Vex V5 Autonomous Line Following

Project Overview
This Vex V5-based project will be focused on designing and programing a robot with sensors to follow a line.

Course Connections	21st Century Skills	CTE Alignment
Middle School Science High School Physics High School Engineering	Communication, Critical Thinking, Collaboration	Energy, Environment, and Development Pathway

Objective
Students will be able to design, build and program a robot to follow a line and avoid obstacles using sensors.

Materials
1. Vex V5 Speedbot 2. Line sensors (3) 3. Proximity/Distance sensor 4. Color Sensors 5. Laptop with Vex V5 Software 6. Blocks/C++ Code.

Block Diagram

Application
This type of robot can be used for future autonomous vehicles, early obstacle detection systems and object recognition.

Outline/Schedule

Part 1: Project Introduction.

- Introduction to autonomous line follower and its applications.
- Overview of the project and its objectives.
  - Objective: Students will build a robot and develop a code where a robot will follow a line and avoid obstacles using sensors
    - Lesson Plan https://docs.google.com/document/d/1J-TFhHEqbgoCctP8L1WCEiO9k4P5VmI0Pp3uXDfOzWA/edit?usp=sharing
  - Introduction to Vex V5 and its components.
    - V5 Library https://kb.vex.com/hc/en-us/categories/360002333191-V5
  - Assign team tasks, distribute materials, and plan the schedule.
    - Roles:
      - Presenter,
      - Recorder (**written** -notes, presentation, **digital** - photos, video, engineering notebook),
      - Researcher,
      - Engineer,
      - Programmer.
    - Students will need to assume a role and contribute to their project based on their responsibilities.
    - Students may be required to assume more than one role as needed.
    - Each role may require more than one student.

- o Project video.

    - ▪ Instructions: https://drive.google.com/file/d/17A6-wKl_g5fC17wHbdqw5amGkY5Hwlye/view?usp=sharing

Part 2: Timeline.

The project timeline should be about 8 business days to complete. Any leftover time should be invested in developing improvements.

- ○ **Day 1- 2. Build the clawbot. (Claw not required)**
    - ■ **https://content.vexrobotics.com/docs/276-6009-750-Rev5.pdf**
- ○ **Day 3 - Install sensors**
    - ■ Line Tracker https://kb.vex.com/hc/en-us/articles/360039287611-Using-the-V5-3-Wire-Line-Tracker
    - ■ Using The sensor
        - ● http://smithcsrobot.weebly.com/uploads/6/0/9/5/60954939/vexcodesensorspdfversion.pdf
        - ● https://www.youtube.com/watch?v=JeJ3QjWCodU
        - ● **https://youtu.be/q0PuSZklUMQ**
        - ● **https://www.youtube.com/watch?v=60eyXMsz5iQ**
    - ■ Vision Sensor
        - ● https://www.youtube.com/watch?v=8WVZ2BjZgiI
        - ● https://www.youtube.com/watch?v=TP80sKOGAg4
- ○ **Day 4 -5. Develop the code.**
    - ■ https://www.youtube.com/watch?v=aszmYQuZYTs
    - ■ **https://youtu.be/vyDCeGtBvog**
- ○ **Day 5- 6 Troubleshoot.**
    - ■ Look for syntax mistakes.
    - ■ Adjust the code for proper robot behavior.
- ○ **Day 7-8 Presentation**
    - ■ Complete the Presentation
    - ■ https://docs.google.com/presentation/d/1kXl4J-DMJpkASu2O_D3kXo3SeQOI0aRBv6HhQjDRCdw/copy
    - ■ Students should document daily via notes, pictures and video their STEM journey.

Part 3: Programming the autonomous line follower

- o Introduction to programming concepts.
- o Overview of the code for the line follower.
- o Practice.
    - ▪ Robot Vacuum
    - ▪ Disk Color Maze
    - ▪ Tutorials
- o Write the code for the line sensors and distance sensor.
- o Test the code on the robot.
- o Record video clips for important steps.

- ▪ [Engineering notes](#)
- ▪ [Presentation](#)

Part 4: Finalizing and Testing the Project (complete by Jun. ??)

- o Design the testing plan based on the project objectives and requirements.
- o Troubleshooting common issues that students may encounter for the project.
- o Allow teams time to finalize their project and test it according to the testing plan provided.
- o Final improvements and adjustments to the vehicle.
- o Record video clips for important steps.
- o Prepare the project presentation and make the video demo.

Reflection
- Have students reflect on their experience with the project and what they have learned about programming, robotics, and Vex V5.   - Discuss how STEM skills and knowledge can be applied to real-world problems and applications.   - Allow time for students to provide feedback on the project and suggest improvements for future iterations.   - Document findings in presentation.

Sample Code
[Sample Code](#)