Dropping Hoops

Model Name and Number: **Dropping Hoops YE.527**
Topic: Creative problem solving skills
Accessory Tools: 2 technical 9 beams, 4 nail beam
Lesson's Goals:

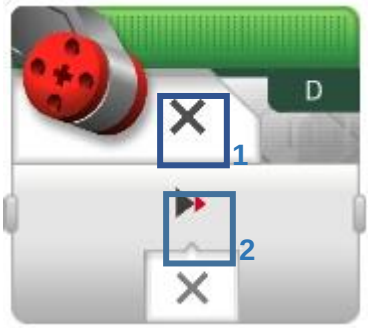
- Students will practice the coast function as a solution to the challenge
- Students will develop their creative problem solving skills

Lesson Structure:

1. Explain the model built in class
2. Repeat the coast function
3. Flow chart – algorithm
4. Programming
5. Construction
6. Playing / experiencing the model
7. Dismantle and rearrange the Young Engineers kits – 10 minutes before class dismisses

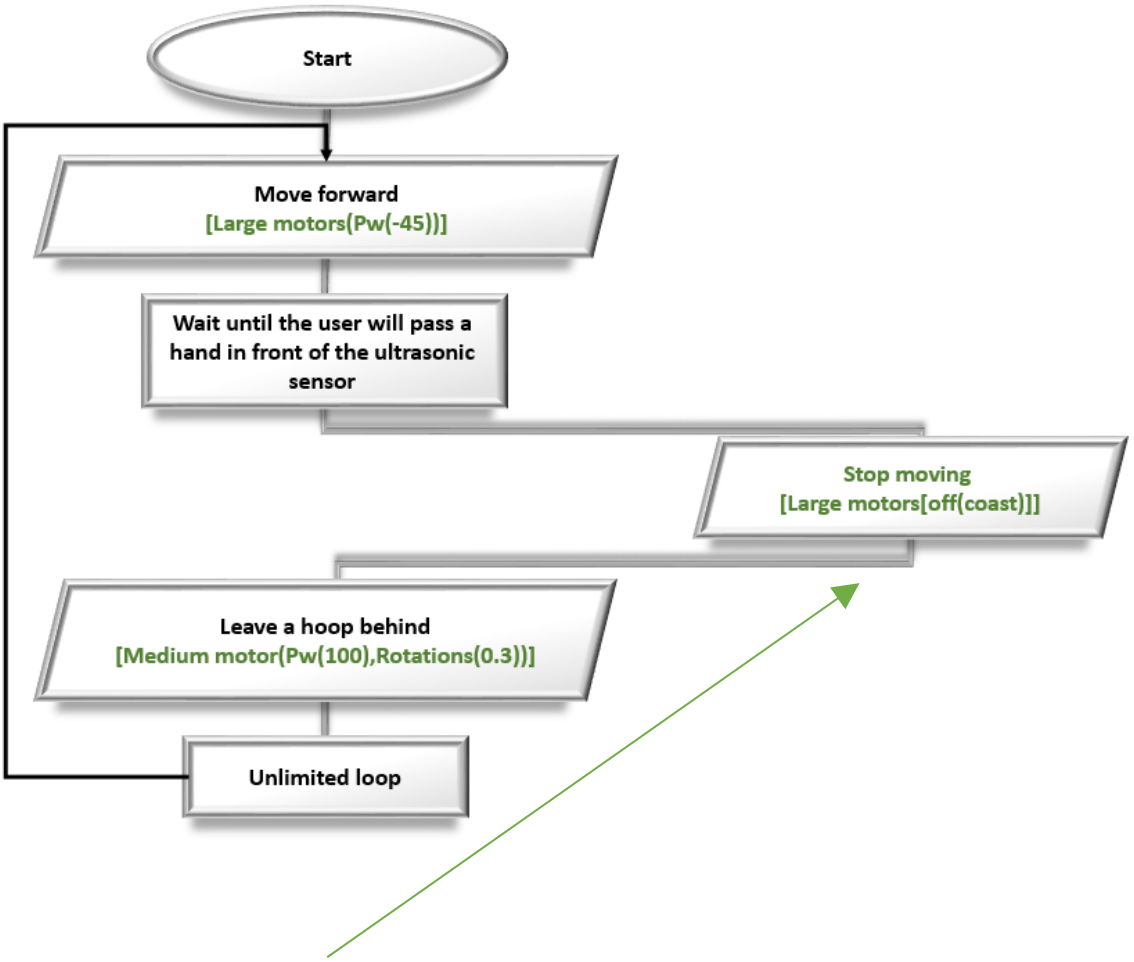
Explanation of the model built in class:
In this class, we will build a model called "Dropping Hoops". This model is a vehicle composed of two motors on both sides that are responsible for its movement. The model is also equipped with an ultrasonic sensor facing upwards and is designed to identify the t hand gesture recognition. Every time the sensor identifies the hand it will drop a hoop. In addition, there is a medium sized motor at the back of the model, as a part of the hoop dropping mechanism (in our model we use regular tires). The operation instructions will be explained further on.

Repeat the motor(Coast) command:
The command was taught and practiced in lesson 13 – Bowling.
The default of the motor's command once the motor has stopped, is to check the break's accuracy.
The new command called coasting, enables a partial brake (for example in a car taking your foot off the gas pedal , in contrasting to that of pressing the brake pedal). This command stops the current to the motor, without stopping it.



Choice 1 – Program type / Stop.
Choice 2 – Choosing the type of motor brake: coast or brake. Brake – complete stop (like braking a car), coast – prolonged / graduated brake (taking the foot off the gas).

Operational Algorithm:



This parallelogram includes the solution to the challenge. (Do not present it during the theoretical part of the lesson).

Programming:

Playing with the Model:
Students face two challenges during this lesson:

1. Programming the model to go along a straight line with square areas (see the accessory tool in the image below). During the drive, the model must drop hoops into the square areas, at least one in each square. To complete this challenge, the instructor should mention the exact value of the motor speeds, as they appear in the programming image. This allows good control over the model.
2. During the programming, the students will face a problem – the model does not wait, it moves very fast and a sudden brake will cause vibration and the instant dropping of the hoops (it is hard to control the model this way). To handle this situation, the students must add the engine stop command whenever it passes their hands. This can be done by adding the coast function, as it will change the sudden brake to a a slower brake.

Notes for the Instructor:

- ✓ To build the track, the students must use Lego Lines to build squares or draw squares on use paper, it's the student's choice.
- ✓ Give the students the exact speed of the engine according to the programming in the lesson structure.
- ✓ If the students fail to solve the challenge, help them so that they have a chance to play with the model towards the end of the lesson.
- ✓ Encourage the students to improve the model by adding another challenge – adding different square areas, improving construction, adding sounds (as shown in the programming image), etc.