B - Save our Robot!

What if our robot gets in trouble half way across the planet? Let's make a program so it can transmit S.O.S in Morse Code to let us know if its in trouble!

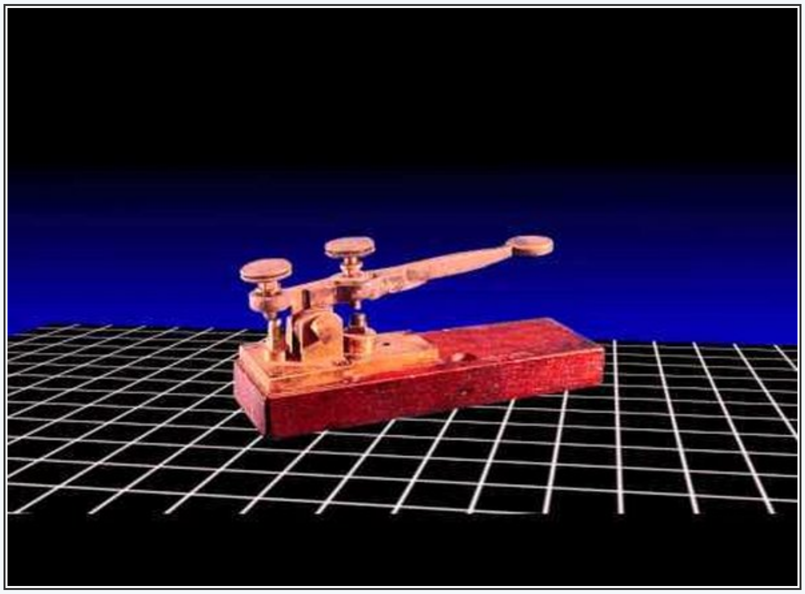
INTRODUCTION

What if our robot gets in trouble half way across the planet? Let's make a program so it can transmit S.O.S in Morse Code to let us know if its in trouble!

Step 1

Morse Code?

- Having red/green LEDs is a great start to communicating with our robot
- What if we want to communicate more than just red or green?
- **Morse Code** allows us to send any letter or number we like, just using a single light or buzzer!
- Watch the video to find out more.

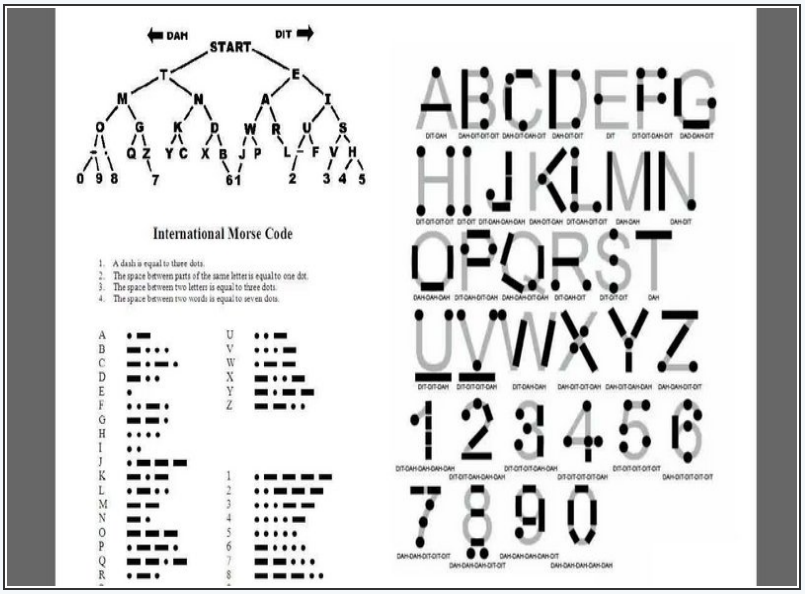


Step 2

Your turn!

- It's your turn to try and decode some morse code into words!
- See if you can **work out the sequence of letters** in the video using the decoding card.

⚠ Make sure you get this challenge **checked off** when you know the answer!


DAH
DIT
START
T
E
M
N
A
I
O
G
K
D
W
R
U
S
Q Z Y C X B J P L F V H
0 9 8 7 61 2 3 4 5
ABCDEFG
HIJKLMN
OPQRST
UVWXYZ
123456
7890

