MidKnight U: 10/23/17

Programming

THE MIDKNIGHT INVENTORS

Programming Directors

OVERVIEW

- What is the Programming Subteam?
- Season Timeline
- Information and Tools
- Java Classes

PROGRAMMING SUBTEAM

WHAT WE DO

- Our subteam writes the ‘instructions’ that the robot follows.
- We write our robot code in Java, but FRC can also use C++ / LabVIEW

TWO PARTS TO THE ROBOT GAME

- First 15 Seconds: Autonomous Period
  - Pre-programmed Instructions
  - Robot uses sensors as input
- 2 Minutes: Teleoperated
  - Controlled by Driver / Operator using controllers

PROGRAMMING INFORMATION

BACKGROUND

- Java is our main language
- Eclipse is our standard compiler
- We create multiple Autonomous programs for the robot
  - I.e. the robot can start in different positions or accomplish different tasks within the game challenge

TOOLS

- WPILib
- GRIP
- Git/GitHub

SEASON TIMELINE

PRE-SEASON

- ❑ Learn Java and WPILib API
- ❑ Set up Git and Github
- ❑ Learn about FRC sensors & electronic components
- ❑ Practice programming previous robots

SEASON TIMELINE

WEEKS 1 AND 2

- ❑ Create Robot base project
- ❑ Start implementing subsystems and commands
- ❑ Integration with Build, CAD, and electrical subteams
- ❑ Begin framework for drive base code
- ❑ Begin planning Autonomous programs
  - ❑ What actions will the robot perform? What sensors will tell it about the field's status?
  - ❑ Typically, we use a camera for vision tracking & ultrasonic sensors

SEASON TIMELINE

WEEKS 3 AND 4

- ❑ Complete Subsystems
- ❑ Complete code for the drive base
  - ❑ Drivers' Practice can begin with one of our robots
- ❑ Begin Autonomous commands
- ❑ Autonomous iterations
  - ❑ With sensors and electrical systems complete on the physical robot, we can integrate these into both Autonomous and Teleoperated code

SEASON TIMELINE

WEEKS 5 AND 6

- ❑ Iterate and improve on Autonomous code
- ❑ Vision
  - ❑ GRIP vision processing (if applicable)
  - ❑ Other work with the field's vision targets?
- ❑ Work with drive team to finish control mapping and iterate on existing teleoperated code
- ❑ Improve Drive Code
  - ❑ Motion Profiling
  - ❑ PID Loops

SEASON TIMELINE

AFTER STOP BUILD DAY

- ❑ Continue work on autonomous & vision targeting using 2nd robot
- ❑ Driver practice / autonomous testing for consistency
- ❑ Improve existing code for:
  - ❑ Stability
  - ❑ Readability
  - ❑ Accuracy
  - ❑ Precision

TOOLS WE USE

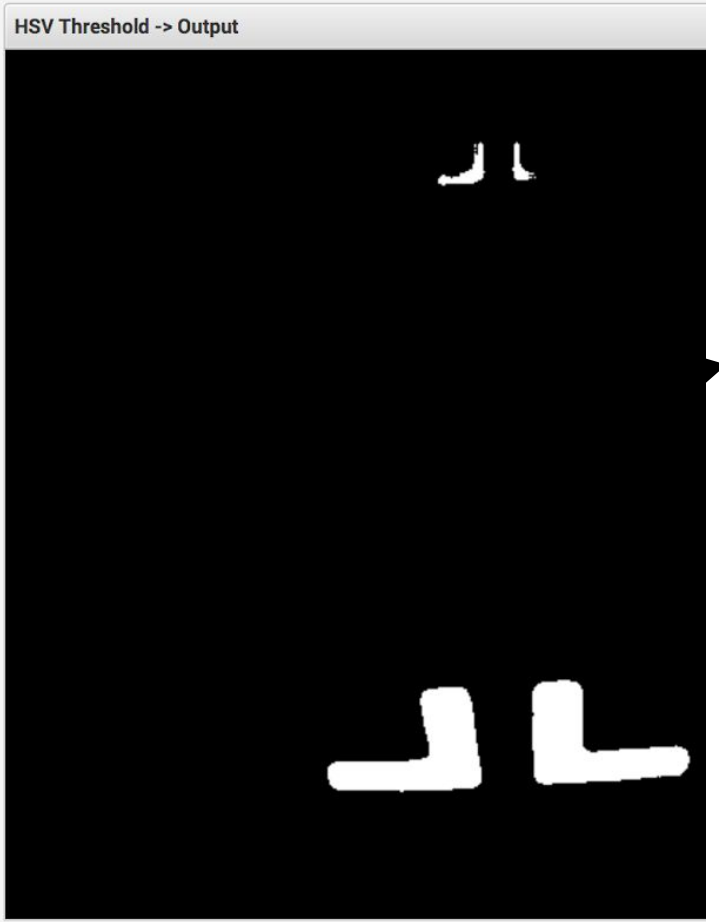
WPILIB

- FIRST-Provided Library for interacting with the robot
- Provides pre-written code for using sensors, encoders & FRC game field communication
- Less code = better
  - Keeps with our overall team goal of simplicity
- Large online community to help with issues
  - The FIRST community is always available to help out!

TOOLS WE USE

GRIP

- Vision Processing
- Object Detection and tracking
- Useful in autonomous or for precise goal lineup in teleoperated period
  - Positioning the robot for an action
  - Knowing when the robot is lined up with a goal
  - Markings on game objects



Vision Tracking (GRIP)

TOOLS WE USE

GIT/GITHUB

- Version Control
  - Everyone can contribute to code!
  - Everyone has the most updated version
  - Allows a stable version to always be ready
  - GUI interface + built into eclipse
- “Google Drive - for code”
  - Allows us to share and collaborate on code while maintaining control of what’s on the robot
- *github.com/Team1923*

MOTION CODE

TELEOPERATED PERIOD

- Assign specific actions to buttons
- Driver and operator press buttons to make robot do actions as needed

DRIVING THE ROBOT

- Use encoders to measure wheel rotations and distance travelled instead of having to run motors for time
- Allows for more accuracy in measurement, especially during Autonomous

OUR RESOURCES

PROGRAMMING CLASSES

- Starting in November
- Meet Thursdays at 7:00 pm
- Learn Java with focus on its FRC Applications
  - No previous knowledge or experience required
  - Will be useful in High School classes too!
  - Don’t have to commit to Programming as your subteam (yet).

QUESTIONS?

CONTACT US:

The MidKnight Inventors

www.FIRSTrobotics1923.org