



# Introduction to Computers

Lab Manual 1



## Learning Outcomes:

## Activity

- Students should be able to visualize how computers and machines work and relate these concepts to programming and its applications
- Students should be able to think logically and develop problem-solving skills.

## Content:

- Define computers and machine's working
- Define Instruction and its execution in computers
- Developing Input, processing, and output concepts

## Introduction of Mr. Robo:



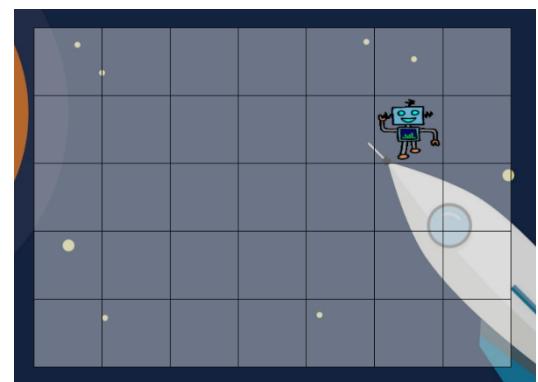
This is Mr. Robo and he is a computer machine. We need to communicate with Mr. Robo to help him navigate his world.

**Note: Though Mr. Robo is a computer machine, however, we are referring to it as an individual person.**

## The World of Mr. Robo

As Mr. Robo is a machine, he can not make his own decisions. We shall help him by giving him instructions so he can move around in his world.

This is the world of Mr. Robo. We can help him by telling him to move **Up**, **Down**, **Right**, or **Left**. We can also help him by telling him to move **zero**, **one**, **two**, or even **three** number of steps at the same time. Further, as Mr. Robo is an electric machine that runs on battery, we can communicate with him so he may **charge** himself.



## Language for the instruction

Mr. Robo is a computer machine (electrical machine) and we know that computers only understand binary language (0,1 On, Off). Therefore, the instruction must be given in the **binary language only**. However, it would be very difficult for us humans to remember so many instructions in binary language. To overcome this, we selected the instructions that are understandable by Mr. Robo and created **nicknames** for each instruction.

**These are the instructions (along with the nicknames) that are understandable to Mr. Robo.**

For example: If we wanted to tell Mr. Robo to change its location by moving, the binary code (instruction) would be “**0001**”. Therefore, for “0001” we have created the **nickname “Move”** so it is easy for us to remember which binary language instruction is used for which purpose. This technique helps us in remembering multiple computer language instructions.

### Types of Instructions

There are three types of instructions that Mr. Robo understands.

1. Either **Move** or **Charge** => **Action Code**
2. **Move Left, Right, Up, or Down** => **Direction Code**
3. **Move zero, one, two, or three** number of steps => **Steps Code**

We must provide the corresponding **binary language code** for telling Mr. Robo to do something.

### Order of the instructions

Another problem is that Mr. Robo is a computerized machine that only understands **computer language instruction** (binary language (0,1)) that are received in a **specific order**. If the instruction is not received in the exact order, Mr. Robo will be unable to understand the instruction. The order for the instruction is as follows.



Figure 3: The order of Instruction understandable by Mr. Robo

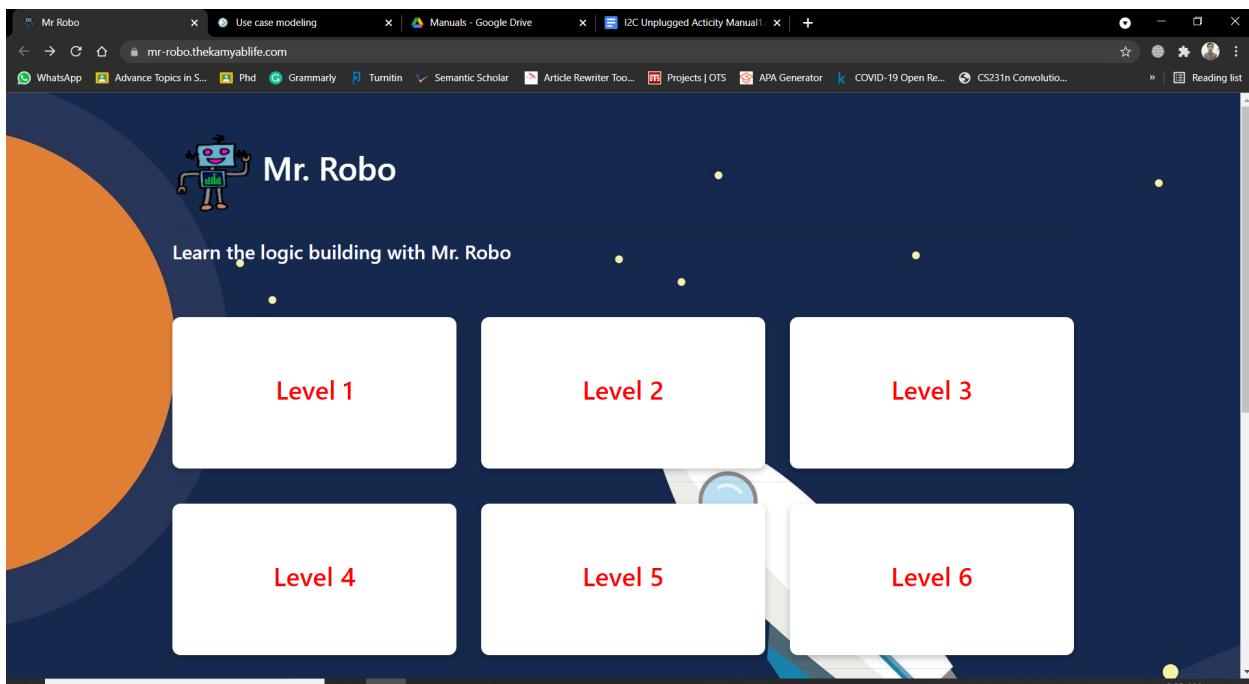
This is the **tray** that is used to give input to Mr. Robo. The received input is analyzed by the mind of Mr. Robo and thus, the output is produced. The output can be Mr. Robo moving certain steps in some direction or charging himself.

Instructions	
Action Code	
Move	0 0 0 1
Charge	0 1 0 0
Direction Code	
Left	0 0
Right	0 1
Up	1 0
Down	1 1
Step Code	
Zero Step	0 0 0
One Step	0 0 1
Two Step	0 1 0
Three Step	0 1 1

## Introduction of the Game:

How to start Mr. Robo?

- To start Mr. Robo, Extract the received archived files on your computer.
- Navigate to the directory by following the given path. **Mr Robo(Uml) >> Game.html**
- Double click on the **Game.html** to start the “Learning”.



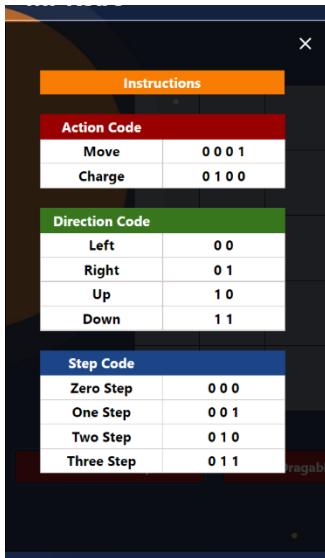
The above-mentioned webpage should be opened in a tab of your web browser.

