

Micro:bit Servo Driver

User Manual

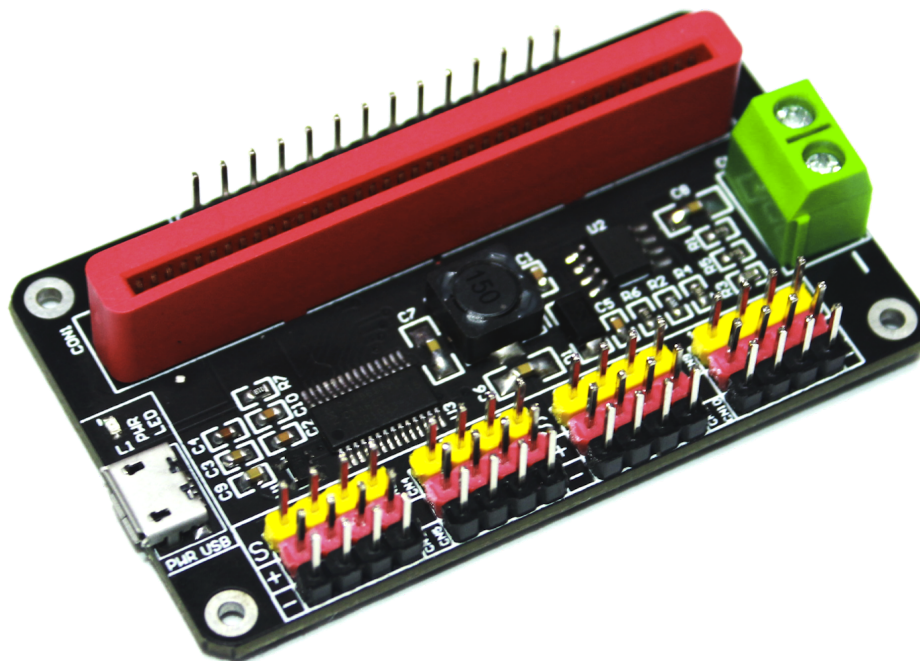


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1. GENERAL DESCRIPTION

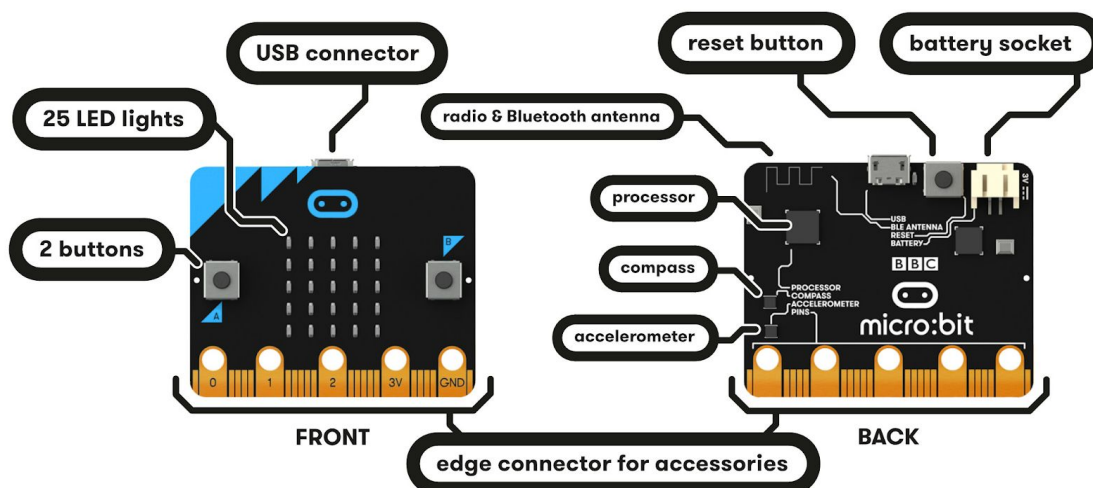
1.1 WHAT IS MICRO:BIT?

Micro:bit is a small piece of technology which helps to bring creative ideas, technology and games in our life. It is a tiny, pocket-sized computer which encourages you to learn the basics of programming and coding.

