

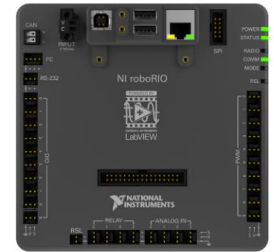
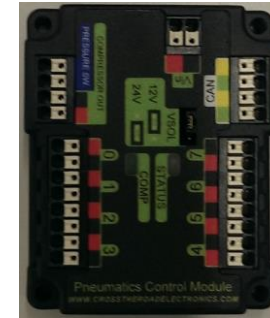
MD ROBOTICS 2016-2017



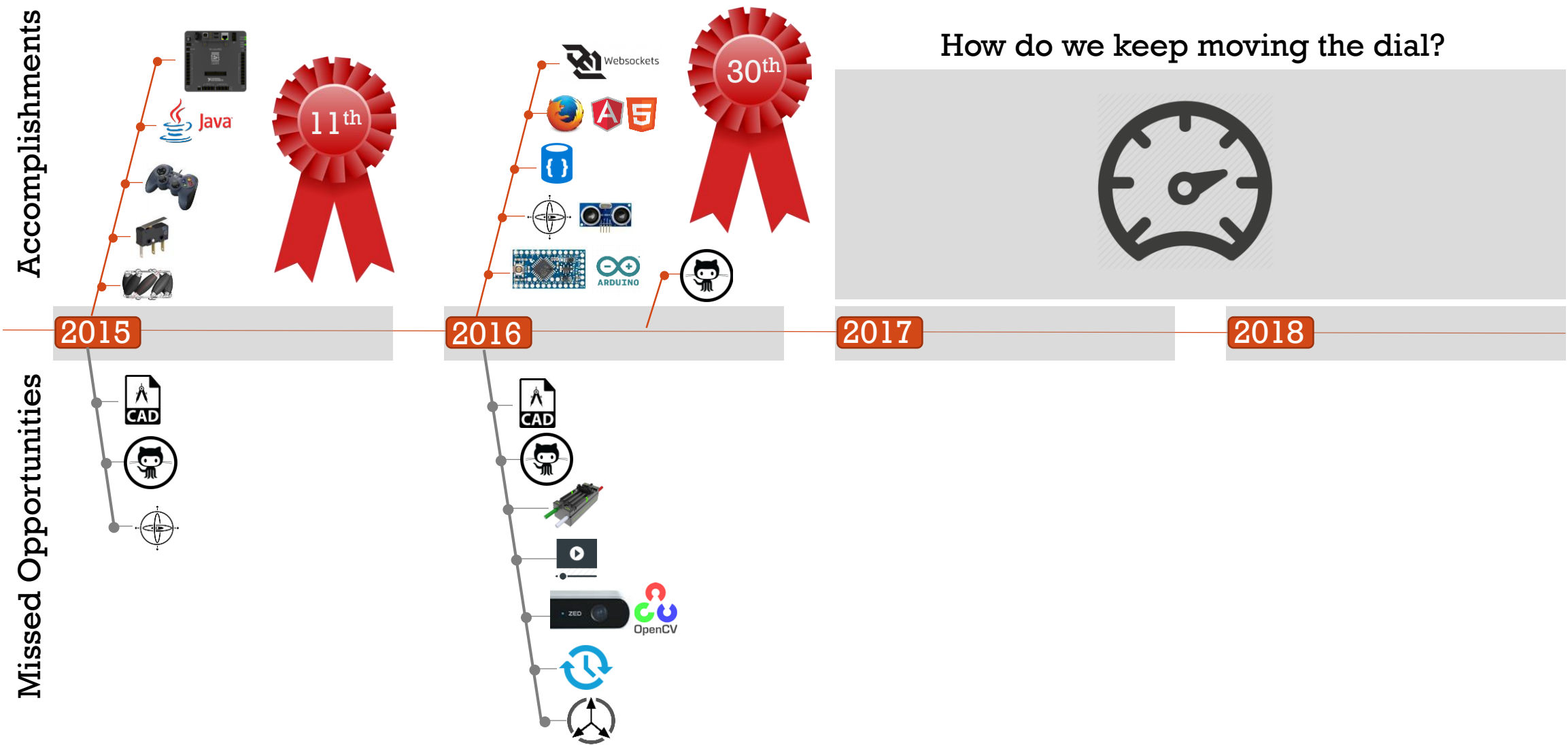
Control System
August 2016

WHAT IS THE CONTROL SYSTEM?