Now, just like any other game, the game also requires some **input** that goes through **processing**, and **output** is provided.

**Click on your desired level and play.**

- Now, we need to **communicate** with Mr. Robo to help him navigate inside his world.
- However, as Mr. Robo is a machine, it can only understand **binary language instructions**.
- Therefore, we must communicate with Mr. Robo in **binary language instructions**.
- BUT, we humans do not understand the binary language!!!
- Now is the time to use the created nicknames to decide which instruction is to be used.

Click on the **Instructions** button on the display screen. The resulting window should look like this.



- We can communicate with Mr. Robo in a total of three ways.

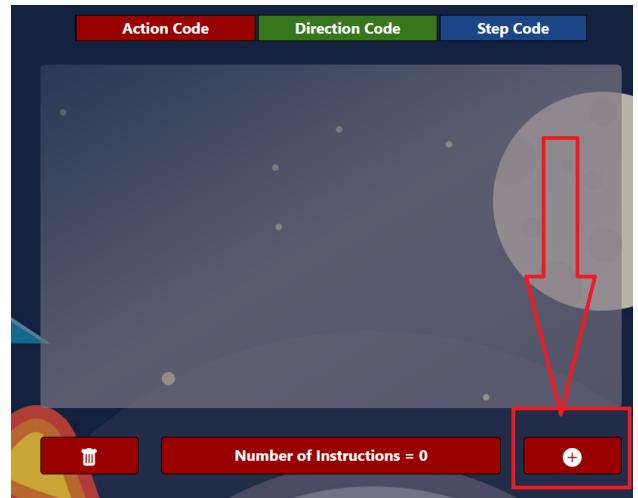
**Action:** As Mr. Robo is an electric machine that runs on a battery, we can ask to **Charge** from the **Charging** station and we can ask to **move**, for moving to a charging station.

**Direction:** There are four possible **directions** in which we can ask to move inside the given table. The directions include left, right, up, and down.

**Step:** Similarly, there are up to three **steps** that Mr. Robo can be asked to move in a provided **direction**.

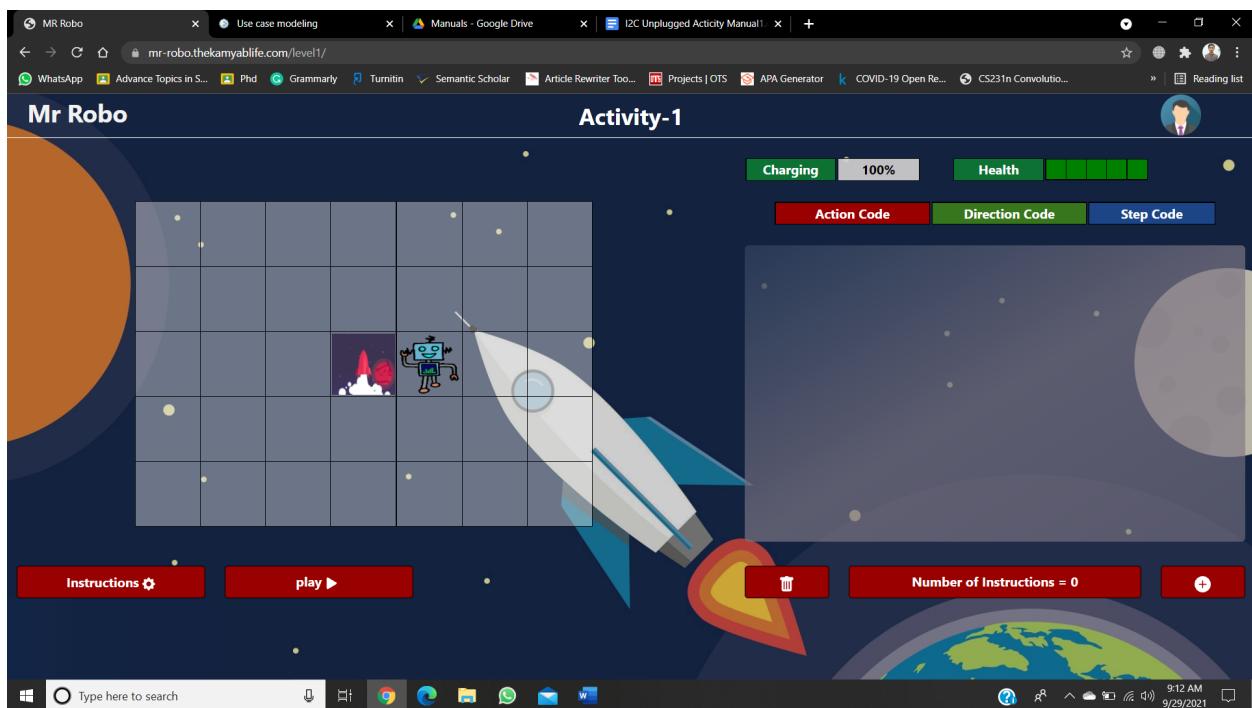
Click on the “+” Red button to initiate the communication with Mr. Robo.

- Provide the desired instruction code in the appeared **input tray** by left-clicking on the boxes.
- Click on Play.
- The execution of the given instruction should start.



## Activity 1:

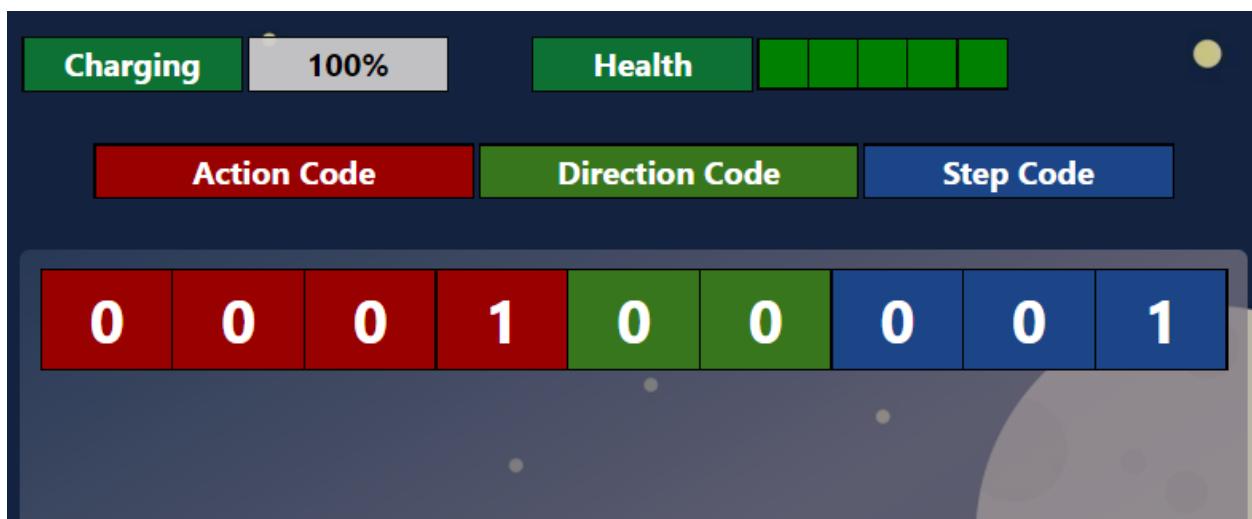
Move Mr. Robo to the destination box.



