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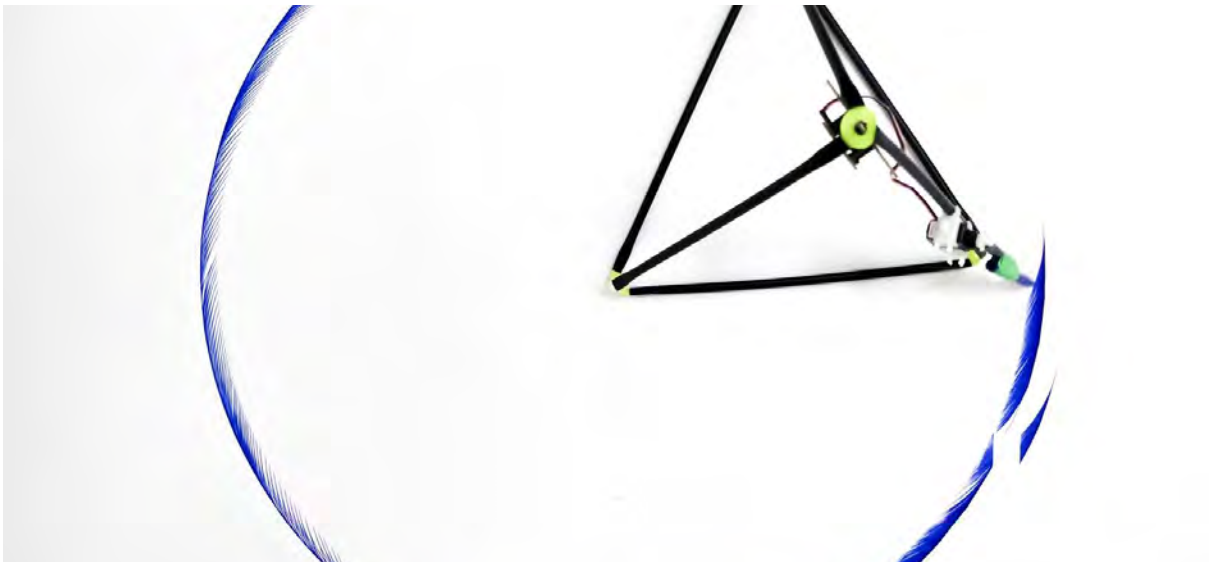
Arkki X Strawbees

Drawing Robot

Playground Map

Amazing Rides

DRAWING ROBOT



PROJECT DESCRIPTION:

In the Drawing Robot project, the pupils get familiar with the concept "variable" in coding by testing different variables themselves and observing the impacts.

Pupils explore and experiment with coding movement by changing parameters and at the end of the project, they visualize the robot's movement in an interesting way. Individual or pair work.

DURATION:

1,5 hours (2 lessons)

MATERIALS & TOOLS:

Computer per each pupil or pair
Quirkbot per each pupil or pair
Motor backpack per each pupil or pair
Servo motor per each pupil or pair
Motor-straw-connector per each pupil or pair
USB-cable per each pupil or pair
Straws
Straw connectors
Tape
Markers
A1 paper per each pupil or pair
Big paper (the bigger the better min 1x2m)

AIMS OF THE PROJECT/ LEARNING OBJECTIVES:

The aim of the project is to practice the concepts of variable, input and output. Pupils practice to use variables to change the movements of the robot.

Pupils observe and test the effect of variables to understand the general principles of how variables work.

THEMES:

Variable, design, coding, robotics, movement, drawing

PROCEDURES AND TEACHING METHODS:

Inspirational start, three-dimensional construction, coding, hands-on experimentation, discussion, teamwork, peer learning

PROCESS:

1. Introduction to the theme

Discuss different kinds of movements and how they are created. You can search for videos of different robots or animals that move in various ways and discuss. Try to search boston dynamics and look at their different robots.

Questions for pupils:

How can you change the movement of the robot? What kind of different movements can you observe? (linear, circular, calm, hurried, erratic, slow, fast...)

Depending on the amount of equipment and computers, hand out the pieces to each pupil or pairs.

2. Getting to know the hardware

Go through the basic hardware used in the project: quirkbot, backpack (for connecting motors), servo motor, motor-straw connectors, USB cable.

Go through the hardware together so that everyone gets to know the robotics parts. Make sure that all the pupils understand that the hardware is sensitive and has to be handled with care. Explain how all the parts are put together and what needs to be taken into consideration to make sure the robot will work.