- Documented at <https://wpilib.screenstepslive.com/s/4485>
- Includes:
 - RoboRio / robot code
 - Driver station
 - Operator Interface / joystick
 - Operator console peripherals (hardware & software)
 - Actuators
 - Motors
 - Pneumatics
 - Telemetry / sensors
 - Cameras



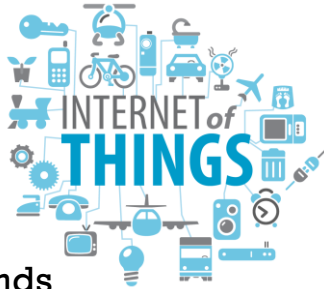
ACCOMPLISHMENTS TO DATE



SOFTWARE DEVELOPMENT OPPORTUNITIES

Embedded Computing

- Autonomous operation
 - Robot logic
 - Telemetry
 - PID controllers
 - Talon SRX
 - State machines
 - Complex commands
 - Multi-threaded concurrent operations
 - Scheduler
 - Robot configuration
- Improved driving control
 - Adapt to driving system
 - Gyroscope and accelerometer enhanced navigation
- Simulation environment
 - Enable faster development
- Version control
 - Reuse of components from prior years



UX / Human Interface

- Enhanced Driver station
 - More useful robot to driver feedback
 - Visualization through HTML5/Angular/JavaScript
 - Adaptive console
 - Support for more complex interface controls
 - Improved robot configuration
- Real-time robot communications via Websockets
- Video Streaming
 - Compressed video streaming compatible with 7mbps bandwidth limitation



SIMPLE



DELIGHTFUL



WELL-CRAFTED

Robot Vision

- Video / Image processing
 - Pattern recognition
 - Augmented Reality
 - Target acquisition & tracking
 - Goal
 - boulder
 - Score confirmation
 - Navigational assistance
 - Autonomous mode assistance
 - Embedded co-processors



OPPORTUNITIES – EMBEDDED SYSTEMS

- Mastering Talon SRX
 - Motor speed controller with embedded feedback
- Make more use of advance Robot features
 - PID
 - Command Scheduling
- RoboRio Connector shield (RJ45?) for sensors
- LIDAR
- Better instrumentation
- Improve Arduino capability
- Robot Simulation



Ideal for someone who wants

- Learn Java
- Learn how to control a robot
- Learn about control systems
- Learn advanced network technologies like WebSockets & DNS-SD
- Learn how to do things with Arduino



Wish List Item

LIDAR

WIRING CONNECTOR KIT



OPPORTUNITIES – UI/UX

- Improve / mature MDConsole features
 - Make easier to use
 - Make more intuitive
 - Add Analytics / Visualization
 - Make console adaptive / situational behavior
- Embed video streaming viewer
- Improve Robot configuration
 - RoboRio and Arduinos
- Database retrieve and selective rerun recorded sessions
- Competition Checklist tab
- Scouting app



Ideal for someone who wants

- Learn JavaScript
- Learn modern web development like Angular, Material Design, NoSQL
- Develop UX Design skills
- Learn advanced network technologies like WebSockets & DNS-SD (Bonjour)



Wish List Item
Large touch screen



OPPORTUNITIES – ROBOT VISION

- Implement basic robot vision
 - Object discovery
 - Object tracking
 - WebCam & Stereoscopic
- WebSocket event exchange with RoboRio and MDConsole
- High performance real-time video streaming for operator assist
- Simple augmented reality



Ideal for someone who wants

- Learn robot vision algorithms
 - Object identification
 - Object tracking
- Learn about video streaming
- Learn GPU programming
- Learn C++ & Java



Wish List Item

NVidia Jetson TX1
Automobile Backup
Camera module
IP streaming camera



OPPORTUNITIES – TEAM IMPROVEMENTS



- Knowledge base
 - How To Guides to on board team members
 - Capture knowledge already learned
 - Articles explaining complex pieces
- Version control

Ideal for someone who wants

- To be a leader
- To build a strong team
- To improve year over year
- To compete at the national level



Wish List Item
Student mentors