It is a device of the size of half a credit card with an ARM Cortex-M0 processor. Micro:bit has 25 LED matrix display, two programmable buttons and also a reset button. From the two buttons, you can control your micro:bit and its functionalities. Micro:bit also consists of an on-board compass to find the location and direction. The devices also come with inbuilt accelerometer sensor which can track your movements as well as can control your actions.

It can be powered up either by micro USB or external batteries. Micro:bit comes with the USB cable and a battery holder. The input and output are provided by the 20 pins/strips edge connector and also by 5 ring connectors.

To program the micro:bit you just simply need to connect it to your computer with the help of a USB cable and there is no need of any extra software or any OS installation. There are online editors where you can write your code, save it, download it to your system (a hex file will be downloaded) and at last upload it to your micro:bit drive. It will take some moments while uploading the program and you'll see a yellow LED light blinking. When the blinking stops your program starts working. It is very easy to start with Micro:bit as you don't require any deep knowledge of programming or computer Science. Micro:bit is basically designed for kids and beginners to inspire them to find their interest in technology. It provides a stepping stone into platforms like Raspberry Pi and Arduino.

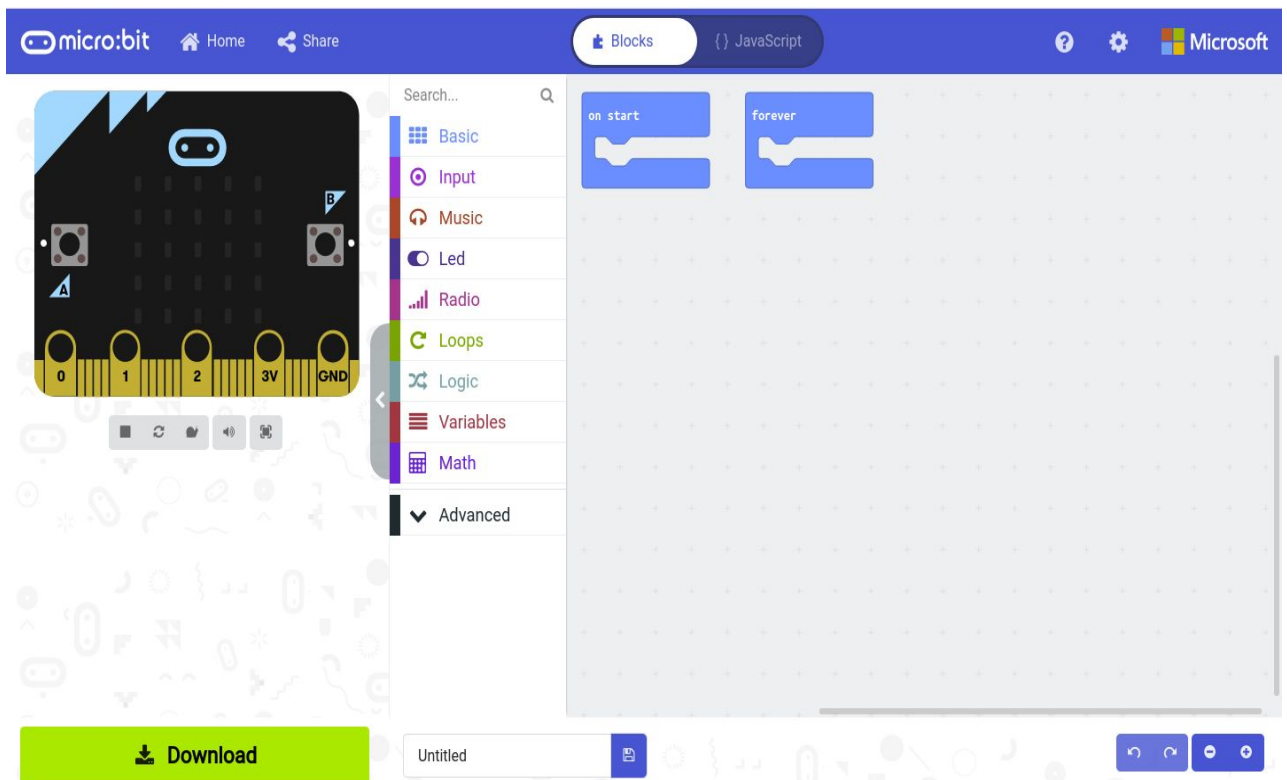


1.2 HOW TO PROGRAM A MICRO:BIT ?

The important question arises is how can we use the micro:bit? It can be programmed in Python and Java. But if you are a beginner we will prefer you to use block programming, that is the Microsoft MakeCode. This is not a text-based language, blocks are there you have to just drag those blocks and drop it to the coding space. The primary aim of MakeCode is to introduce programming in a way that is easily approachable. Also to make people comfortable with programming and don't find programming complex.

MakeCode is an online editor and also has an offline version. It is a combination of a block editor, a language editor, a target simulator and a target code generator.