## Solution:

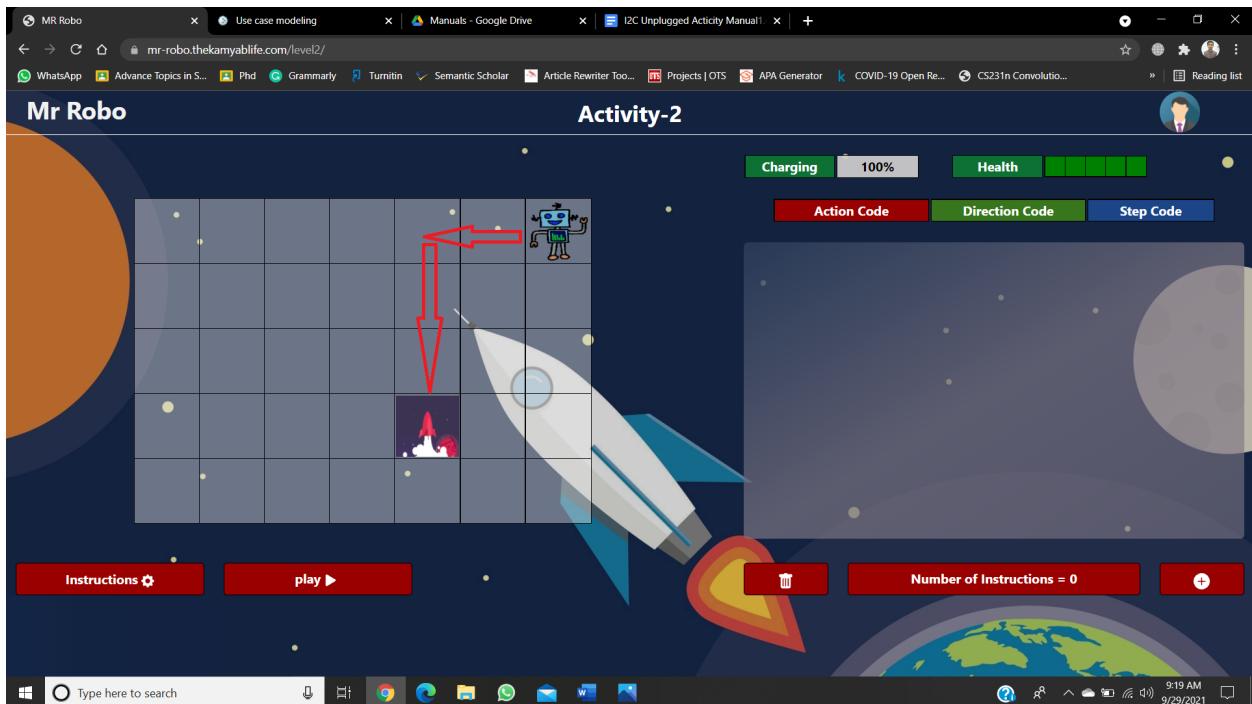
Apply the code into the instruction code box by clicking on the “+” button.

- Move one step to the left.



## Activity 2:

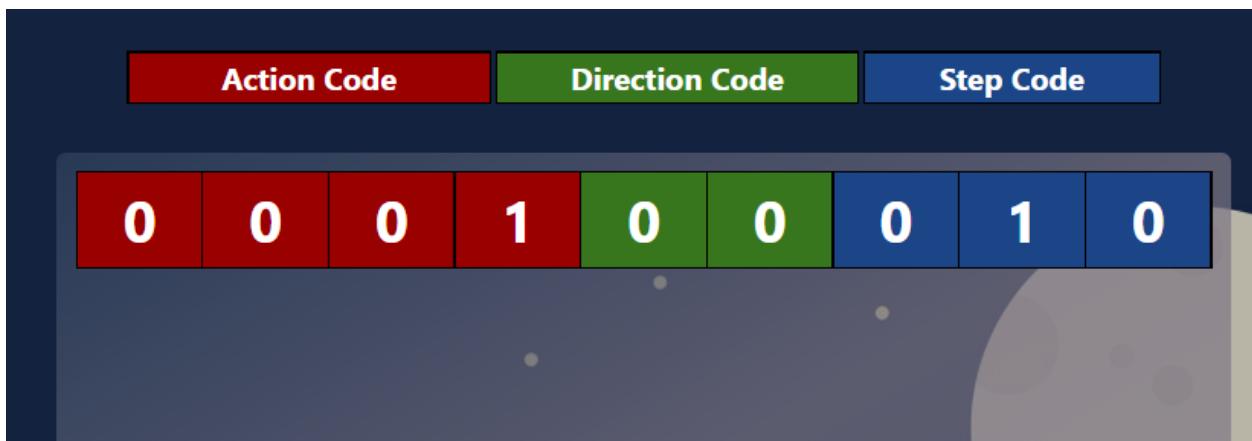
Move Mr. Robo into the destination box.



solution:

Apply the code into the instruction code box by clicking on the “+” button.

- Move two steps left.

