



Prize Winner

Programming, Apps & Robotics Year R-2

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The Writing Robot

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The Aim of the Entry

I made a robot that can write. I need to program the robot's arm to make it write. Later, I will develop it to be bigger, smarter and more accurate. I can build bionic robots that will be able to help people without arms or legs.

The Type of Robot, Computer and Program

I used LEGO to build my robot. I used my iPad to open an app called LEGO BOOST to program my robot, my iPad and the robot is connected by the Bluetooth. My robot can write any letter. For demonstration it will write my name "ANNA".

Instructions

1. Open the LEGO BOOST app on the iPad.
2. Click the curtain to open it and press the magic window.
3. Open the program I made called "Robot Arm".
4. Turn on the Move Hub by pressing the green button on the robot.
5. Initialise the robot arm to the lowest position by turning the gear.
6. Click the green start button on the iPad to start the program.
7. The robot would start to write.

Robot Explanation

My robot has two wheels built on it, they can both be programmed separately. The reason the two wheels get programmed separately is because they need to make the whole robot turn and move in different angles to be able to write.

The second motor is used to move the penholder. The motor is called the External Motor. It spins the gear to move the penholder across the stick.

I designed the stick one end lower and the other higher so the pen could be lifted up or down.







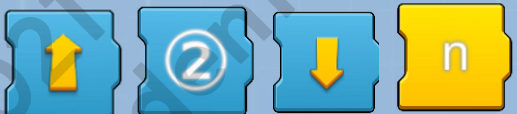

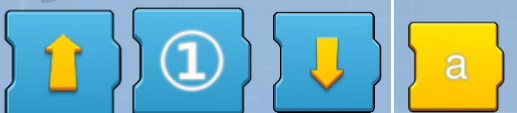




Programming Explanation

❖ Main Program



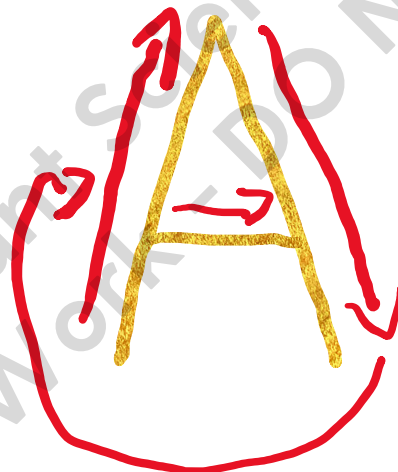
My dad suggested I can use composite blocks in my main program. That would make the program easy to read and clean. I used module method to program.

Step	Icon	Explanation
1		First, I added a start block.
2		Then I put a composite block that I made by myself and would make the robot arm write an "A".
3		I programmed another composite block that would move the arm to a higher position, so when the robot is moving, it would not write where it isn't supposed to write.
4		Then I used a composite block which combines duration, speed and time functions on it to control the robot's movement. The robot will move to the start writing point of the next letter.
5		I created another composite block to make the pen go down to the normal position again.
6		Then the next block was a composite block too and it will make the robot arm write a "N".
7	 	Repeat Steps 3, 4, 5 and 6 to write another "N". But there is a slight difference in step 4 because different end writing point for different letters, I named as icon
8		Then repeat Steps 3, 4, 5 and 2 to write another "A".
9	 	The robot will lift its penholder after finishing the writing. The robot will lift its penholder after finishing the writing.

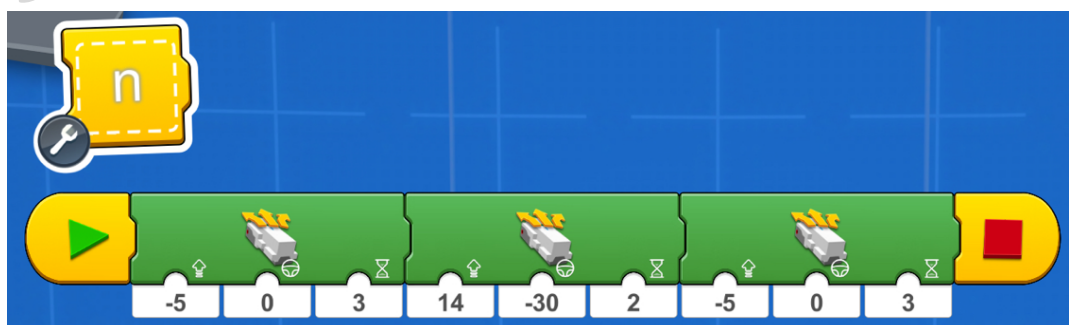
❖ The Composite Blocks

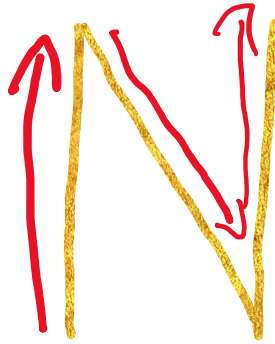
For the main program to be easy to read, I made them all into composite blocks.

1. Composite block to write "A": I first programmed the diagonal line of the left side and then the right side. Then the penholder would lift up, go to the middle of the left-side line then draw horizontal line across to the right-side line. I draw a picture below to show how the robot write the capital letter "A".

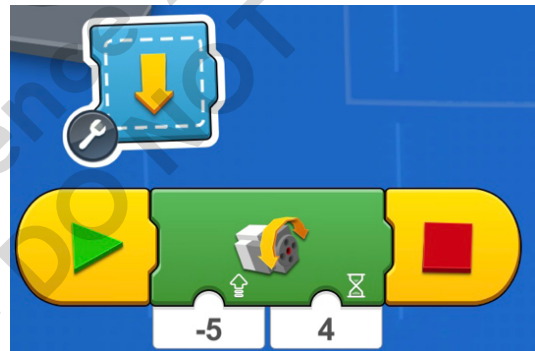
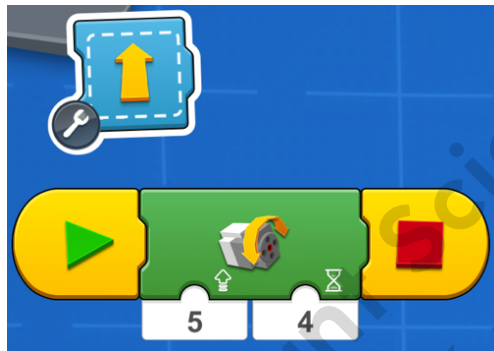


2. Composite block to write "N": Normally we write "N" like vertical down first, but to make it easier for me to program and easier for the robot to write, I programmed it to move the pen holder vertical up first, then I made it go diagonal down and the vertical up.





3. Composite blocks to move higher or lower the pen holder: I made the robot arm able to go to a higher and lower positions. It can move the pen holder up and down, to let pen write where is supposed to write and the pen would be moved to the higher position when it isn't supposed to write.



4. Composite blocks to move the main body of the robot: The purpose of the number blocks is to run the Move Hub to let the pen move from the end point previous letter to the start point of the next letter.



Acknowledgement

Dad helped with building and programming problems.

Dad helped me draw the table to let me explain blocks clearly.

Dad helped me uploaded the video to YouTube.

My robot video can be watched here: <https://youtu.be/7X46WFKb4uU>

Bibliography

1. Benedettelli, D. *The LEGO BOOST Activity Book*. San Francisco: No Starch Press, Inc., 2019.
2. Isogawa, Y. *The LEGO BOOST Idea Book*. San Francisco: No Starch Press, Inc., 2018.