SASTA OLIPHANT SCIENCE AWARDS

SOUTH AUSTRALIAN SCIENCE TEACHERS ASSOCIATION

Prize Winner

Programming, Apps & Robotics

Year 5-6

Narayanan Singaram

Paringa Park Primary School

The Pong Machine

By Narayanan Singaram

Hi, I am Narayanan Singaram here. I am currently in Year 6 at Paringa Park Primary School. I am going to explain about my Spike Prime robot that shoots Ping Pong balls. It is called, The Pong Machine.

My Robot

The aim of The Pong Machine is to help professional Table Tennis players to practice their skills by themselves. So If you are a kid and your parents that are too busy doing their work, just turn this machine on and you will be practicing Ping Pong in less then a second.

Devices are needed To run The Pong Machine

Any Laptop, Chromebook or Ipad.
I have written the code on my Mum's Macbook and saved it on the Spike Prime website. I have also downloaded the code on the Spike Prime hub under Number 1.

Instructions On How To Use It

There are 7 steps to use this robot to perfection.

Step Number 1: Carry the robot carefully by holding it on the first and second base. The 2 bases are the big yellow pieces attached to each other by a grey piece.

Step Number 2: Place it on the other side of the player and it should be very close to the net. Place the cardboard piece behind the robot to prevent the ball from getting lost.

Step Number 3: Load the machine with 5 ping pong balls.One of those balls must be locked by the ball releaser.

Step Number 4: Turn the Spike Prime hub on by pressing the big round button. Then press the button on the right hand side of the big round button twice and then press the big round button again to start.

Step Number 6: In the hub, press the right hand side button to start the blue wheels. Then press on the left hand side button to start the ball releaser.

Step Number 7: After playing, collect the balls and use again.

The Program Part 1

This program is going to spin both blue wheels in an anti-clockwise direction.

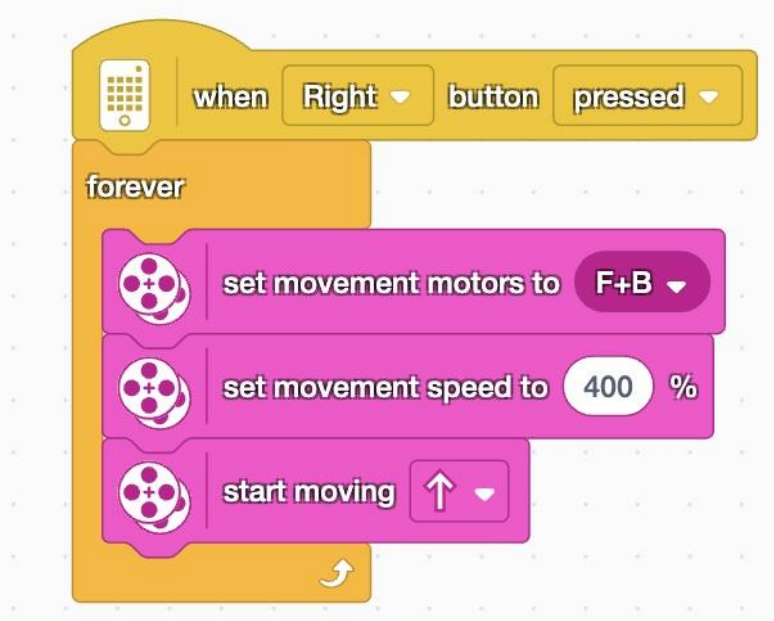
I have used the event block "WHEN RIGHT BUTTON PRESSED" for the right button in the hub.

I have plugged the motors that make the wheels spin into port F and B in the hub. I used the "SET MOVEMENT MOTORS" block.

I have included a SET MOVEMENT SPEED TO 400% block so that 400% is the maximum speed for the motors to spin.

Lastly, I have added the START MOVING FORWARD block so the wheels start spinning in an anti-clockwise direction.

I have put the above 3 blocks in a "FOREVER LOOP" so the wheels spin forever.