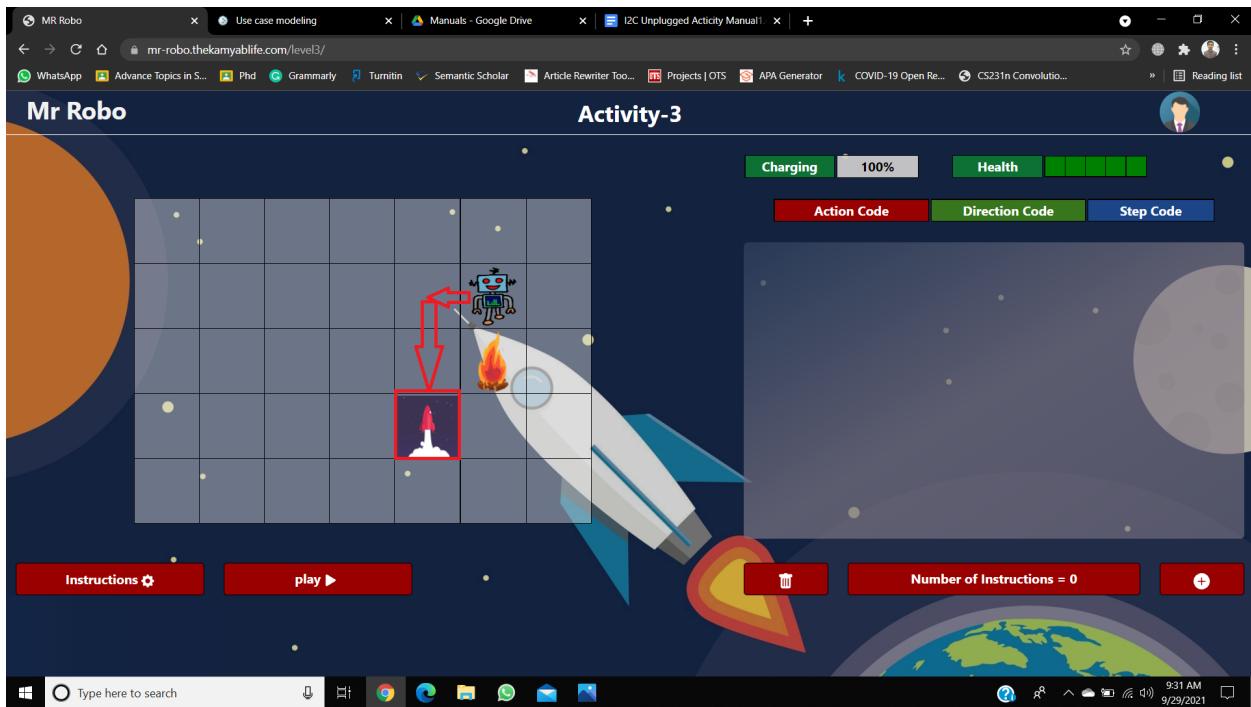


- Move three steps down.



### Activity 3:

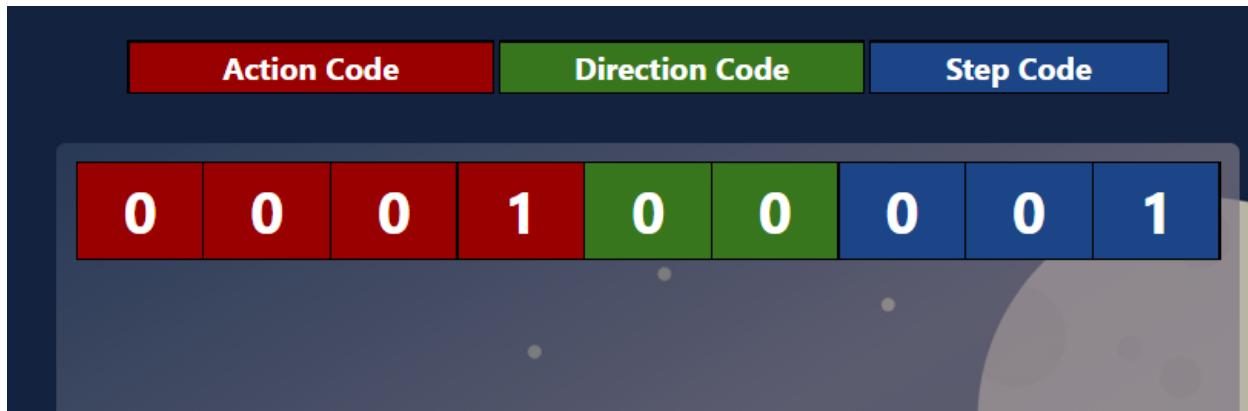
Move Mr. Robo into the highlighted box.



### Solution:

Apply the code into the instruction code box by clicking on the “+” button.

- Move one step left

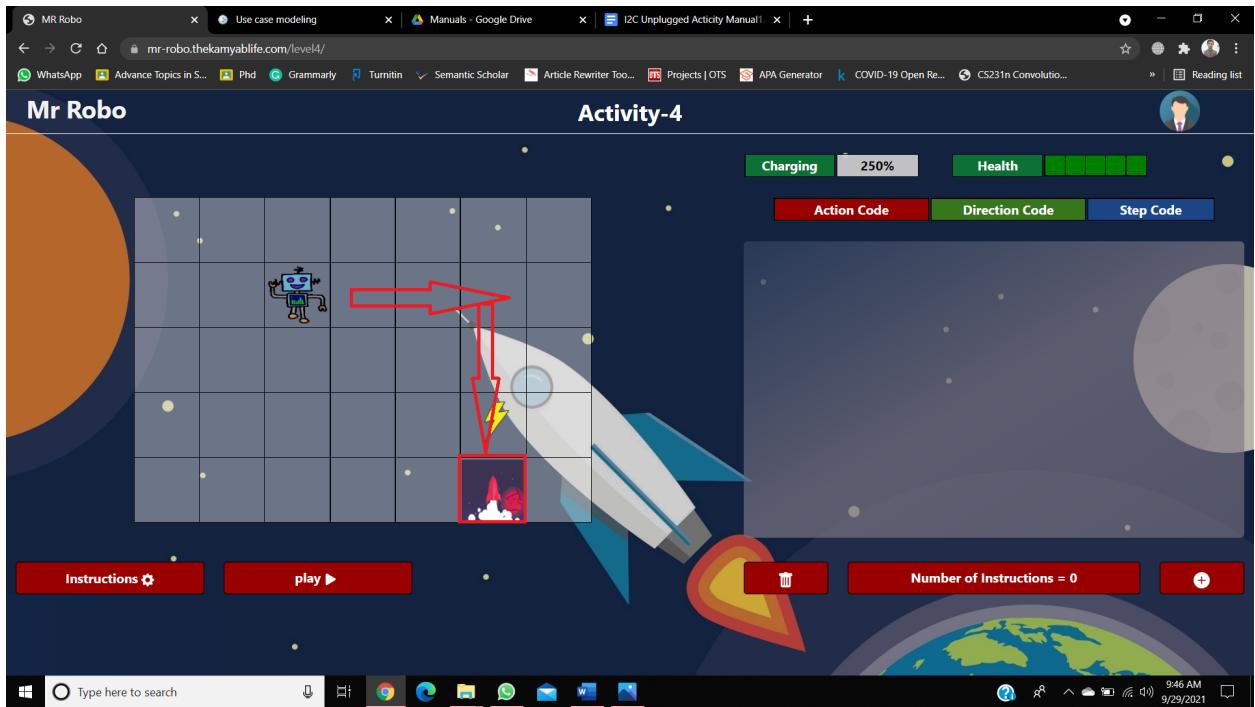


- Move two steps Down.



#### Activity 4:

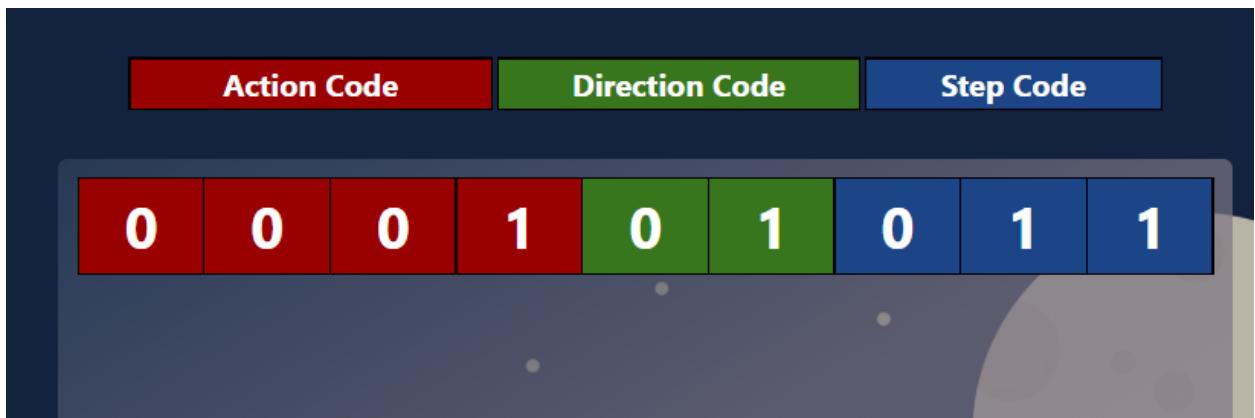
Move Mr. Robo to the highlighted destination point.



