2007 FIRST Robotics Competition Software Overview

A variety of software tools are provided to help teams understand, program and control FIRST robots. This overview details the software suite available to 2007 FRC teams.

The robot control system consists of the *Innovation First* (*IFI*) Robot Controller (which is pre-loaded with an installed default program to control the robot) and the *IFI* Operator Interface. *IFI* provides documentation and an overview of the control system at www.ifirobotics.com/frc-robot-control-system-overview.shtml. Details on the system components are located at www.ifirobotics.com/oi.shtml and www.ifirobotics.com/rc.shtml, with the latter site including the *IFI* default program source code and documentation as well as a very useful Programming Reference Guide. Support for the control system is provided at www.ifirobotics.com/forum and teams should monitor the *IFI* website during the season for updates to the default program.

Teams have two options to modify the robot controller code using either a text based programming interface or with a graphical user interface programming tool.

For text based programming, teams start with the default code and make their own alterations to this existing code. The *Microchip Technologies* MPLAB Integrated Development Environment (IDE) is provided as the software interface to write, edit and debug robot controller programs in the ANSI C programming language. MPLAB IDE uses the MPLAB C18 compiler, and both of these pieces of software are supplied in the 2007 FRC Kit of Parts. Compiled code is downloaded to the Robot Controller using the *IFI* Loader software (supplied in the 2007 FRC Kit of Parts and downloadable from www.ifirobotics.com/rc.shtml).

FIRST volunteer and NASA Jet Propulsion Lab engineer Kevin Watson continues to offer a very useful library (supported with full documentation) for programmers working in the MPLAB IDE format. Libraries for most of the sensors provided in the 2007 Kit of Parts, including the CMUCam2 Vision Sensor, gyro, accelerometer, and the Hall-effect sensors, are available at www.kevin.org/frc.

A graphical user interface (GUI) programming tool has been developed by *intelitek* and customized for the 2007 FIRST Robotics Competition. EasyC PRO™ is a GUI programming tool that can be downloaded by 2007 FRC teams at www.intelitekdownloads.com/easyCPRO.   The software will be available for download at 12:00 PM EST on Saturday, January 06, 2007. An easyC PRO Resource CD has been provided in the 2007 FRC Kit of Parts. This software, which includes code for sensors contained in the 2007 Kit of Parts, can be used to create, debug, compile and upload code to the FRC Robot Controller and the Vex controller. The Microchip C18 compiler is now included with easyC PRO for all FRC teams. Technical support for this software is hosted by the Chief Delphi Forums and is available at www.chiefdelphi.com/forums/forumdisplay.php?f=153. Please monitor this page for updates to the program during the 2007 FRC season. Intelitek is providing one license of easyC PRO free to all teams with the opportunity to purchase additional seats at http//shop.intelitek.com. Once the software has been downloaded, the user will have 7 days to register their software. The main contact for each team will receive an email from intelitek with their license key for the software on Monday, January 08, 2007.

An additional piece of software is provided by *National Instrument,* LabVIEW 8, is graphics based software for testing, measurement and control. This software, which is used external to the robot, can help teams learn about sensors, test electronics, and monitor output from the Operator Interface. In association with the Worcester Polytechnic Institute (WPI), *National Instruments* has developed an **FRC Robot Modeling and Simulation Toolkit** for LabVIEW. This robot modeling and simulation toolkit allows teams to prototype, develop, and test robot code on the FRC Robot Controller *without* the need of a robot. By using LabVIEW and the National Instruments USB-6009 DAQ device (not supplied in the Kit of Parts) - attached to an FRC Robot Controller - to simulate the characteristics of a chosen robot design without the completed robot.

Also available are sample applications for LabVIEW 8 from *NI*'s Danny Diaz and *DEKA*'s Russ Beavis have created including:

- CMUcam2 GUI – virtual control panel for the CMUCam2 Vision Sensor
- Motor simulation – Virtual instrument for simulating motor performance
- Dashboard demo - Virtual instrument to process/display data from the Operator Interface dashboard
- Motor tester – virtual instrument for testing motors using the NI USB-6008 Data Acquisition module (available for purchase from *NI*)
- Motor tester – virtual instrument for testing motors without using the NI USB-6008 Data Acquisition module

These applications (and their documentation), technical assistance, and a discussion forum on the LabVIEW 8 software are available at www.chiefdelphi.com/forums/forumdisplay.php?f=149 .

This software suite is a significant advancement in the software provided to teams participating in the 2007 FIRST Robotics Competition. Teams are urged to use this software to further their understanding of and control of the components of an FRC robot. A free and open discussion of software developments is encouraged through the use of the listed forums, as well as other forms of team-to-team contact.