To write code all you have to do is to drag blocks onto the editor workspace. Blocks represent coding actions and all the required blocks are present in the block palette for the program. Also, Makecode has a JavaScript section where you can write the program in JavaScript. Micropython editor is also there for micro:bit. People who have some knowledge of programming or who want to move to text-based programming can use it.



1.3 SERVO DRIVER

Since the BBC micro:bit is an amazing small programming device it is used in many projects. Students, hobbyists and teachers love to explore new ideas with micro:bit. People also love projects made of motors. This micro:bit servo driver gives you the freedom to run servo motors using micro:bit.

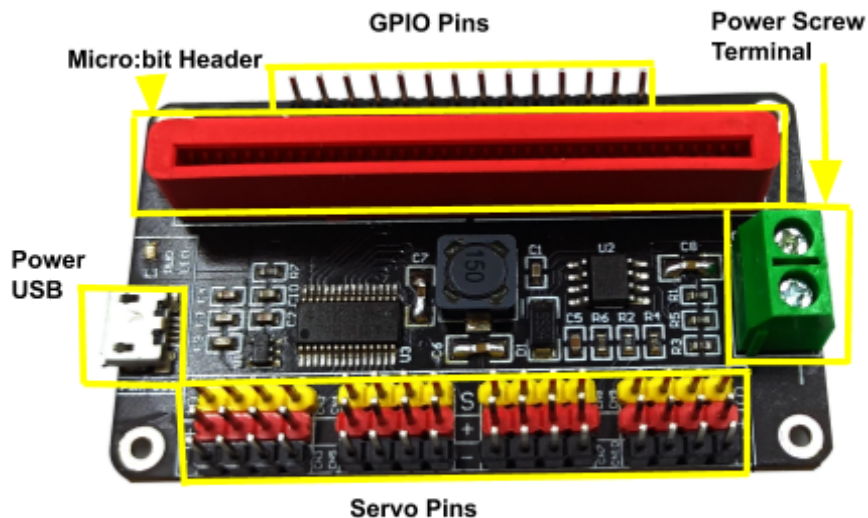
The reason why we can't control a servo motor by a micro:bit is the input voltage required to drive motors is way more than the output of microcontroller/micro:bit. To overcome this problem we can use this expansion board. This is a servo/ PWM expansion for micro:bit. Using PCA9685 motor driver, the maximum output current can be 3 A and it can also be operated on batteries. The board is capable of running 16 motors at the same time. The board also consist of 5 V regulator. Uses I2C interface and each channel supports 12-bit resolution.

The servo driver board can be used in number of Robotics Application.

2. FEATURES

1. Dimension of board: 65mm x 36mm.
2. Servo voltage: 5V.
3. Power supply required by the board(Battery also): 6V~12V.
4. Logical Voltage: 3.3V.
5. Control interface: I2C.
6. Motor Driver Chip: PCA9685.
7. Size of mounting hole: 3.0mm.
8. USB Power Supply: 5V.

3. HARDWARE



On the above side of you can find the edge connector where you can place the micro:bit. There are also 14 GPIO header pins are provided. For power-up use the screw power terminal (6V ~ 12V) and you can also use the USB port for power the micro:bit. A LED is also present which glows every time the board gets power. A 5V regulator is there and the maximum output power is 3A. The regulator changes the 5V voltage supply of USB to 3.3V supply for micro:bit.