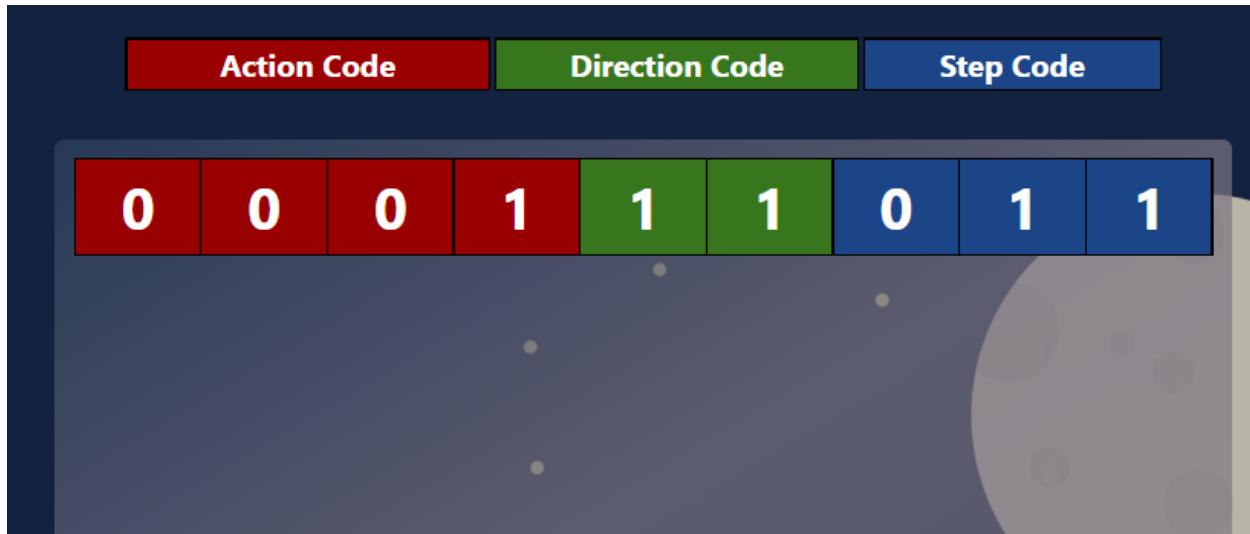
### solution:

Apply the code into the instruction code box by clicking on the “+” button.

- Move three steps Right



- Move three steps down.



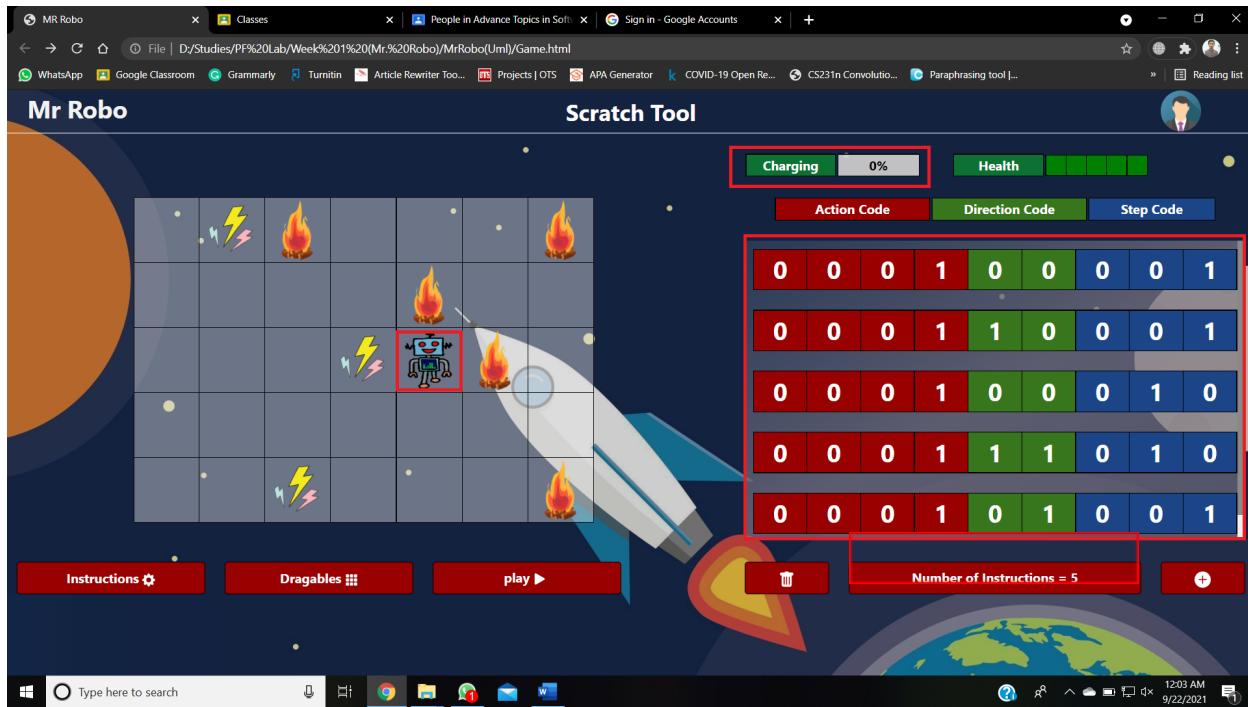
### Activity 5:

Using **multiple instructions** move Mr. Robo to highlighted destination box.

