plow to move objects to the right place



How can a robot that cleans up plastic on the beach work?

Or a robot that cleans the streets for particulate matter?

Or perhaps a robot that is meant to clear mines in war-torn areas.

These are projects that you can illustrate, discuss, and reflect on.

38 Project 3

Make your own design



Start with a cardboard box, like a shoebox or similar.

Find out where the different components fit.

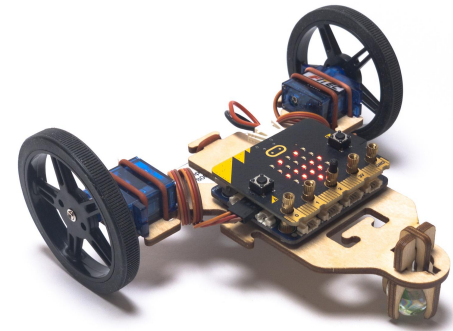
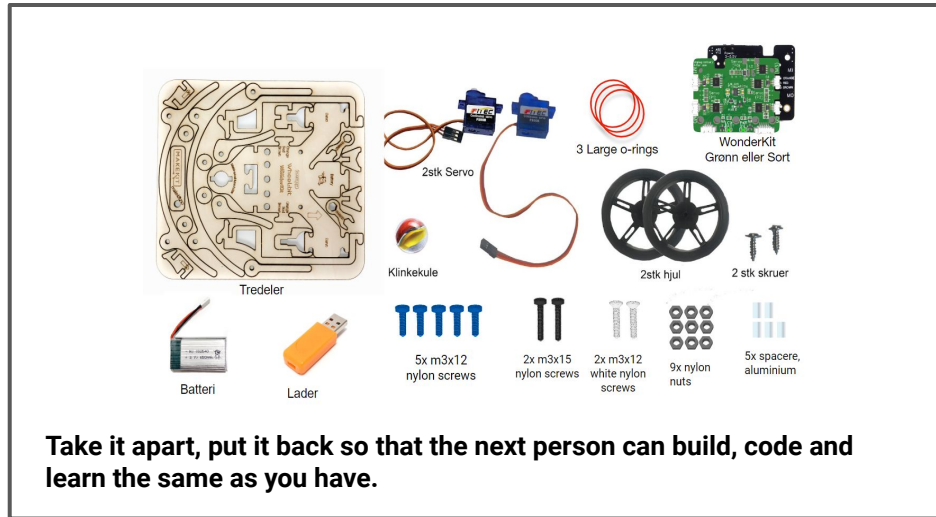
Make holes and mount the components.

Color and add your own style to the car.

Feel free to share with others on social media:
Tag: @gomakekit & #wheelbit #wonderkit

39 Make it ready for the next person

If you are done with the Wheel:bit for this time, take the part apart and sort it so that it is ready for the next person to build and code.



NB: You do not need to dismantle the control board if you have assembled it.

40 The solution (Green Card)

Tip:

There are to ways to mount the servo, this can affect the direction and you can then adjust the code.

This is the way to solve it.

Here you have the opportunity to find your own way to solve it.

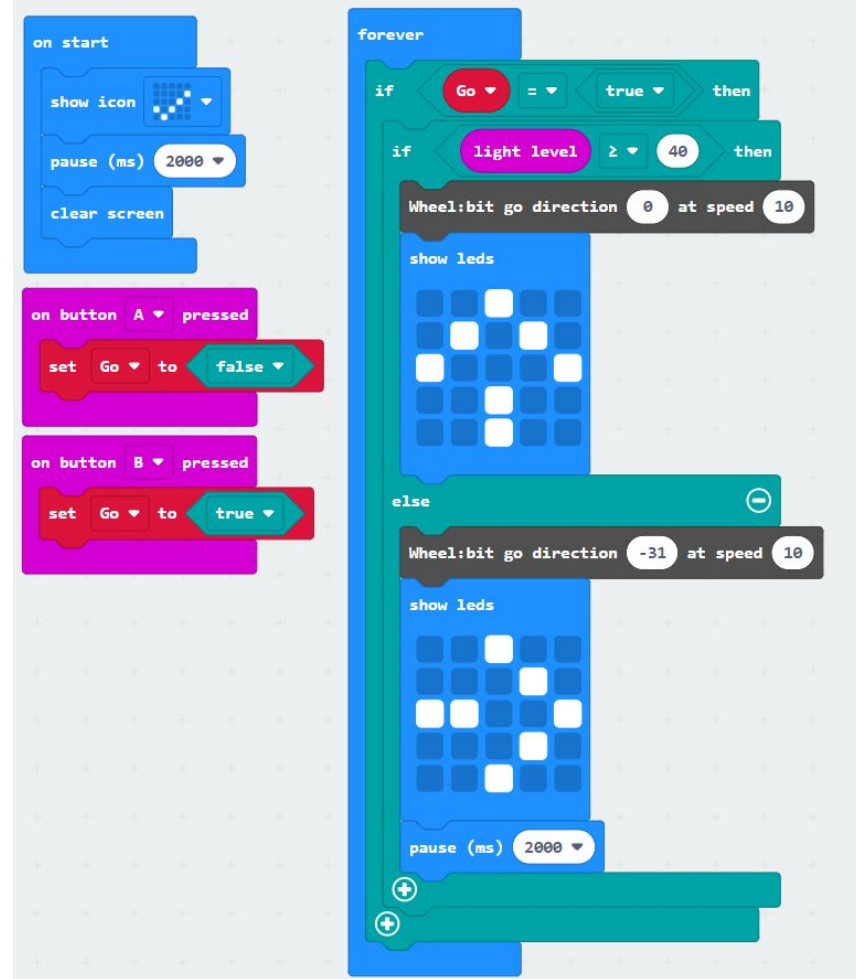


41 The solution

(WonderKit - black card)

This is the way to solve it.