The servo motor GPIO pins are there at the lower side of the board. 16 servo motors(0 ~ 15) are supported at the same time. The black pins are GND, red are for VCC (5V) and yellow pins are for the PWM signals.

NOTE:

1. Make sure the motor and power wirings are proper.
2. The USB power connection is not for the motors it only for micro:bit.
3. For running motors of higher power, you should connect the power supply of higher voltage.

4. HOW TO USE SERVO DRIVER?

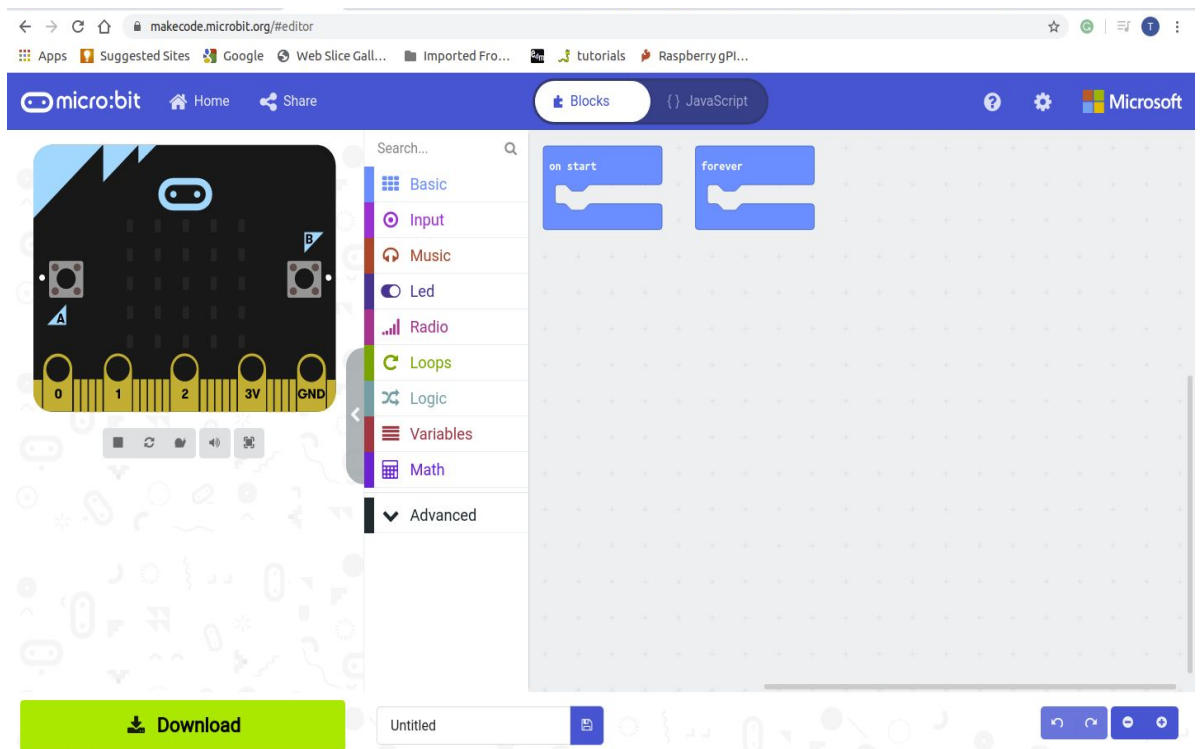
4.1 CONNECTIONS

1. Stack your micro:bit on the edge connector of the servo driver board.
2. Connect the power supply or battery to the power pin (6V~12V).
3. Connect the servo motors to the board. The brown wire of motor is for GND, red for VCC and orange for the signal.
4. Connect the micro:bit with your computer.