International Morse Code

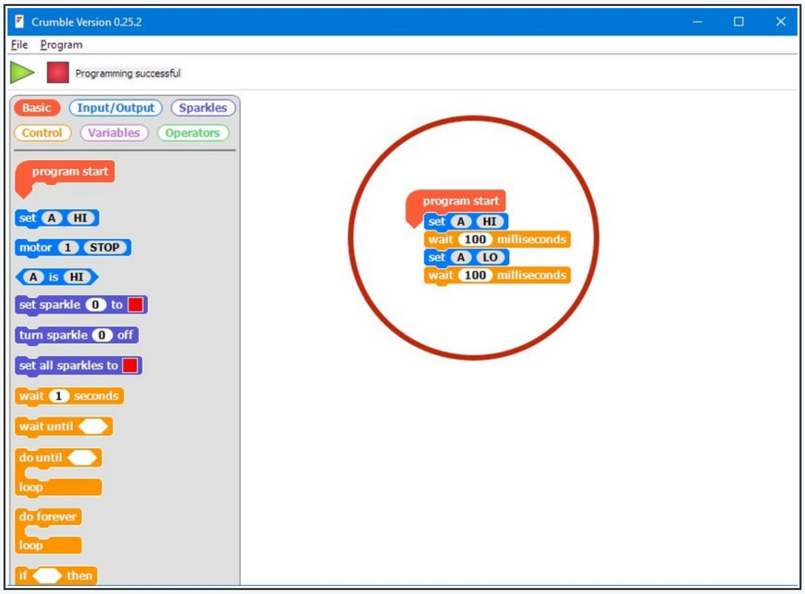
1. A dash is equal to three dots.
2. The space between parts of the same letter is equal to one dot.
3. The space between two letters is equal to three dots.
4. The space between two words is equal to seven dots.

A	● ▬	U	● ● ▬
B	▬ ● ● ●	V	● ● ● ▬
C	▬ ● ▬ ●	W	● ▬ ▬
D	▬ ● ●	X	▬ ● ● ▬
E	●	Y	▬ ● ▬ ▬
F	● ● ▬ ●	Z	▬ ▬ ● ●
G	▬ ▬ ●		
H	● ● ● ●		
I	● ●		
J	● ▬ ▬ ▬		
K	▬ ● ▬	1	● ▬ ▬ ▬ ▬
L	● ▬ ● ●	2	● ● ▬ ▬ ▬
M	▬ ▬	3	● ● ● ▬ ▬
N	▬ ●	4	● ● ● ● ▬
O	▬ ▬ ▬	5	● ● ● ● ●
P	● ▬ ▬ ●	6	▬ ● ● ● ●
Q	▬ ▬ ● ▬	7	▬ ▬ ● ● ●
R	● ▬ ●	8	▬ ▬ ▬ ● ●

Step 3

Letter S

- Let's write a program that will send the **letter S.**
- In the picture is a program to send **1 dot** with the LED. For your **wait blocks,** we suggest:
  - **100 milliseconds** for a dot
  - **1 second** for a dash
- **Extend** the program in the picture to send **3 dots,** which is an **S** - your LED module should still be plugged in to **A** like the last lesson!

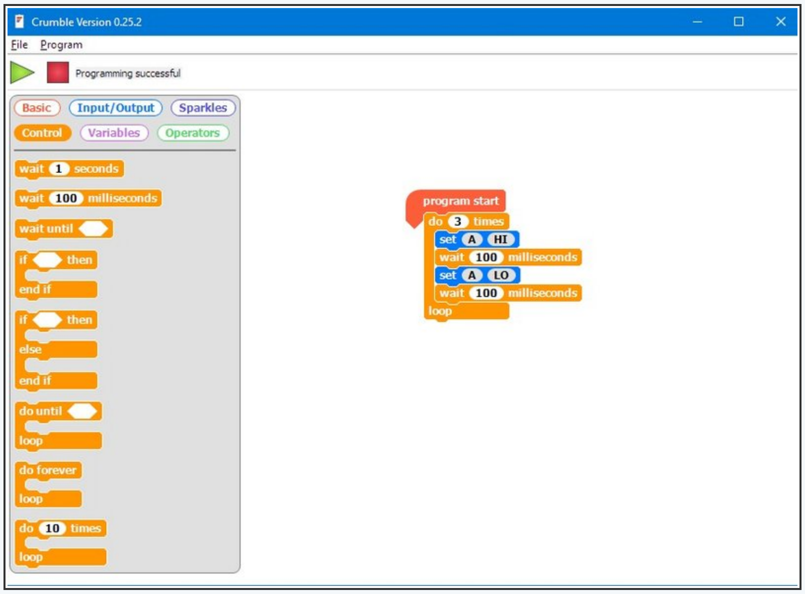


```
program start
set A HI
wait 100 milliseconds
set A LO
wait 100 milliseconds
```

Step 4

S with a Loop

- Can you work out how to make the S program **shorter**?
- We can use a **do _ times loop** like we used for moving the robot in a square!
- Change your program so it sends Morse Code for an **S** using a **loop.**



```
program start
do 3 times
  set A HI
  wait 100 milliseconds
  set A LO
  wait 100 milliseconds
loop
```