Put together the hardware needed in this project step by step checking that all the pupils are following each step. During each step explain what the part is, how it works and is connected to other parts.

Get to know your quirkbot:
https://www.youtube.com/watch?v=GkSwaykm1vs&list=PLyv_nhrFP6i90IBe3npaNGD9UYdU3q_QV

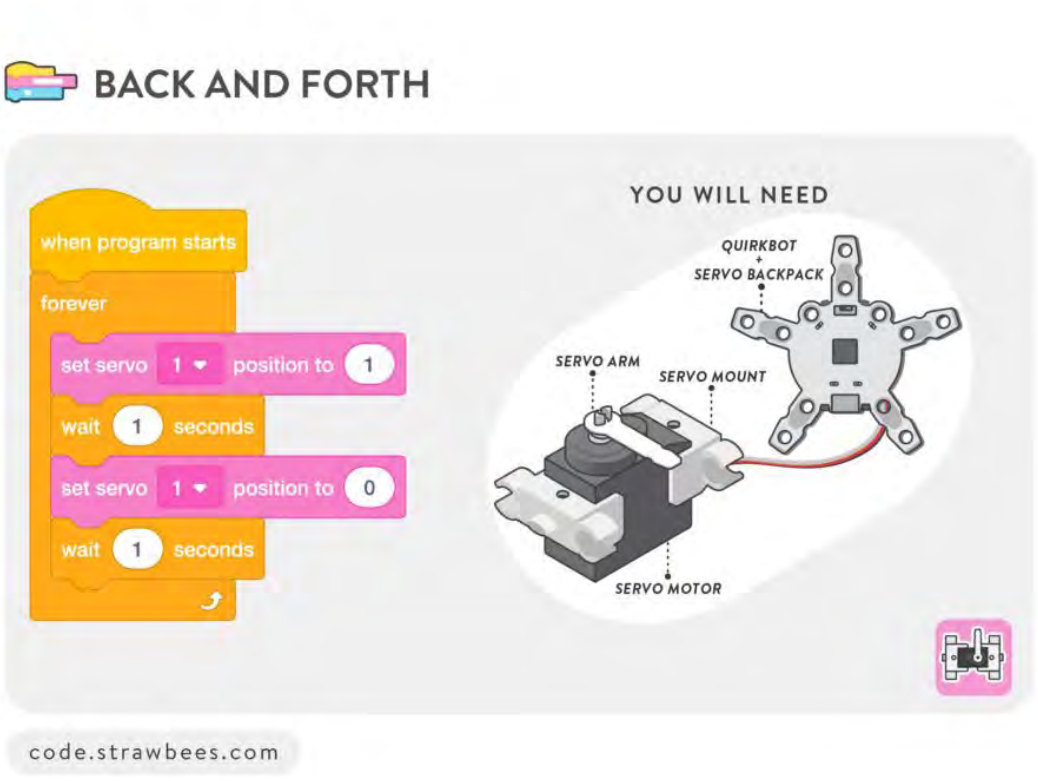
Strawbees basics:
The drawing robot structure and code can be based on the robot racer project.
https://learning.strawbees.com/activity/create-a-robot-racer/

3. Basics of coding

Take your hardware and USB cable to the computer and get prepared to start coding. Explain how the USB cable is connected to the quirkbot and computer.

If needed go through the basic use of a computer. Open the web browser (google chrome) and go tho the address code.strawbees.com. You need to install a chrome extension to use the coding platform (you can install it beforehand to each computer).

For this project you'll need to code a back and forth movement with a servo motor. Build the code used for the drawing robot together step by step with flow or block programming. Explain how the code is built and make sure everybody has the basic code working. Now the pupils can experiment with the variables and change them to see how they affect the movement of the motor.