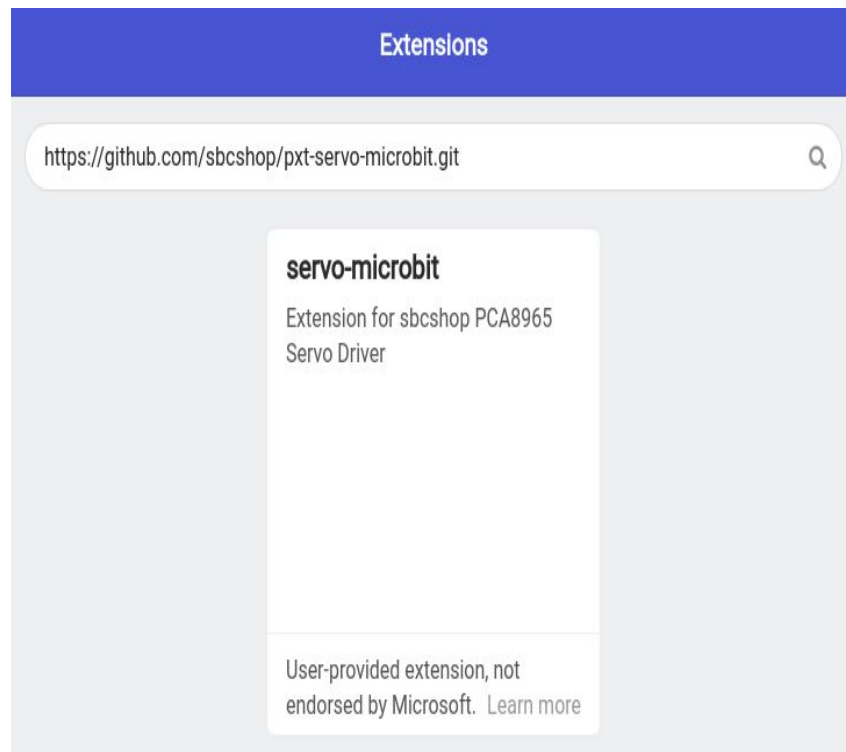
5. SOFTWARE

1. Open the online editor MakeCode for block programming

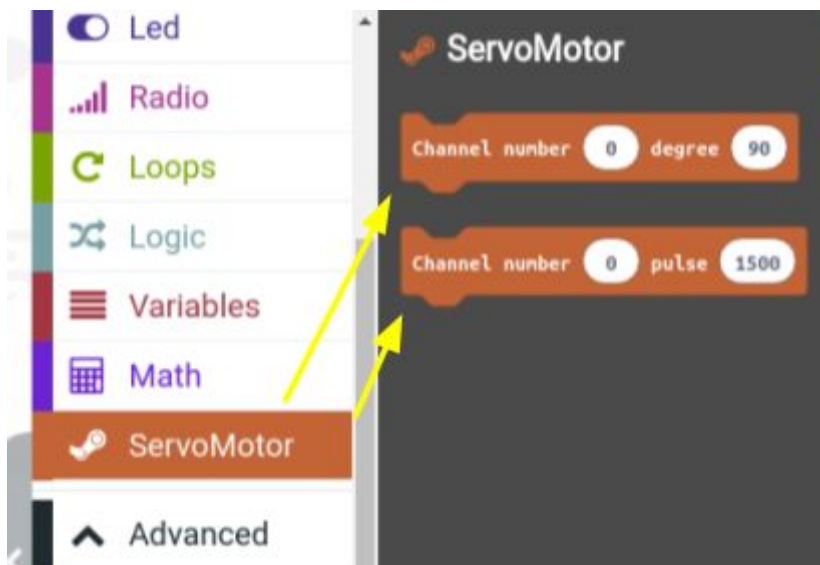
<https://makecode.microbit.org/#editor>.



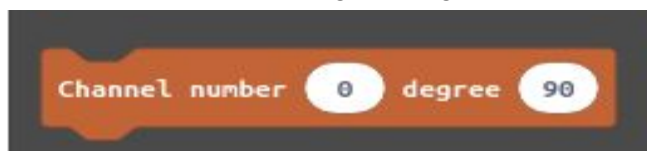
2. To add the block extension for the servo driver board click the **Advanced** block and go to the **Extensions**, add this URL in the space given
<https://github.com/sbcshop/pxt-servo-microbit.git>