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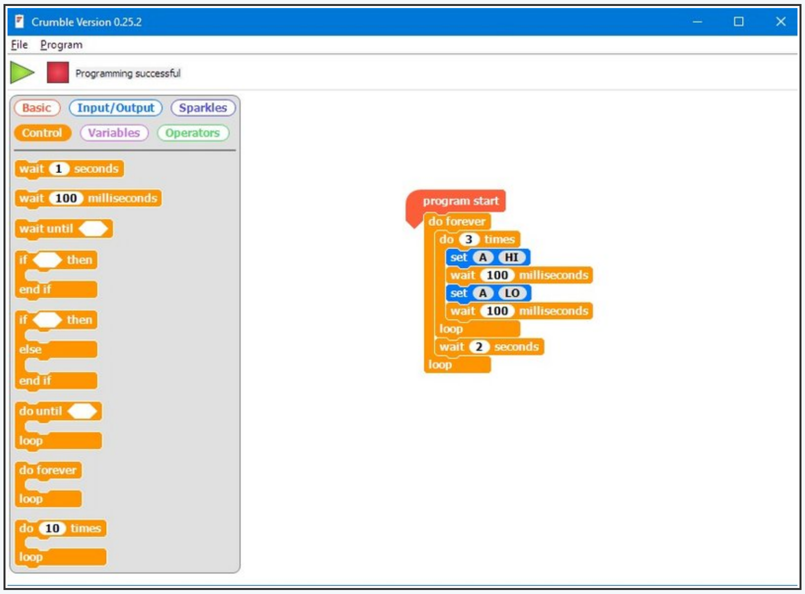
Step 5

Gaps Between Letters

- You might have noticed when you were listening to the code, that **between the letters** we need **longer gaps** so you can tell when they **start and finish.**
- A time of **2 seconds** works well.
- Put your loop that flashes an S inside a **do forever** loop so it flashes S forever, and **add a wait block** so there is a **gap of seconds between each S.**



Programming successful

```
program start
do forever
  do 3 times
    set A HI
    wait 100 milliseconds
    set A LO
    wait 100 milliseconds
  loop
  wait 2 seconds
loop
```

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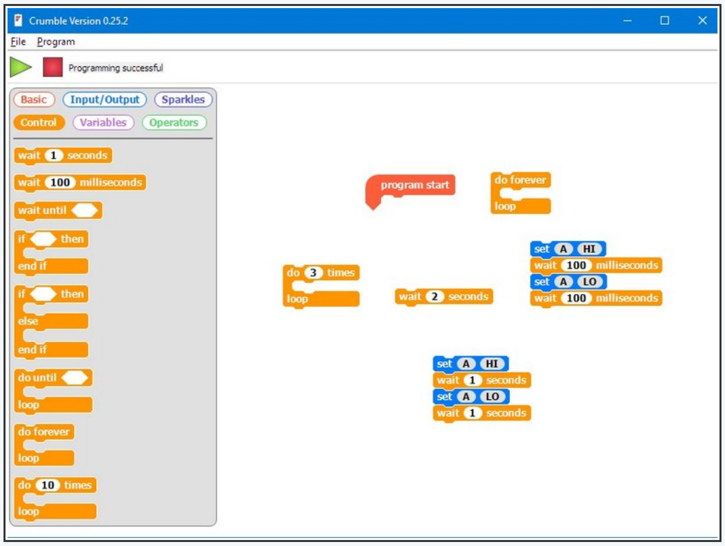
Step 6

SOS Flasher



Programming successful

```
program start

do forever
loop

do 3 times
loop

wait 2 seconds

set A HI
wait 100 milliseconds
set A LO
wait 100 milliseconds

set A HI
wait 1 seconds
set A LO
wait 1 seconds
```

- Let's make a program to get our robot to flash **SOS** using an LED, in case it has a problem.
- Your program should flash the sequence of dots and dashes required for the letters SOS - for bonus points put it in a loop to make it flash SOS **forever!**
- Try to shorten your program using **do _ times loops.**

If you're a bit stuck, have a look in the picture to see which blocks you will need to use.

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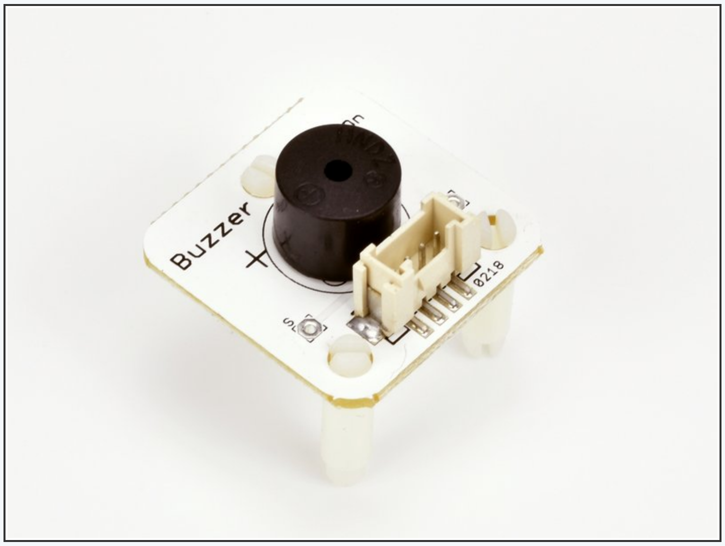
Step 7

Buzzer SOS



- Using lights for Morse Code is great for long distances, such as between two ships, but what if you are looking the other way when your robot is in trouble?
- Replace your LED module with the **buzzer module** like in the picture, so your robot buzzes SOS instead.
- If you're feeling really clever, put the LED module back into another output and add some more set blocks so it flashes **and** buzzes the sequence for S.O.S!