### Solution:

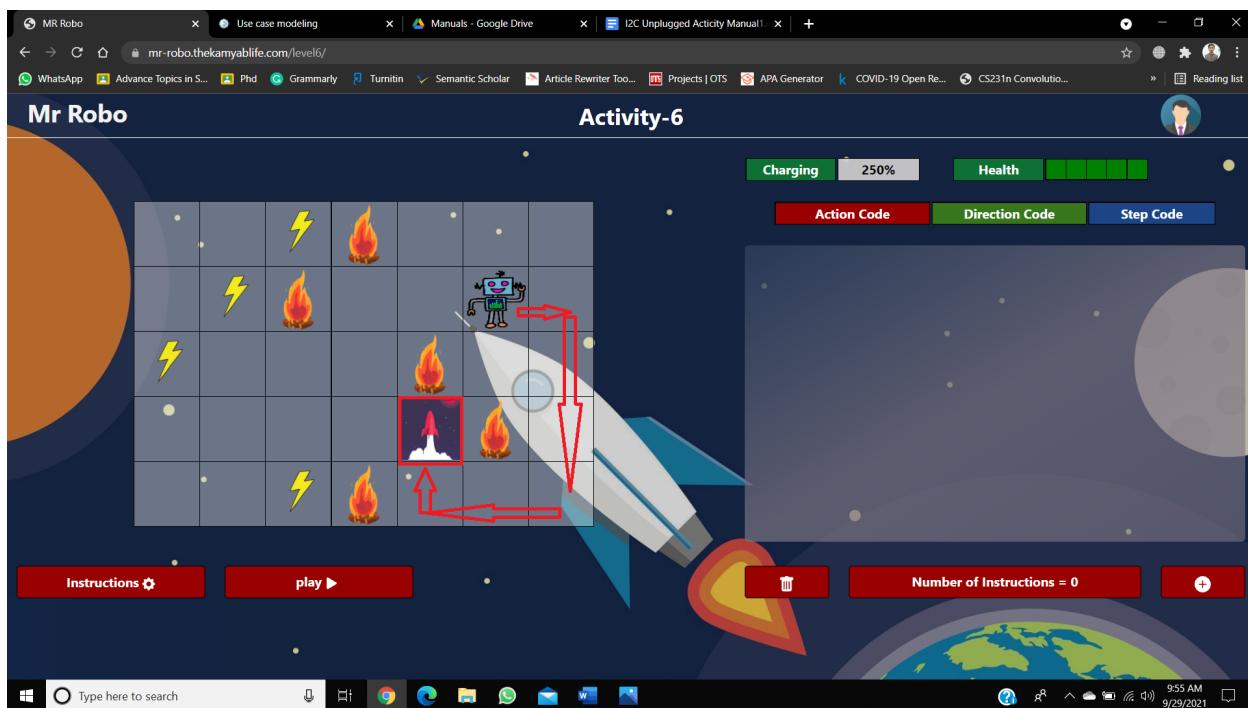
Apply the code into the instruction code box by clicking on the “+” button.

- Apply the instructions



## Activity 6:

Using **multiple instructions** to move Mr. Robo to highlighted destination box.



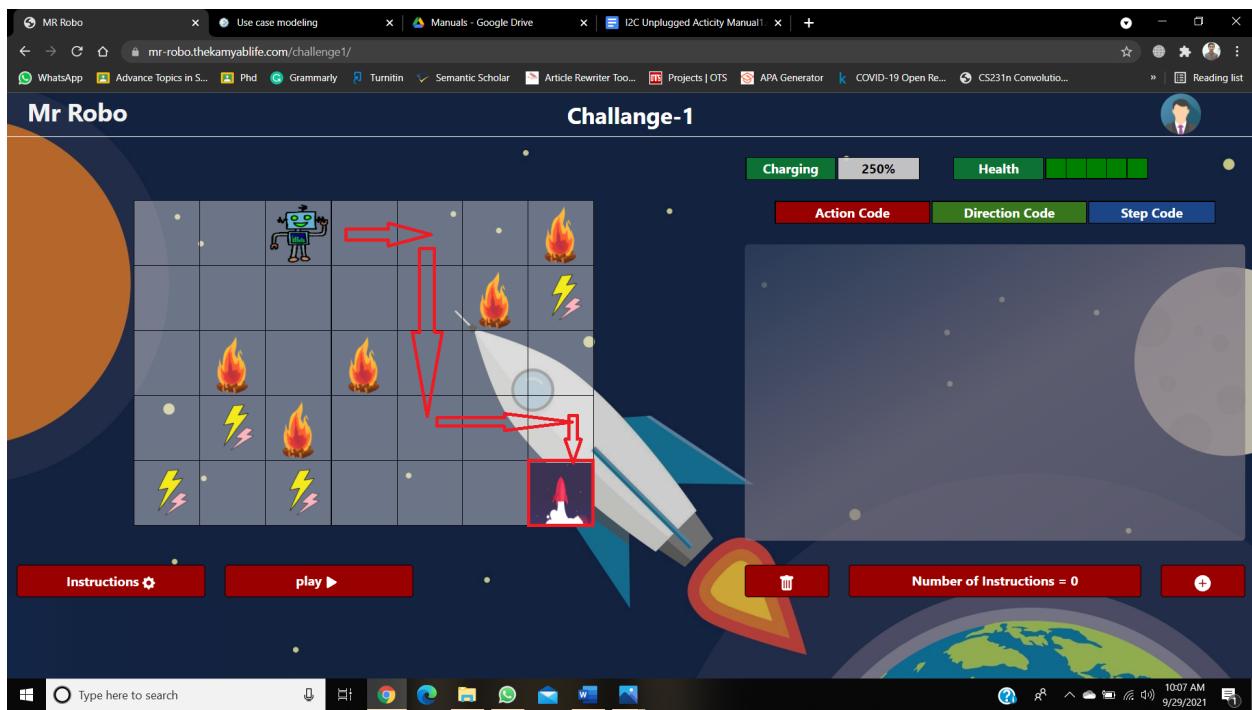
**Solution:**

Apply the code into the instruction code box by clicking on the “+” button.

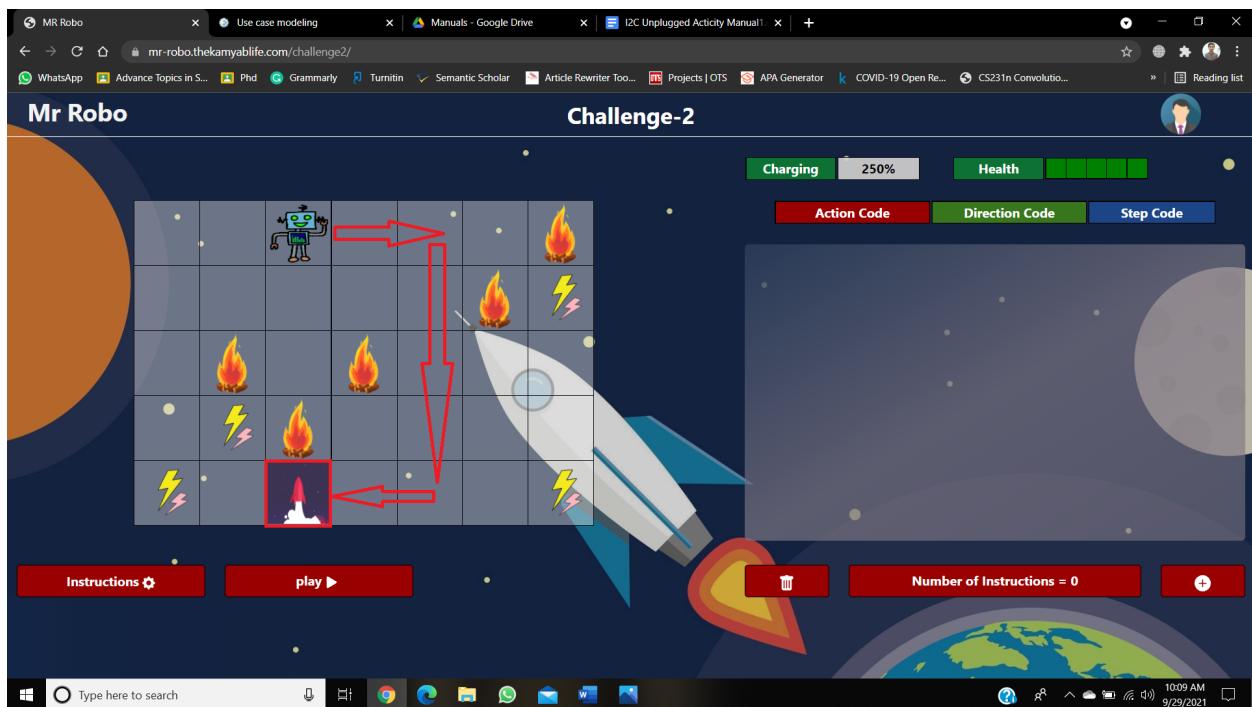
- Apply the instructions

Action Code	Direction Code	Step Code
0 0 0 1	0 1	0 0 1
0 0 0 1	1 1	0 1 1
0 0 0 1	0 0	0 1 0
0 0 0 1	1 0	0 0 1