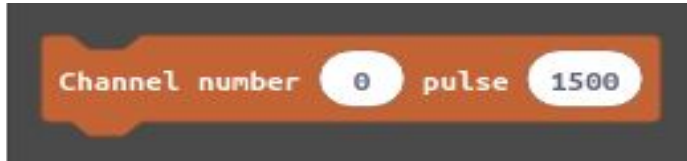
3. By adding the extension of the servo driver you will get blocks like this:



4. This block is for controlling the angle(0~180) of the motor(0~15).



5. This block is for controlling the PWM pulse(500~2500 Hz) of the motor(0 ~15).



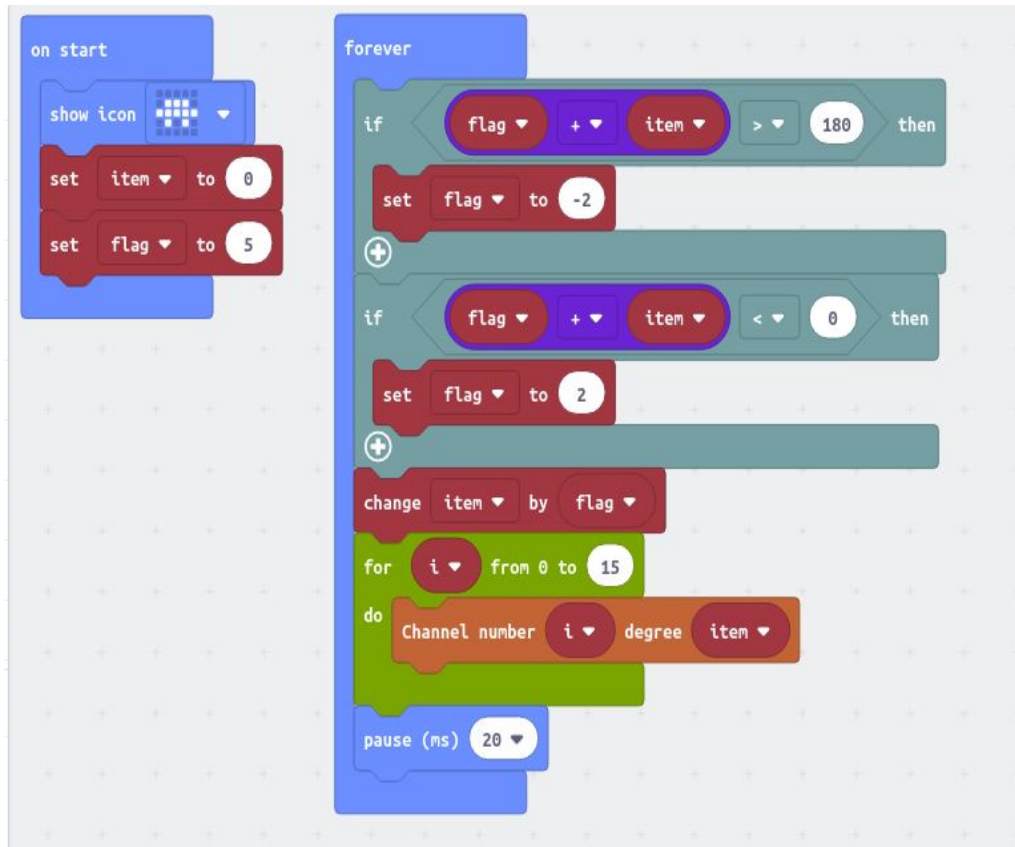
6. Following table shows the relationship between the pulse and the degree of motor:

PULSE(Hz)	ANGLE(DEGREE)
500	0
1000	45
1500	90
2000	135
2500	180

7. We have also provided sample codes(hex code) for the servo driver board. You can get the hex code from cloning the URL <https://github.com/sbcshop/pxt-servo-microbit.git>. Import the code in the Makecode editor <https://makecode.microbit.org/#editor> and test your board and motors. Else upload the hex file into your micro:bit and run the motors.