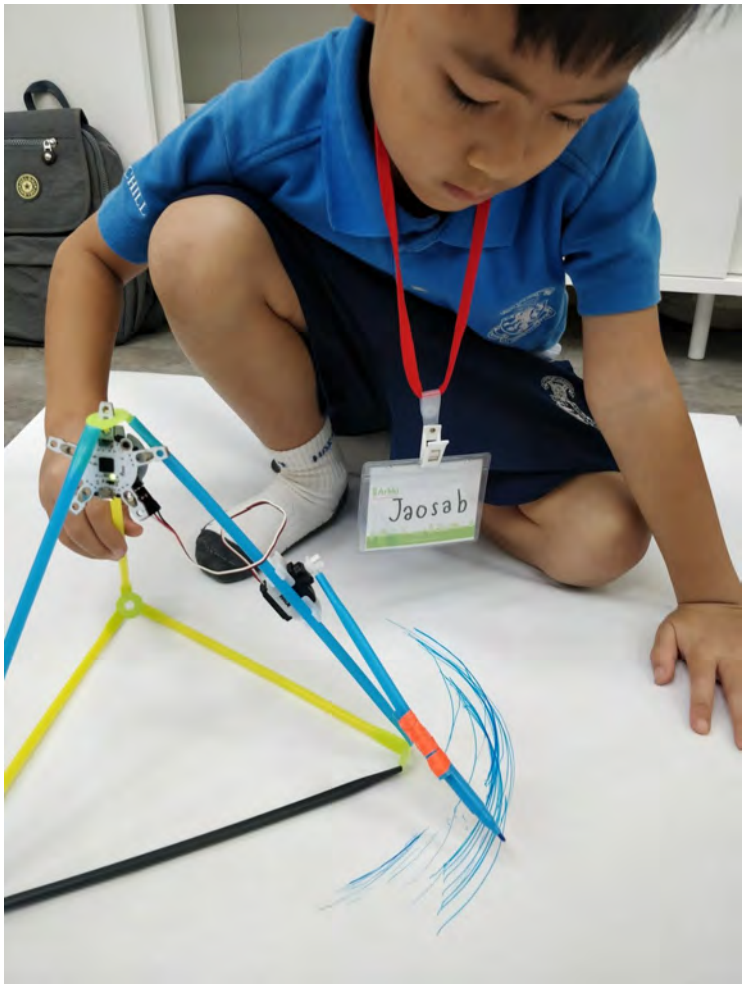


4. Building the structure for the drawing robot

Build a simple structure for the drawing robot. A good structure to start with is the tetrahedron.

5. Drawing robot

To make your robot draw attach a marker and your motor to the structure!
(you can simply use tape to connect it to the pipe)



6. Experiment and analyze

Test your drawing robot on A1 paper. What kind of patterns does the robot draw?
Change the code of your robot and look how the movement changes. (The pupils need to move back and forth to the computer and drawing to test the effects how the change in coding affects the drawing)
What other factors affect the movement of your drawing robot? You can also change the structure of your robot, change the way the marker is attached or even add markers. (by adding more markers to different places of the robot (e.g in the corners) the drawings get more complex and interesting)

Questions for pupils:

Can you analyze what kind of movement the robot was doing from the drawing it made?

7. Joint robot drawing

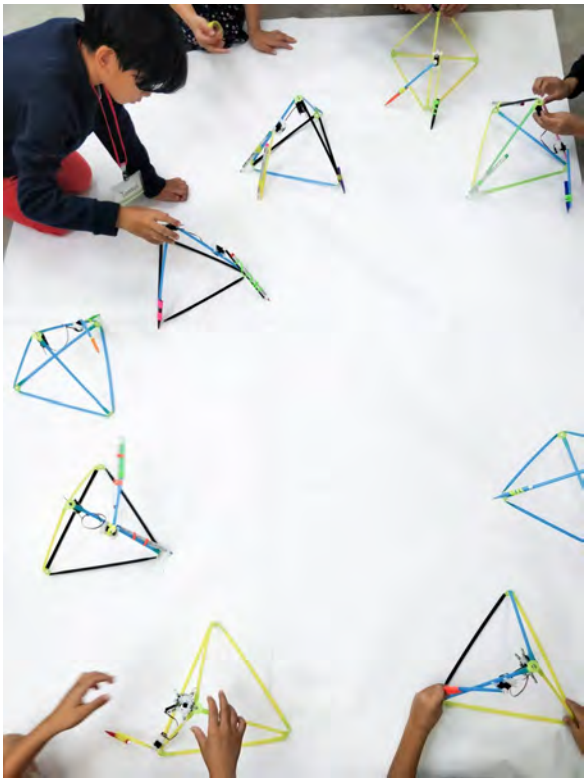
Use a big paper (at least 1x2 meters) to draw a joint drawing. Put all your drawing robots on the paper and create an artwork together! (crashing creates unpredictable changes in the movement and affects the artwork.)

