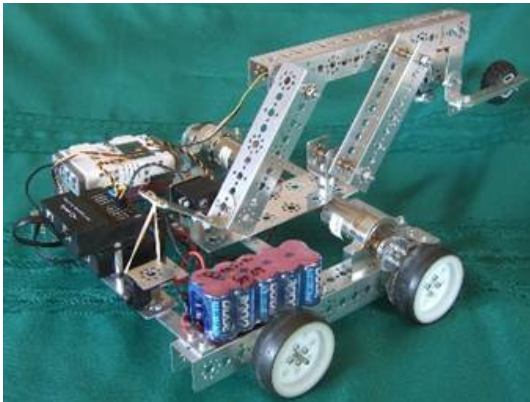




Oregon Robotics Tournament and Outreach Program, ORTOP, has designed a modular robot kit based on LEGO Tetrax parts to use in workshops, classrooms and try-it sessions.



Goals:

- Cost needs to be as low as possible
- Robot needs to include a manipulator of some kind
- Robot needs to support autonomous and tele-op control
- Robot needs to be able to built in multiple modules in parallel
- Needs instructions that can be easily followed by novices
- Needs to provide a reasonable taste of the full FTC experience

Our Solution:

- Robot is built from three modules: Chassis, Control and Arm
- A full FTC kit has nearly enough metal to build two robots
- Can build the robot in 1 hour by building the modules in parallel
- Can build the modules in series over the course of a full day
- Includes detailed heavily illustrated step by step instructions
- Includes well documented sample code in RobotC
- Step-by-step programming instructions are currently in progress
- Can work in both autonomous and tele-op modes just like a full FTC robot

We have used this robot in one hour classes where groups of 6 to 9 are given one kit. Each group breaks into smaller 2 to 3 person teams to work on each of the three modules. It takes about 45 minutes to build the modules in parallel. As each team finishes building their module they have the opportunity to play with a finished robot while their sibling teams finish up. Then the team that finished first combines the 3 modules while the team that finished last gets their chance to play with the example robot. Finally, the group's finished robot is programmed and they get to compete against the other groups' robots doing simple tasks like picking up empty soda cans and dropping them in a box.

We have also used this robot in all day workshops and week-long classes with groups of 1 to 2 working on the entire robot one module at a time and then learning everything from RobotC installation and programming to configuring Bluetooth adaptors and game controllers. In conjunction with Don Domes at Hillsboro High we are building a large set of activities and challenges for the groups to attempt with their finished robots.

We have determined that two of these robots can be built from a single FTC kit with the addition of these parts:

- 1 Servo Controller (W991445)
- 1 Motor Controller (W991444)
- 1 Tetrax 12v Rechargeable Battery (W739057)
- 1 On/Off Switch (W739129)
- 4 3" Wheels (W739025)
- 2 288mm Flat Bars (W739070)
- 4 Gear Hub Spacers (W739090)
- 1 NXT Intelligent Brick (W979841)
- 6 Axles (W739088)
- 1' Hook-and-Loop Fastener (W751974)
- 2 Rubber bands (the FTC legal ones)

It probably requires some additional nuts and screws of each size. I don't remember exactly how many came in the FTC kit. All of the C channel, motors, servos, gears, plates and so on come in the full FTC kit in sufficient quantity to build two robots. A small cost savings could be gained by using the AA disposable battery pack for the second robot instead of the rechargeable battery. The attached zip file includes a full parts list for the modular robot.

Next Steps:

- We intend to develop a sensor package as a fourth module
- We are working on Bluetooth troubleshooting step-by-step instructions
- We are working on RobotC programming step-by-step instructions for use with this kit
- We would like to eventually work with LEGO Education to develop a similar kit for the classroom

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