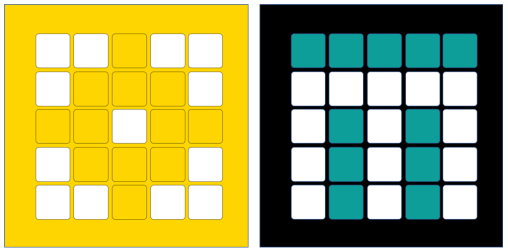
PRIME LESSONS

By the Makers of EV3Lessons



HOW TO USE THESE LESSONS

BY SANJAY AND ARVIND SESHAN

WHO ARE THE AUTHORS & FOUNDERS?

- We are undergraduate students at Massachusetts Institute of Technology.
- We started competing in FIRST LEGO League at the ages of 6 and 8.
- In 2016, we won First Place Programming at World Festival St. Louis. In 2018, we won First Place Champion's at World Festival and also had a robot scoring in the top 6.
- We authored all the lessons on EV3Lessons.com which are used by more than 850,000 users worldwide. FLLTutorials.com has an additional 150,000 users.
- We were selected to be the "First 5" – Two of the first five community members selected by LEGO to give feedback on SPIKE Prime as it was being developed.
- We have over 12 years of experience working with, teaching, writing lessons, and competing with LEGO robots.

Arvind

Sanjay

Copyright © 2023 Prime Lessons (primelessons.org) CC-BY-NC-SA. (Last edit: 05/11/2023)

MISSION AND FOCUS

- There are programming lessons available inside the SPIKE Prime software. Those lessons are short, project-based lessons. There is a competition unit included. There are also projects available in Robot Inventor.
- Prime Lessons offer a different perspective. We focus on developing programming skills by using a basic training robot with two drive wheels
- The skills we teach can be applied to any project or competition
- We believe strongly in the need for discovery. At no time will we provide direct solutions to a competition. It is expected that you learn the concept and apply it situations you need in competition
- We believe strongly that sensor usage is a valuable tool to increase robot reliability, and so you will find majority of our lessons talk about sensors in some way
- Our lessons are designed to be completed in order so that you will have the correct prerequisites for each lesson. They are organized into handy units that build upon each other.

Copyright © 2023 Prime Lessons (primelessons.org) CC-BY-NC-SA. (Last edit: 05/11/2023)

LESSON FORMAT

- Our lesson content and format are based on 9 years of writing and teaching programming lessons.
- We try to keep our lessons short (10-12 slides) on purpose.
- Our lessons are not YouTube videos on purpose. However, we will provide a supplemental video to demonstrate robot movement when needed.
- Every lesson includes the following components:
  - Objectives, Main Blocks, Challenge, Solution
- Lessons are grouped together into units

Copyright © 2023 Prime Lessons (primelessons.org) CC-BY-NC-SA. (Last edit: 05/11/2023)

PRIME LESSONS ORGANIZATION

- UNIT 1 – Getting Started
  - How to use these Lessons
  - Building a Robot
  - How to Create a Robot in CAD
  - Easier Building with SPIKE Prime and Robot Inventor
  - Installing Software and Firmware
- UNIT 2 – Intro to Hub and Software
  - Introduction to Hub and Software
  - Managing Projects
  - Viewing Sensor Values
- UNIT 3 – Beginner Movement
  - Configuring Robot Movement
  - Moving Straight
  - Turning with Gyro
  - More Accurate Turns
- UNIT 4 – Good Practices
  - Backing Up Files
  - Printing Code
  - Pseudocode
  - Commenting Code
- UNIT 5 – Sensors
  - Introduction to Force Sensor
  - Introduction to Color Sensor
  - Introduction to Distance Sensor
  - 3X3 Light Matrix *
- UNIT 6: Intermediate Programming
  - Using Repeat Blocks/Loops
  - Using Sound Blocks/Speaker Functions
  - Using Light Blocks/Light Functions
  - Using If-Then Blocks/If-Else Statements

Copyright © 2023 Prime Lessons (primelessons.org) CC-BY-NC-SA. (Last edit: 05/11/2023)

