Coding activity
Thanks to RSGB Maker Champion Tom Wardill, 2E0JJI, and his **Python Pocket Morse activity** last year, you will have learned Morse code and how to write code in Python. In this activity we see how the BBC Micro:bit can be used to send Morse code on either a telegraph wire or wirelessly. The challenge is to see how far your transmissions will travel.

Time: About 30 minutes

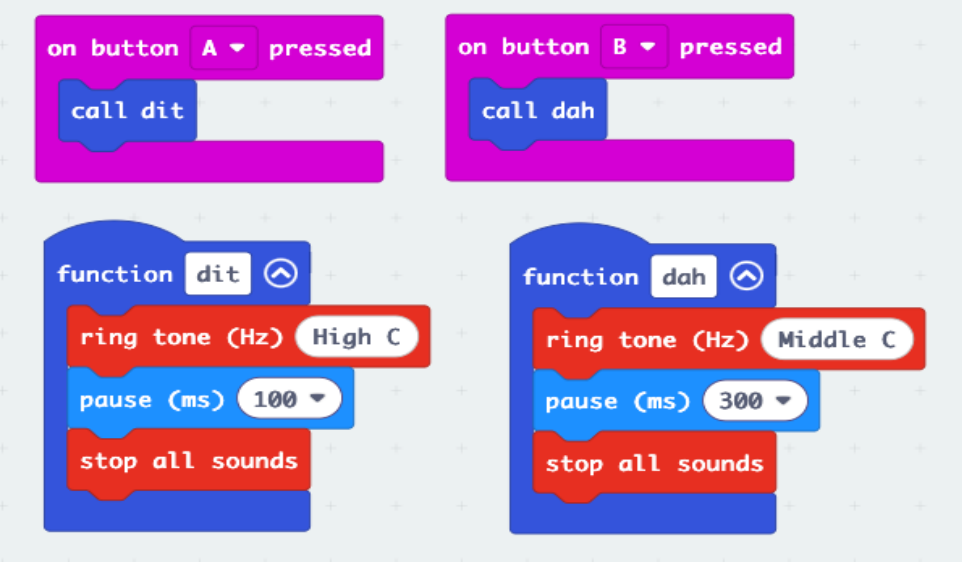
Kit List:

- 2 BBC Micro:bits V2
- Battery packs
- Laptop
- Copies of the Morse code
- 3 croc to croc wires, preferably of different colours
- 2m of twin & earth cable

Instructions:

The Micro:bit can be programmed online (https://makecode.microbit.org/). Alternatively, you can go offline and use the app (https://makecode.microbit.org/offline).
Makecode allows you to design your own block, making it easier to follow the program. Click on 'Advanced' and then '*f(x)* Functions' followed by 'make a Function'.

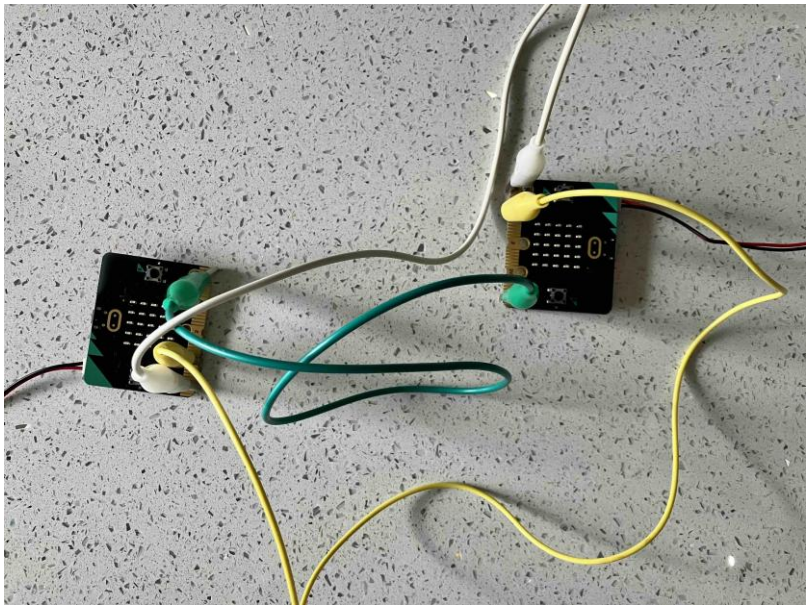
Call the function 'dit' where it says 'doSomething' and press done.
Make another function and call it 'dah'. For each block you have to tell it what to do - make the sound, send the signal and an image if you wish. We are making button A produce a short dit sound of a high frequency (high C) and button B a longer dah sound of a lower frequency (middle C) and three times longer.



