Review: Building Smart LEGO® MINDSTOMRS EV3 Robots

By Jetro

About the Author

Kyle Markland got the attention of the EV3 community when he started uploading videos to his YouTube channel (builderdude35) and announcing them both on his website (builderdude35.com) and in the MINDSTORMS community on Facebook a little over three years ago. His weekly videos have covered everything from basic FLL and WRO concepts to more detailed tutorials on programming and building aspects of both the NXT and the EV3 MINDSTORMS platforms. In August 2017, Kyle was among the last wave of 'power users' added to the select MINDSTORMS Community Partners program. On April 4 his book 'Building Smart LEGO® MINDSTORMS EV3 Robots' was published by Packt (https://www.packtpub.com/hardware-and-creative/building-smart-LEGO®-mindstorms-ev3-robots).

About the Book

Building Smart LEGO® MINDSTORMS EV3 Robots explores five robot models that were created by Kyle to teach building and programming skills ranging from basic to advanced, and takes the reader on a journey of discovery using the MINDSTORMS EV3 with six projects.

However, not all the models Kyle uses in his book use only the parts present in the Retail kit (31313) or in the Education kit (45544) so you'll need to get some extra elements to follow them all. One of the models uses the track elements from the Edu set, while another uses the rubber tracks from the Retail set. If you have either one of them and a few Technic sets you may already have everything you need to follow the building instructions. If not, now is a good time to add some parts to your collection or get creative. The use of sensors is a little bit more problematic, as one of the models uses both the Ultrasound sensor from the Edu set and the IR sensor and remote from the Retail set, while another uses two infrared sensors.

Each chapter starts out by investigating a number of mechanical solutions in the model it explores. Building instructions are not included in the book, but can be downloaded from Kyle's website, together with sample code for all of the projects. Although the book mentions LDD files for each of the models, Kyle has since worked on making PDF instructions available that were created with LDraw tools to make them as similar as possible to the instructions used for official LEGO® models. This is a significant improvement over the LDD files as those don't always provide a logical or coherent building sequence. There is also a video for each of the six projects to give you an idea of what your robot will be capable of doing once you finish programming it.

The mechanical concepts discussed in the book range from a standard tank drive design to rack and pinion steering in the Falcon car concept. Another skill Kyle discusses in the book is making a walking robot. However, the important part of the book is not the mechanical designs or the instructions, as those are freely available on Kyle's website anyway. The added value in the book lies in the explanation for the choices made while designing the robots and why some mechanical designs are more practical in certain robots.
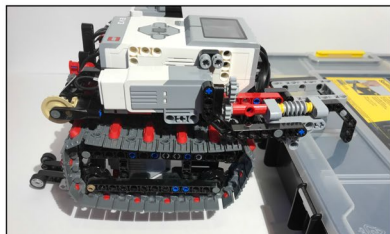
The entire climbing mechanism is powered by one EV3 medium motor, plugged into port A. The motor routes its power through a long drive shaft that runs along the length of the robot:

EV3 Medium Motor

Drive Shaft
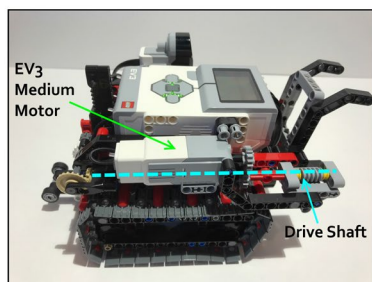
Navigate over to the switch tab that has the right brick button highlighted. As usual, add the display reset and display print blocks at the beginning. Then, add a medium motor block (port A, **On**, 100 percent power). This motor block keeps the jaws and tail moving continuously while the operating mode is active:
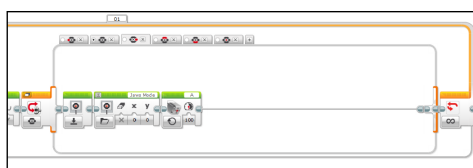
Now, it is time for something new: drag out two loops and place one under the other. Name both loops Mode Loop. Split the programming's flow so that it branches off to both loops. Drag the program's flow cable to create a new branch by clicking on the small tab on the right edge of the last block in the original branch, and drag the cable over to the first block in the new branch:
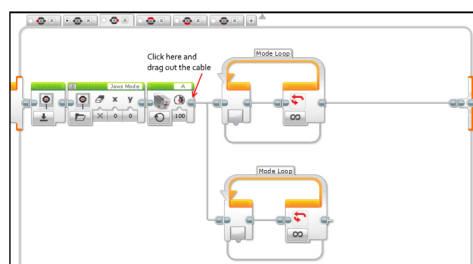
Each chapter then turns to programming the robot. The book starts off with simple concepts like loops and cases (switches), but soon moves on to proportional steering, creating menu graphics, creating an interactive robot and using MyBlocks to recycle code and keep everything organised. The coding steps ae well explained and there are plenty of colour pictures to illustrate each step. While the programming concepts have been designed to go from simple to more complex, it is perfectly possible to just jump in to any of the models if you'd rather not follow the sequence of the book. If that means you don't fully understand a concept (even though the steps are fully explained) you can also go back to a previous model later on to fill in the blanks.

The final chapter reads like a bonus and has some special requirements: it uses two 3rd party sensors (the dGPS from Dexter Industries and the HTCompass from HiTechnic). While this means you cannot complete all the missions with just the MINDSTORMS EV3 elements, the chapter does give you a good idea of where to go next with your MINDSTORMS hobby. The chapter also shows you how to export a MyBlock from one project and import it into another, or how to create a MyBlock with parameters (inputs), and Kyle does a great job explaining the principles behind GPS navigation in an easy to understand and accessible way.

Building Smart LEGO® MINDSTORMS EV3 Robots is the perfect book for the EV3 MINDSTORMS fan who has a bunch of parts but needs inspiration for building and some pointers on how to think about and put together programs. The projects are fun and teach many programming skills you will need for your EV3 robots.
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