Ideas for STEM Bus Labs

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Lab 1: Demonstration to Machine Learning and Object Detection using JeVois and TensorFlow

Objectives

- Demonstrate the use of the JeVois camera and its capabilities
- Allow students to see how machine learning can be used to detect objects
- Show the structure of a machine learning model and compare it to tools such as FaceID

Materials

- JeVois camera, found at https://www.jevoisinc.com
- Computer with JeVois software installed
- Objects to detect

Procedure

- Show the students the JeVois camera and its software
- Explain how TensorFlow works and how it is used to detect objects
- Allow for students to experiment with the camera by using personal and provided objects

Lab 2: Introduction to Basic Robotics and Programming with VEX Go

Objectives

- Introduce students robot systems found in the real world (Drivetrain, Arm)
- Convey the idea that robots and automation can be used to solve real-world problems

Materials

- Pre-Built VEX Go Robot
- VEX Go Field
- Simulated “Trash” (augmented trash bags with a rod through the middle, as well as another stretched across the top, to act as a handle)
  - The bases will be 3D printed, and the existing magnets from the previous attempt will be used as weights
  - Important measurements to note:
    - The handle will be at least 3.25 inches in diameter, to allow for the robot to pick it up
    - To make the augmented trash bags, you are to cut a large trash bag into 5×7 inch rectangles, then apply heat to the edges to seal them

Procedure

- Show students the VEX Go system
- Demonstrate the robot’s capabilities and how it can be programmed
- Task the students with either driving or programming the robot to move “trash” to designated areas on the VEX Go field

Lab 3: VEX v5 Transmission Demonstration

Objectives

- To enhance the students' understanding of one of the fundemental systems of an automobile
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Materials

- Coming Soon!

Procedure

- Coming Soon!

Lab 4: Laws of Motion Labs- Simple Activities to Demonstrate a Greater Concept: Newton's First Law

4.1 The Law in practice

- Newton's first law states that an object in rest will stay in rest, and an object in motion will stay in motion unless acted upon by an external force

4.2 Objectives

- Coming Soon!

4.3 Materials

- Coming Soon!

4.4 Procedure

- Coming Soon!

Lab 5: Laws of Motion Labs- Simple Activities to Demonstrate a Greater Concept: Newton's Second Law

5.1 The Law in practice

- Newton's second law states that the force of an object is directly proportional to an object's mass and acceleration

5.2 Objectives

- Coming Soon!

5.3 Materials

- Baloon filled with helium
- Electronic scale
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5.4 Procedure

- Coming Soon!

Lab 6: Laws of Motion Labs- Simple Activities to Demonstrate a Greater Concept: Newton's Third Law

6.1 The Law in practice

- Newton's third law states all forces come in pairs, and when one object pushes or pulls another object, the second object pushes or pulls back with an equal force in the opposite direction

6.2 Objectives

- Students will have a rudimentary understanding of Newton's third law of motion

6.3 Materials

- Cardboard Rectangle
- Drinking straws
- Skewers
- Balloons

6.4 Procedure: Pre-Rollout

1. Cut a rectangle out of cardboard
2. Create a hole between the layers of the cardboard 1/4 of the lenth down the rectangle using the skewers
3. Once a hole is created, insert the straw into the hole and cut it to size
4. Repeat steps 2 and 3 approximately 3/4 down the length of the rectangle
5. Complete the rest of the steps with students at the rollout
   Reference Video

6.5 Procedure: Rollout

- Retrieve the rectangle from pre-rollout
- Guide the students through the process of creating the axles of the car using skewers and bottle caps
- Add the balloon and straw to the top of the car
- Have fun!