8. Presentation and peer review

Stand around the finished artwork or hang it on the wall so everyone can see it. Look at the drawings and discuss. Let the pupils explain their figures made by their own drawing robot in the joint drawing, and how they evolved the code to reach the desired outcome. How did the change of coding affect the movement?

9. Continue the joint robot drawing

Save the joint robot drawing to continue the work in a surprising way in the next project! (you can continue right away or later depending on the time frame)



PLAYGROUND MAP

PROJECT DESCRIPTION:

In the Playground Map project the pupils experiment, participate, collaborate, and create an interesting plan for a future ArkkiBotic playground. The project challenges the pupils to try out, tolerate the uncertain and get inspired!

DURATION:

0,5-1 hours

MATERIALS & TOOLS:

Watercolors or liquid watercolors per each pupil or pair
Paintbrushes & Watercups
A3 paper
Joint robot drawing from the Drawing Robot project

AIMS OF THE PROJECT:

The aim of the project is to practice experimentation, teamwork, collaboration, uncertainty and finding inspiration.

THEMES:

Design, planning, materials

PROCEDURES AND TEACHING METHODS:

Inspirational start, discussion, drawing, hands-on experimentation, teamwork, peer learning

PROCESS:

1. Introduction to the theme

Look at different playground plans and aerial pictures. (type crazy landscape design in google search and look at the pictures) Discuss about the different forms, materials, textures and surfaces used in the parks, playgrounds and urban design.

2. Change of perspective

Take the big robot drawing made together in the Drawing Robot project. This drawing will now work as a base for your playground plan.

3. Map legend

Create together a map legend for your playground on A3 paper. What kind of areas or materials are used in your playground. Go through the legend so that everybody understands the meaning of the different colors or symbols.

For example wood = yellow, grass / vegetation = green, water = blue, soft rubber surface = red.

4. Color the robot drawing to change it into a playground plan

What areas are vegetation, water, wood, etc. Use your map legend to plan the different areas of your playground. You are not allowed to draw new lines into the drawing just decide what different areas will become.

You need to work together as a team and discuss and agree who is doing what and what the different areas of the drawing will become.

5. Presentation and peer review

Discuss the final plan together. What kind of ideas are in the final plan? Was it easy or difficult to work together and why?

AMAZING RIDES

PROJECT DESCRIPTION:

In the Amazing rides project the pupils design and create their future imagination playground. The pupils innovate, design and create machines, rides, and structures for a robot playground. This can be done with one or two motors. You can choose one model for everyone or the pupils can create their own variations. Pair or max 3 pupils per group.

DURATION:

4 hours

MATERIALS & TOOLS:

Computer
Quirkbot
Motor backpack
Servo motor
Rotation motor
Motor-straw-connector
USB-cable
Straws
Straw connectors
Tape
Paper
Cardboard
Recycled plastic objects

AIMS OF THE PROJECT/LEARNING OBJECTIVES:

The aim of the project is to design and create a piece of moving playground furniture. The pupils practise using loop, variables and algorithm in coding.

The aim of the project is also to practice the design and planning process focusing on innovation and making new ideas.

This project can be done with one or two motors. Adding the other motor will make it a bit more challenging, but many times more fun!

THEMES:

Design, coding, robotics, playground, loop, variables

PROCEDURES AND TEACHING METHODS:

Inspirational start, discussion, design exercises, hands-on experimentation, teamwork, peer learning

PROCESS:

1. Introduction to the theme (c. 15 minutes)

Look at futuristic playgrounds that get your imagination going! (e.g type crazy playground or amusement park in google and look at the pictures). Discuss with pupils what kind of playground equipment / amusement park rides they like.

Questions for pupils:
What could a future robotic playground be like? What kind of movements are there in amusement park rides? Are the movements rotational or back and forth?

2. Rotation motor (c. 5-10 min)

Introduce the rotation motor to the pupils and go through how it can be coded. With the rotation motor you can create movement that rotates clockwise or counter-clockwise and you can change the parameters in the code to affect the speed, duration and direction. Test how the rotation motor works and can be coded together with the pupils. How could you use the rotation motor in your playground equipment?

3. Servo motor (c. 5-10 min)

You can add difficulty and fun if you add another motor to the design. You can use the servo motor that the pupils are already familiar with from the Drawing Robot project.
Having two motors with different movements adds a very interesting and challenging aspect to the project and makes the exploration and experimentation real amusing!