6. SAMPLE CODES

6.1 RUNNING SERVO MOTORS

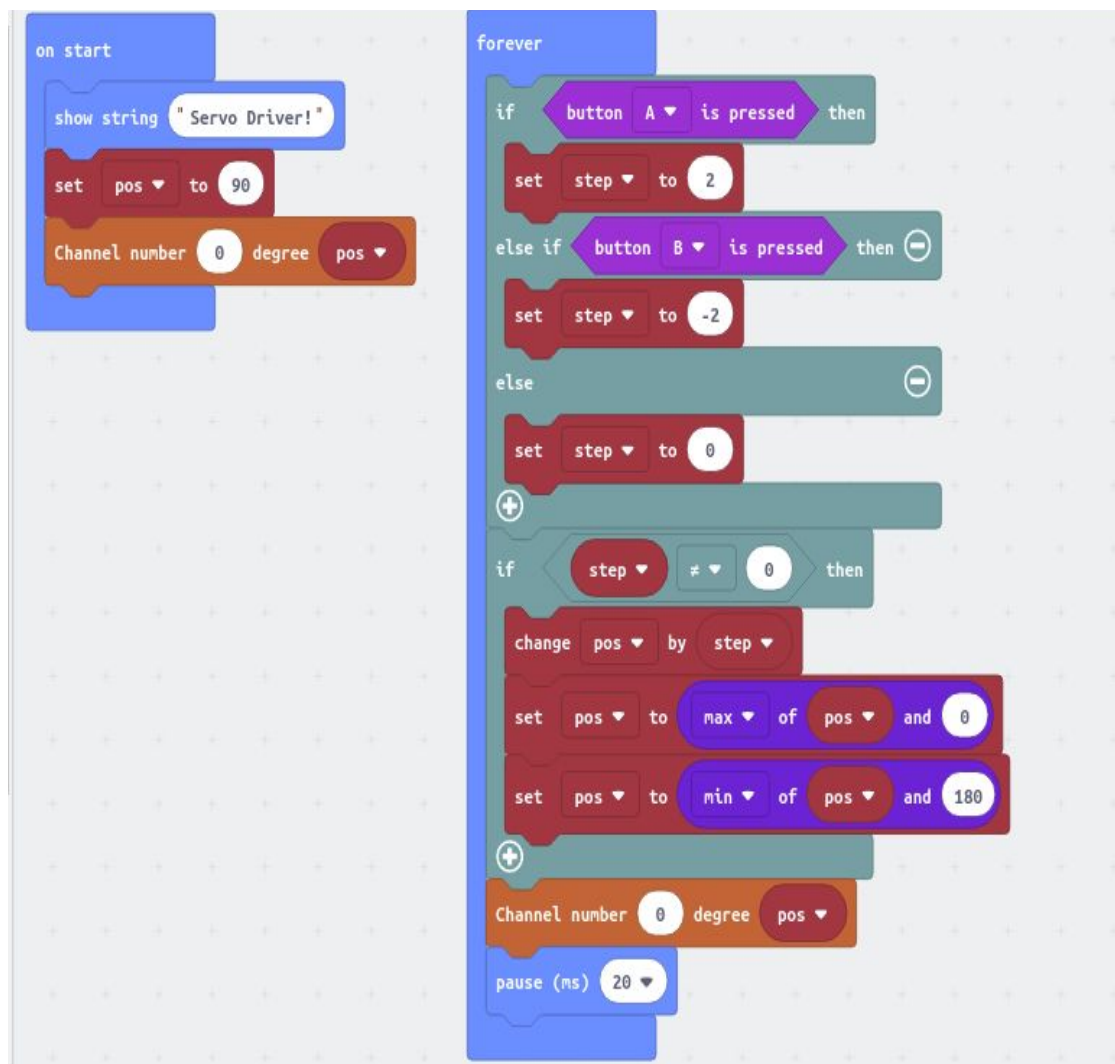


This code can run 16 servo motors at a time from angle 0~ 180 degrees.

The **item** denotes the current angle. The **flag** shows the step length for every change.

When the value of flag is positive it will rotate in forward direction and in negative value, it runs in the reverse direction for every 20 seconds. You can change the speed by changing the pause in the program.

6.2 CONTROLLING MOTOR THROUGH BUTTONS



In this code, we can control the direction of a particular motor via Programmable buttons A and B of micro:bit. You can set the channel/ servo number and make it move forward through button A and in reverse through button B.