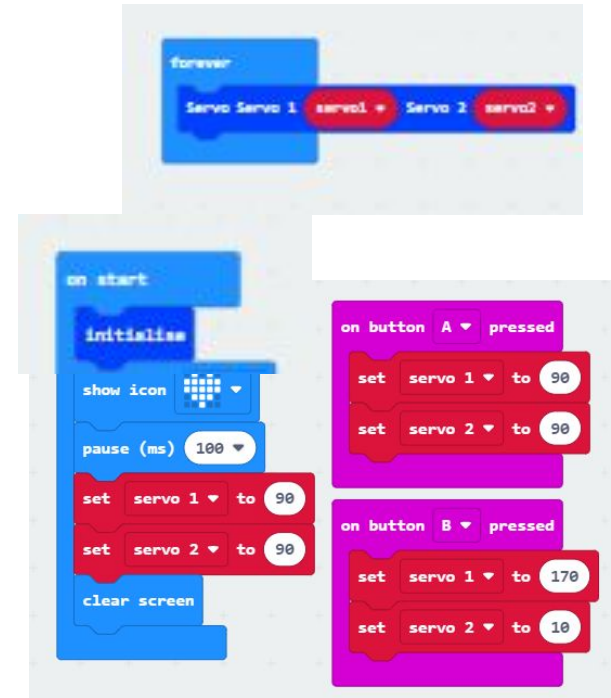
Here you have the opportunity to be creative and find your own way at solving this.



42 The solution (blue card)

This is the way to solve it.

Here you have the opportunity to be creative and find your own way at solving this.



43 The next step:

Design your own car

1. Find a cardboard box (packaging) at home, preferably one that will be thrown away. Type; Shoe box, milk carton, or similar
2. Find out where and how the various components should be placed
3. Cut holes and make ready
4. Color and create the expression you want
5. Mount the WonderKit card and micro:bit, servos and battery

44 The next step: **Design your own car**



STE(A)M FOR THE FUTURE

Science Technology Engineering (Art) Math

Maker joy for the whole class.



Air:bit

Give your pupils an experience they will remember!

Sustainable educational tools that engage and will give the pupils maker joy and a sense of mastery.

Suitable for 4th to 10th Grade.

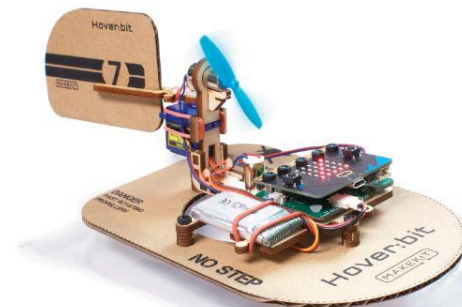
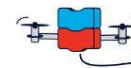
Learn to program with the BBC micro:bit
Designed and produced in Norway.



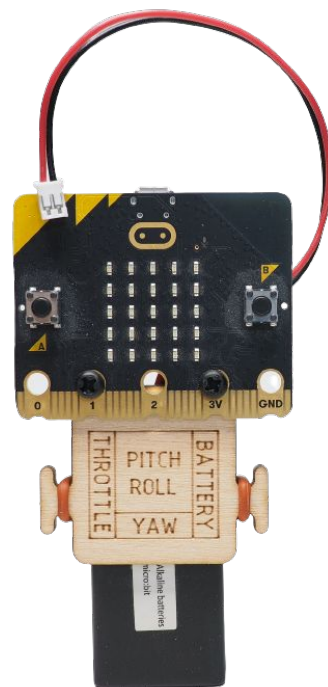
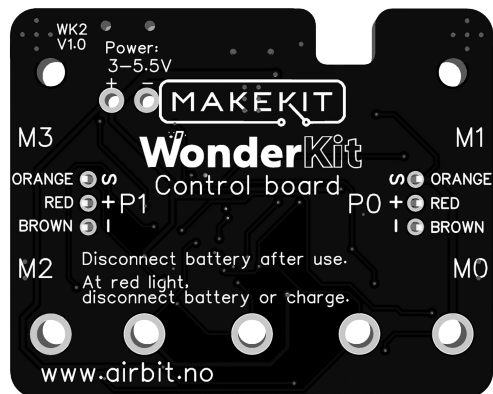
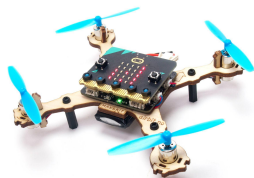
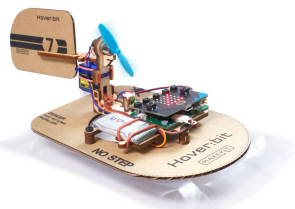
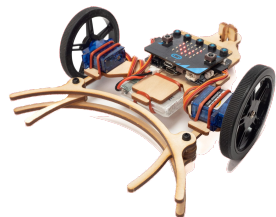
Wheel:bit



Bubble:bit



Hover:bit



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