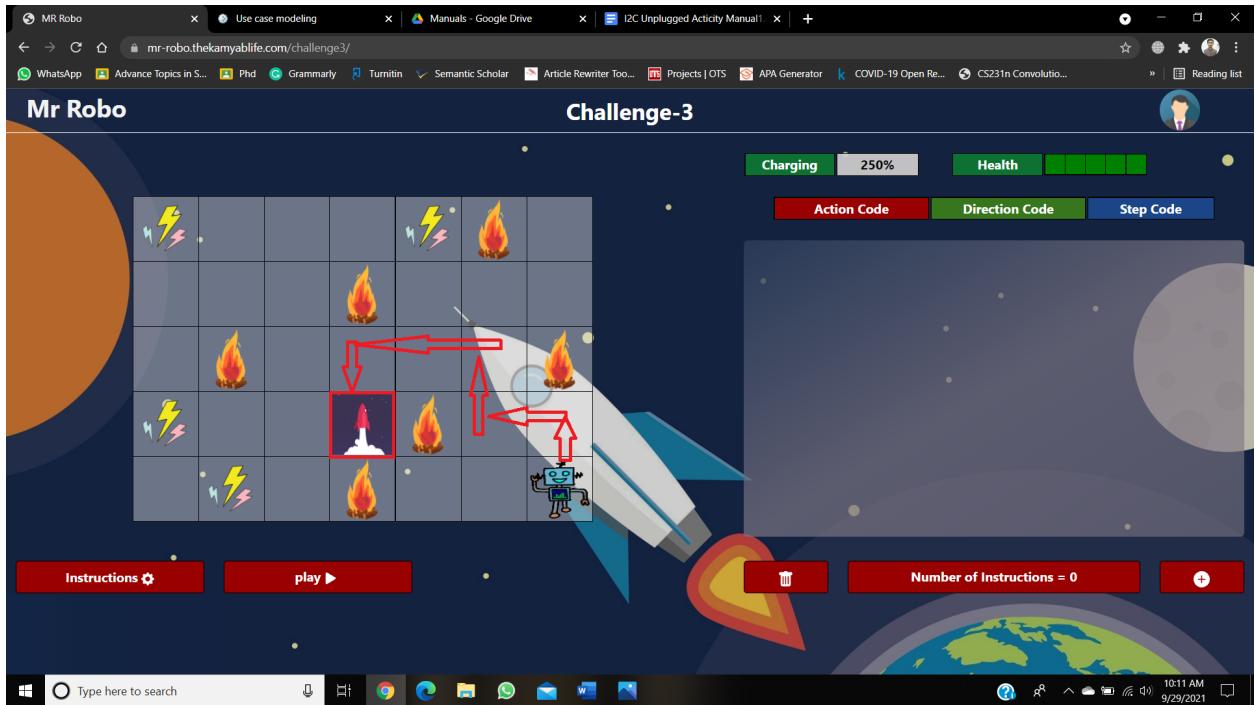
### Challenge 1



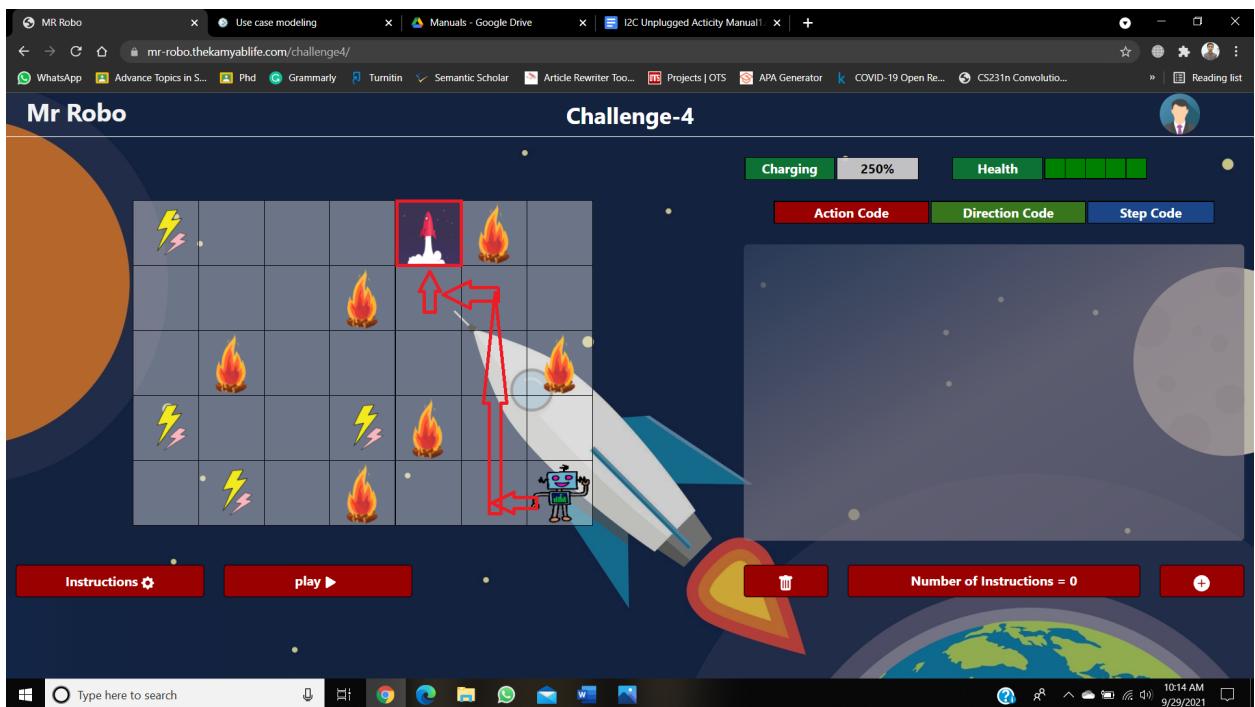
## Challenge 2



### Challenge 3



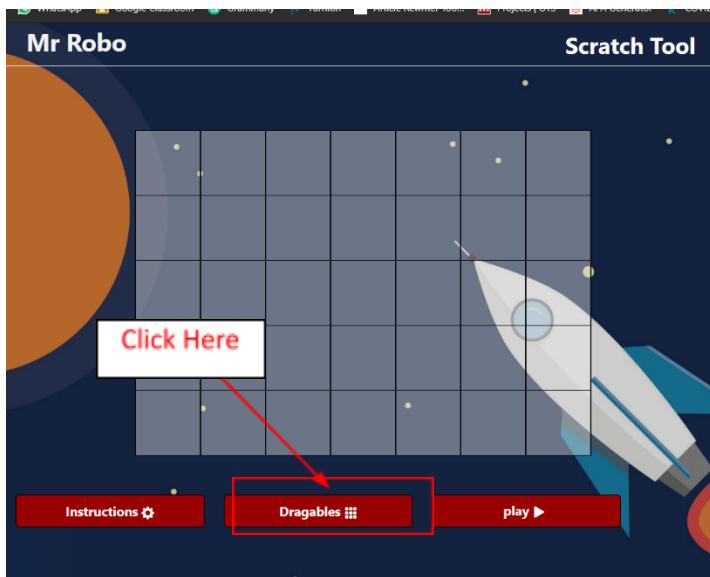
### Challenge 4



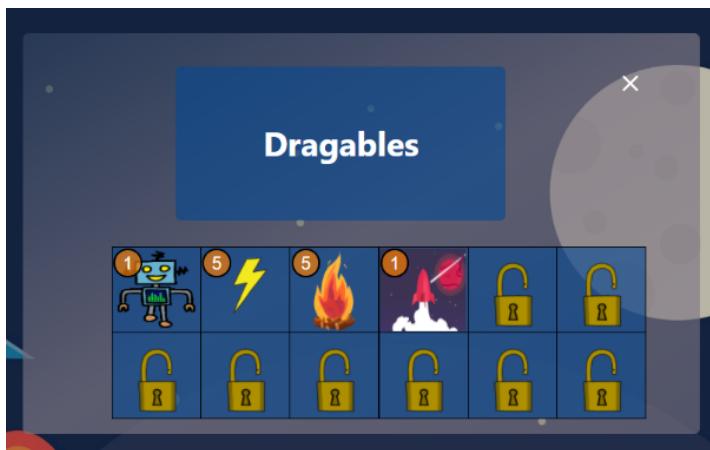
**Create Your Own World in a custom manner.**

Select **Create your own world**.

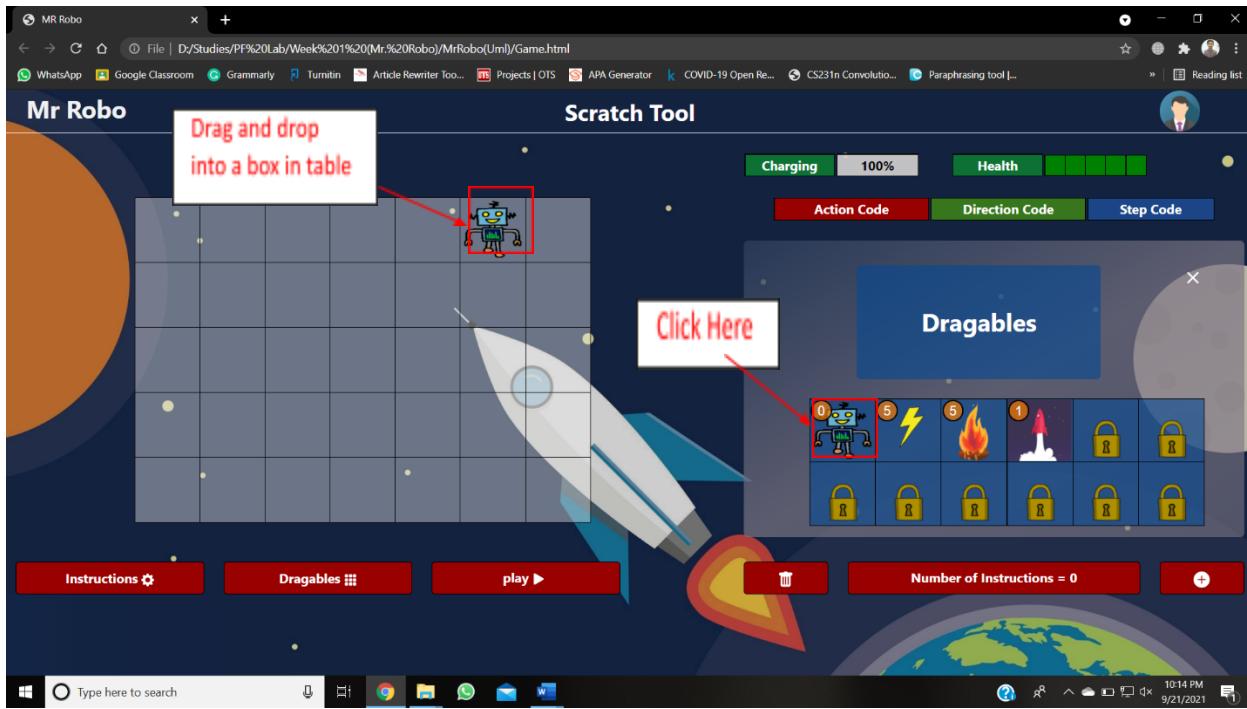
- Click on the Rectangular Red button “**Dragables**”.



- The “dragables” should appear on the right section of the screen.