4. Sketching (c. 10 min)

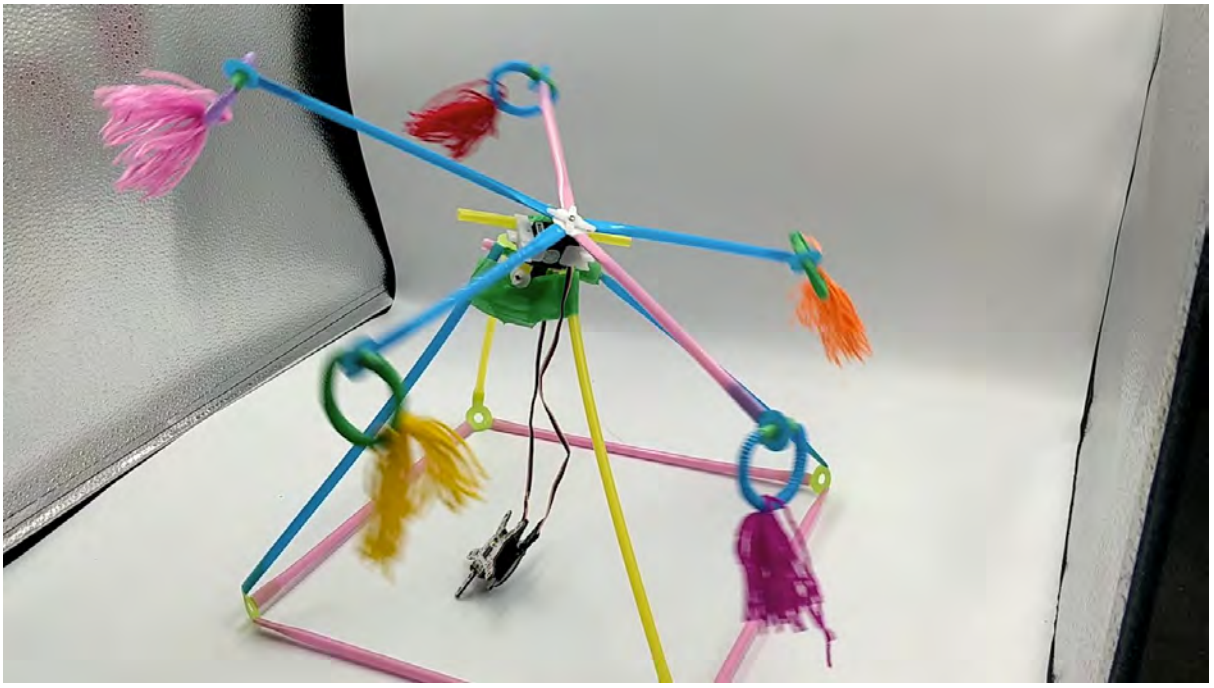
Divide the class into groups of 2-3 pupils. Each group will think about what kind of robotic playground equipment = crazy rides they want to design for the playground. What does it do? And how does it work? Each team draws a sketch of their idea!

5. Build and code amazing rides! (2 h)

Build a prototype of your robotic playground equipment using strawbees & other materials, such as cardboard and recycled plastic objects.
Start testing the structures and movements in the early phase: reality might pose some challenges to the ideas and designs! Maybe the pupils need to try out several ways to connect the motors to the other materials to achieve the desired movement.
Testing and experimenting will help to build and finalise the projects. If you want all groups to do a similar ride, here is one example:

Wiggly Carousel

(2 motors: servo+rotation)



You can create all kinds of amazing rides with two motors, but an easy way to get started is a wiggly carousel.

Build a pyramid as the base of the carousel and attach a servo motor on top of it. You'll need to use creativity and maybe some tape to get it sturdily attached.

Connect a motor-straw-connector to the servo motor and use some more tape, straws and creativity to connect a rotation motor to the moving motor-straw-connector of the servo motor.

Attach a connector that allows you to attach several straws to the rotation motor to create the arms of the ride. At the end of each arm you can build swings or seats where the people ride the machine.

Check these videos for inspiration:
https://youtu.be/PGJlZJzYhwI
https://youtu.be/nSA3giWDDnw

6. Presentation and peer review (15 min)

Present your Amazing Rides and discuss what it would be like to use them.

Arkkibotics video:

https://youtu.be/a4DxzZybGg8

There are a huge amount of possibilities for the movements when you combine two motors! Explore and enjoy!