Click on '*f(x)* Functions' to call the dit or dah, as shown in the diagram.

Check it works so far using the simulator, pressing button A or B and then download the program. Hold the Micro:bit with two hands so that the thumbs do the pressing, just as you would texting on a phone.

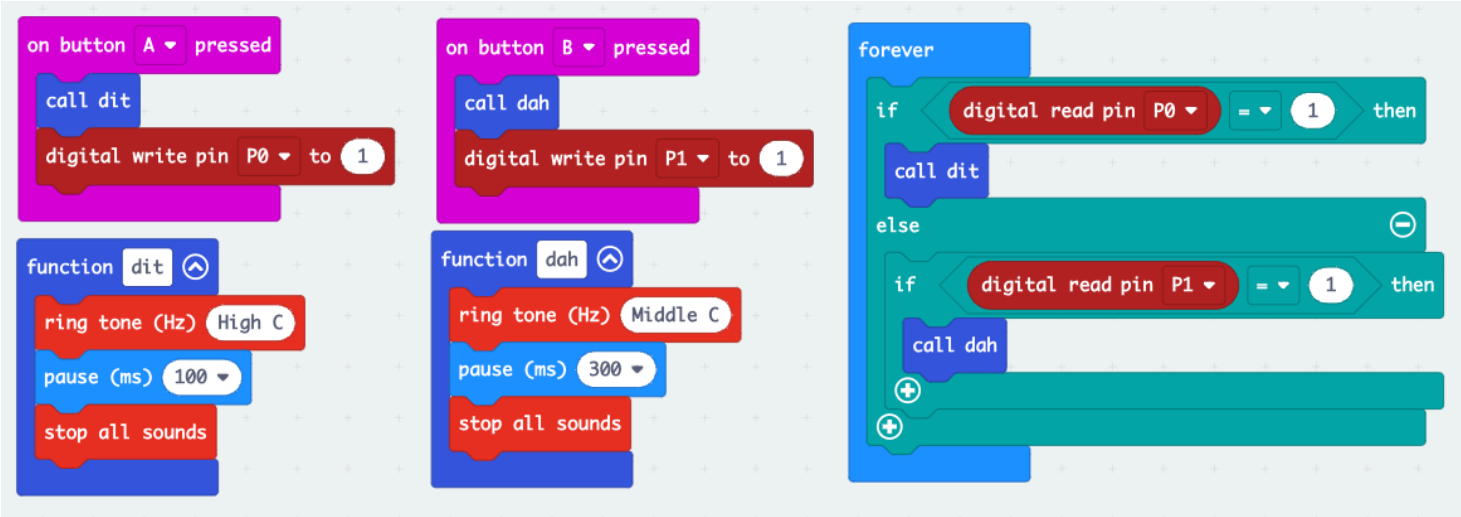
The telegraph came before wireless. How do we send Morse code using wires and the Micro:bit? The gold area at the bottom of the Micro:bit is the edge connector and it has 25 external connections called pins. We will use pins 0, 1 and GND, ground, as they are general purpose



digital input and output pins. Connect the pins from one Micro:bit to the other, GND to GND and 0 to 0, 1 to 1.

Click on 'Advanced' and go to 'pins'. 'Digital write' sends the signal, 'digital read' receives it. So when we press button A it makes a dit sound and sends a signal from pin 0 to your friend's Micro:bit, making a dit sound as well. Likewise with button B and dah, but with pin 1.

Use some long twin and earth cable to find out how far you can transmit between the two Micro:bits.



Now we are going to use the radio capabilities of the Micro:bit to see how far we can transmit Morse to each other wirelessly (https://microbit.org/get-started/features/radio-and-pins/).

The Micro:bit can transmit radio signals to 256 different groups each with their own id, on 84 different frequencies, 1 MHz wide, based on 2400 MHz. Therefore, a class of children or a group of club members can carry out this activity without interference to each other. With 21,504 possible stations, that shouldn't be a problem!

We both need to be on the same radio set group. In this case group 1, but there are 256 to choose from. Then we choose the radio set frequency band from the choice of 84.

We send the number 1 to the other Micro:bit to indicate a dit and a number 0 for a dah. Now when we press the button A, not only does it make a dit sound in your Micro:bit but it does so in your friend's Micro:bit. You can check it first with the simulator.

Download it and investigate the range, which can be as much as 100m.