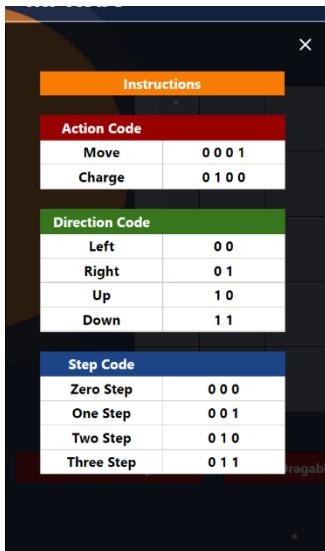
- Move the cursor to Mr. Robo and drag it to one of the boxes in the table on the left by long-pressing the left mouse button.



Similarly, perform the same set of actions for other “**dragables**” to get more familiar with the game.

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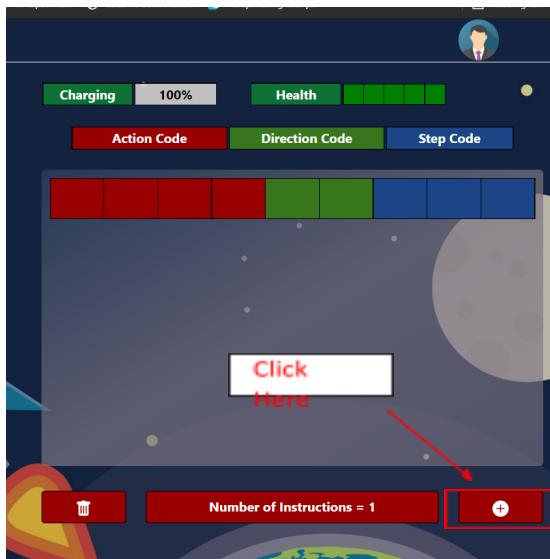
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