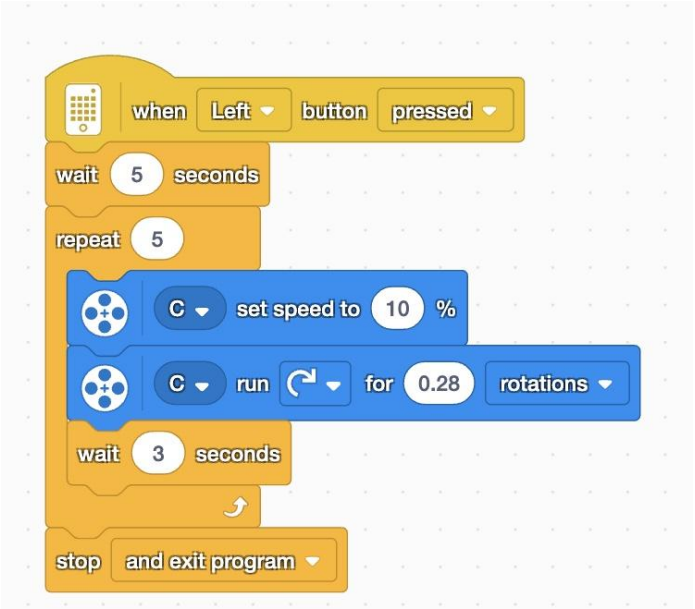
The Program Part 2

This program will start the ball releaser.
I have used the event block "WHEN LEFT BUTTON PRESSED" for the left button in the hub.

I have used a WAIT block so the robot will wait until the player walks to the other side of the table.

I have plugged the ball releaser motor in port C in the hub. Then I have used a "SET SPEED TO 10%" block for spinning the ball releaser very slowly.
I have then added a "RUN CLOCKWISE FOR 0.28 ROTATIONS" block for the ball releaser to release one ball at a time. I put a "WAIT 3 SECONDS" block so it doesn't release all the balls at once. I have put the above 3 blocks in a "REPEAT 5 TIMES" block because there are 5 balls in the ball carrier.

After the loop has ended, I have added a "STOP AND EXIT PROGRAM" block so the wheels stop spinning after the fifth ball is released.



The Problems I had while building The Pong Machine

I actually tried building The Pong Machine 3 times. It was because the mechanisms in 2 of them didn't work. My first build was a simple tire spinning shooter with only 1 big and tiny gear for both the wheels.

The 2 gears per wheel did not spin the 2 wheels fast enough to release the ping pong ball so I disassembled it and built another shooter. My 2nd shooter was with the Slide and Crank mechanism. This shooter does not have any wheels to release the ball.I made a rod out of a yellow L shaped block and two 4 hole pink blocks and attached it to the motor. I tied the rubber bands on the rod to create tension so it can act like a sling. I then figured out that this mechanism does not have enough power to release the ball. I then disassembled it and built a third shooter.

I found this video(the link is in Reference List) where it shows how to spin lego wheels faster with motors.I learnt this trick from this video. "More the gears attached, the faster the wheels spin." So I doubled the amount of gears for 1 wheel and the wheel turned out to spin fast enough for the ball to be released.

Scientific Concepts

GEARS

A wheel with teeth are called as gears. Gears can work only with pairs as the teeth of 1 gear will interlock with the teeth of other gears. It transfers force and motion from one object to another object. It makes the work easier and faster. It also changes the direction and speed of the moving object.

GEAR TRAIN

When many gears can be joined with each other are called Gear Trains. There are 2 types such as Simple Gear train and Compound Gear train.

SIMPLE GEAR TRAIN

It means only one gear on a shaft or axle. It has 2 gears, The Driver Gear and The Follower Gear. The Driver Gear is powered by the motor and transfers force and motion to the Follower Gear. The Follower gets turned by the Driver Gear and it either will have less or more power depending on the gear sizes.

COMPOUND GEAR

I have used this principle for my robot. A Compound Gear means more than one gear is on an axle or a shaft. I used this technique in order to get a higher gear ratio which means that the object will go faster with more power.

Acknowledgements

I thank my mum for teaching me the concept of gears.

I thank my Science teacher for teaching how to use the Lego Mindstorms so now I am really interested in building and coding a lot of robots using Spike Prime.

Reference List

https://science.howstuffworks.com/transport/engines-equipment/gear-ratio.htm

https://www.godigit.com/motor-insurance/automobile/compound-gear-train

https://www.youtube.com/watch?v=zJ3TABb1MRY

https://www.youtube.com/watch?v=_EFMx_5bNnM

https://www.youtube.com/watch?v=0RGzUQ6LJnw

https://www.youtube.com/watch?v=BKjo8Usp21k