Fire Engine

Time required: 30 minutes

Please read all the directions carefully before beginning the assignment.

- Comment your code as shown in the tutorials and other code examples.
- Follow all directions carefully and accurately.
- Think of the directions as minimum requirements.

Understanding

Demonstrate understanding of:

loops

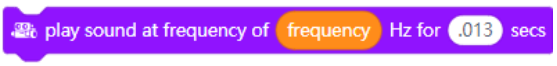
Knowledge Points

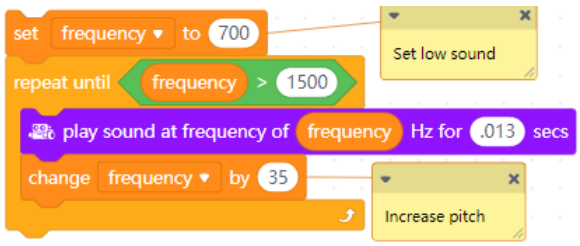
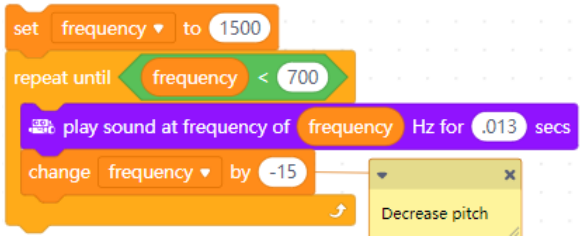
This program simulates the sound of a fire engine siren.

Fire Engine Sire Simulation

The fire engine siren's low frequency sound is between 650Hz and 750Hz, and its high frequency sound is between 1450Hz and 1550Hz. The siren sound is generated by repeating the following pattern: the low frequency sound amplifies to a high frequency sound in 1.5 seconds, and then drops back to the lower frequency in 3.5 seconds. Therefore, the fire engine siren sounds can be programmatically simulated as follows:

Set the low frequency to be 700Hz, then set the high frequency sound to be 1500HZ, repeatedly playing the buzzer in a range from 700Hz to 1500Hz and then back to 700Hz. The ratio of amplification time to the drop time is 1.5:3.5, which is 3:7, so the ratio of frequency amplification to the drop needs to be 7:3. By tuning the sound time and amplification vs. drop's amplitude, the fire engine siren is simulated.

	Define variable  as the frequency of a tone and set the sounding duration as 12ms (12 here is for example only, and you can set it to any value you think proper).

	Set the lower limit of variable frequency as 700 and the upper limit of frequency as 1500.
	This block indicates repeated run of the blocks within it until the condition is established. When the condition is established, it will break the loop and run the following blocks.
	This block means: set the initial value of tone frequency as 700Hz and sound it, and then increase the frequency by 35Hz each time and sound it until above 1500Hz, where it breaks the loop and the frequency will not be increased anymore.
	This block means: set the initial value of tone frequency as 1500Hz and sound it, and then decrease the frequency by 15Hz each time and sound it until below 700Hz, where it breaks the loop and the frequency will not be decreased anymore.

Why "repeat it until frequency > 1500", not "frequency = 1500"?

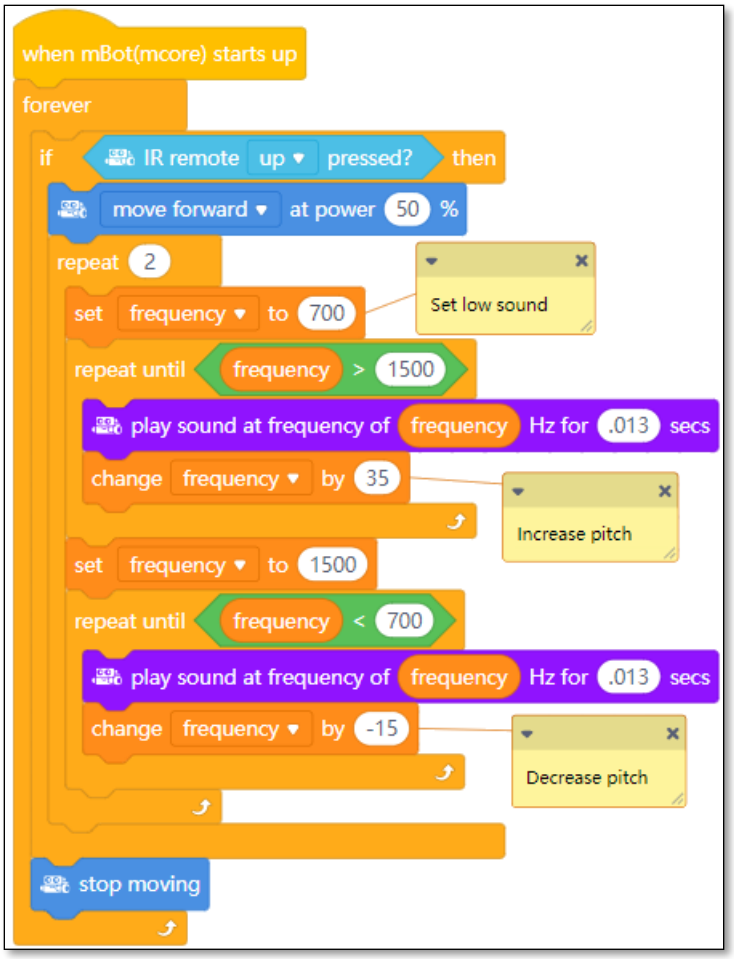
That is because in the example of simulating the fire engine sound effects, it is hard to define the sound frequency each time when it is increased from 700Hz to 1500Hz and what increment it should be each time the frequency is increased. If we set frequency=1500, the final frequency should reach 1500 so that it can break the loop, or the frequency will be increased again and again, making it hard to debug. We use frequency >1500, and when the frequency is above 1500, the loop will be broken and the following program decreasing the frequency will be executed.

Tutorial Assignment

1. Start mBlock. Save the program as **Fire Engine**.
2. Complete and test the program as pictured with the requirements listed.

Requirements

- The program runs as shown.



Assignment

Start with your tutorial project and add the following.

Keep the fire siren. Add a police car sound or another siren sound. How you switch between the two sirens is up to you. It can be automatic or controlled by the IR remote.

How to simulate police car sound effects: Low-frequency sound is set between 650Hz and 750Hz and high-frequency sound between 1450Hz to 1550Hz.

It takes 100 ms to raise a low-frequency sound to a high-frequency tone and then 220 ms to lower a high-frequency sound to a low-frequency one.

Assignment Submission

- **All students** → Attach finished programs to the assignment in Blackboard.
- **In class assignment submission** → Demonstrate in person.

- **Online submission** → A link to a YouTube video recording showing the assignment placed in the submission area in BlackBoard.