PRIME LESSONS ORGANIZATION

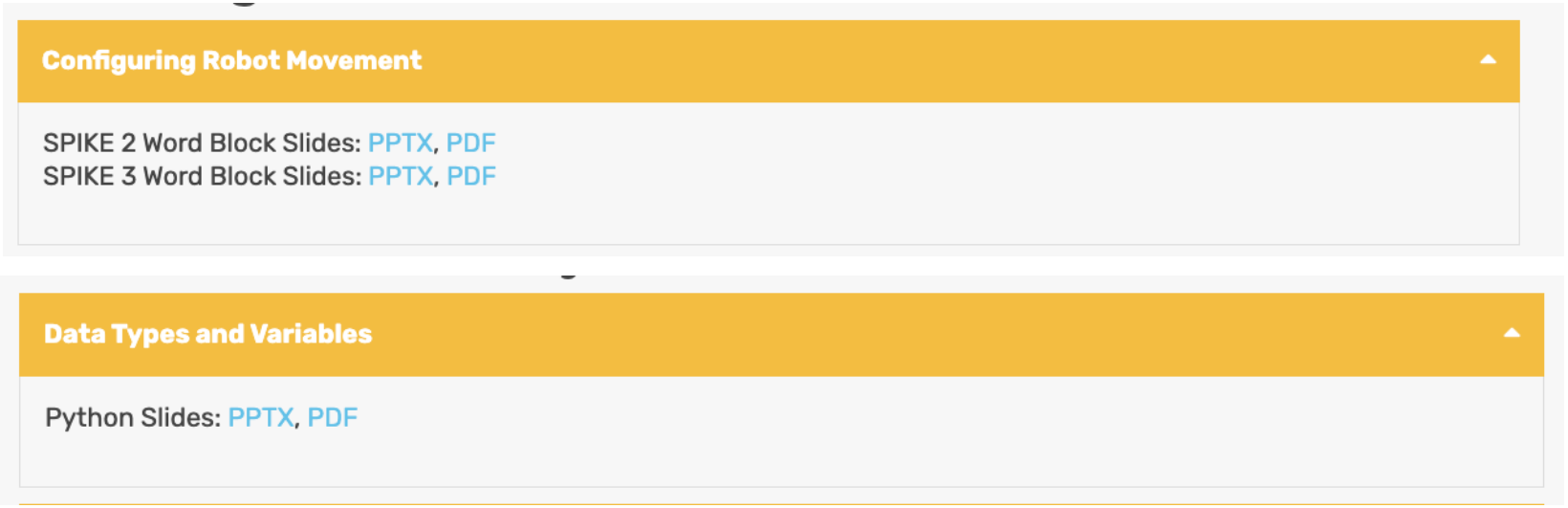
- UNIT 7: Intermediate Movement
  - Moving an Object with Stall Detection
  - Basic Line Follower
  - Challenges
- UNIT 8 – Advanced Programming Techniques
  - Introduction to Events
  - Event Synchronization
  - Variables
  - My Blocks
- UNIT 9 – Advanced Movement
  - Acceleration
  - Squaring on a Line
  - Proportional Line Follower
  - Gyro Move Straight
  - PID Line Follower
- UNIT 10 – Additional Competition Skills
  - Acceleration
  - Debugging Techniques
  - Reliability Techniques
- UNIT 11 – Robot Inventor*
  - Machine Learning
  - Hub-to-Hub

* Planned

Copyright © 2023 Prime Lessons (primelessons.org) CC-BY-NC-SA. (Last edit: 05/11/2023)

TYPES OF LESSONS

- Lessons are available for Word Blocks and Python
- Lessons were updated to use SPIKE 3 in 2023.



- SPIKE Prime and MINDSTORMS Robot Inventor are very similar, but there are different features and blocks available in each software.

Copyright © 2023 Prime Lessons (primelessons.org) CC-BY-NC-SA. (Last edit: 05/11/2023)

CREDITS

- This lesson was created by Sanjay Seshan and Arvind Seshan for Prime Lessons
- More lessons are available at www.primelessons.org

This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

Copyright © 2023 Prime Lessons (primelessons.org) CC-BY-NC-SA. (Last edit: 05/11/2023)