Raider Robotics Controls Notebook

2024-2025 - VEX High Stakes

Contents

Meeting Notes

Timestamp: [Date] - Author
Attending:

Meeting Goals

- Goals / Directives for the meeting

Discussion

Details of the meeting including resources used, implementation details, and meeting setup details.

Results

- Accomplishments of the meeting

Action Items

- Todos for next meeting

Tuesday Strategy Meeting

Timestamp: [09/17/2024] - [Luke Gagnon, Leigh Goetsch]
Attending: Peter Wolfgramm, Andrew Needham, Miles Trompeter, Landon Van Mersbergen

Meeting Goals

- Tools for developing robot strategies
- Investigate virtual robot simulation options

Discussion

Here is an option for virtual robot simulation recently posted to the vex forums. I think looking at options for virtual robot simulation for controls would be a good idea. bowlerstudio

Here is the pygame repo for testing robot strategies: repo

Wednesday Integration Meeting

Timestamp: [09/18/2024] - Luke Gagnon, Leigh Goetsch
Attending:

Meeting Goals

- Finish Friday task
- Assemble and test odom systems

Discussion

We will be finishing the challenge you were given on Friday: program a robot to move autonomously across the field as creatively as possible

Add a copy of the auton program to a text file in the "autons" folder. Please put your name and auton file name here when done!! :D

Results

name(s)	file name

Table 1: Auton files

Tuesday Strategy Meeting

Timestamp: [09/24/2024] - Luke Gagnon, Leigh Goetsch
Attending:

Meeting Goals

- Finish the STEM Center Canvas course for STEM Center Access
- Control Theory: Tracking Robot Position
- Strategy Formulation: Analyzing the Game and Field

Discussion

Please complete the STEM Center Canvas course for STEM Center Access. This will give you STEM Center access for the rest of the year.

Here is the page on odomentry and tracking robot position from the Purdue VexU team

Youtube video series on odometry

For the strategy formulation, we will be analyzing the game and field. We will be putting a picture of the field on the board and discussing path planning and autonomous routines. Add any notes you have to the strat folder, please!!!

Results

- STEM Center Canvas course completed
- Watched youtube video series on odometry
- Analyzed the game and field

Monday Controls Group Meeting

Timestamp: [9/30/24] - Landon & Hunter
Attending:

Results

- Odometry pods are working and calculations appear to be accurate. More precise offset measurements will be needed to improve accuracy.
- Square root input curve on drive is working using voltage control.
- Voltage control allows motors to drive above max speed.
- Due to uneven friction, voltage control adds slight drift and may need to be removed.

Action Items

- SD card for differentiation between bots, images, odometer.
- Implementing path gen for usable auton paths in competition.

Friday Controls Group Accomplishments

Timestamp: [10/04/24] - Landon & Hunter
Attending:

Results

- Added control to toggle claw in op and autonomous control.
- Practiced autonomous routes with claw mechanisms.

Action Items

- Research pros tasks to run processes in parallel.
- Research odometry for autonomous routes.
- Plan autonomous routes for skills and competition.

Strategy Meeting - Project Updates

Timestamp: [10/08/2024] - Luke Gagnon, Leigh Goetsch
Attending: Peter Wolfgramm, Andrew Needham, Miles Trompeter, Landon Van Mersbergen

Meeting Goals

- Review progress on current project objectives
- Discuss next steps for each project area
- Identify any roadblocks or challenges
- Plan for future strategy meetings

Project Updates

The following is a summary of the progress made in each project area and the next steps planned for each group:

Leblib Path Planning

Group: Andrew, Peter, Salvin
Objective: Set up the Leblib path planning library and begin integrating it with autonomous navigation and odometry.
Plan:

- Successfully set up the path planning library on the development environment.
- Initial testing was not conducted yet; plan to test integration with the robot's autonomous systems and odometry tomorrow.

Next Steps:

- Tomorrow, test the library with the robot's autonomous functionalities and odometry data.
- Identify any adjustments or customizations needed for better integration.

Robot Communication

Group: Luke, Leigh, Miles
Objective: Establish a communication protocol between robots and test message reception.
Plan:

- Set up a basic test environment to verify correct message reception between robots.
- Began discussing the communication protocol for inter-robot messaging, focusing on what specific data needs to be shared.

Key Considerations for Communication Protocol:

- Location data: Essential for coordinating movements between robots.

- Object detection data: Could be useful in determining shared understanding of obstacles or objectives.
- Game state: Related to object detection, the state of the game (such as target detection or task progress) may need to be shared.
- Help signal: To allow one robot to request assistance from another if necessary.

Next Steps:

- Finalize the communication protocol, specifying the exact data types to be transmitted.
- Implement and test the protocol between the robots.

Task Abstraction

Group: Not assigned yet
Objective: Develop a task management system for handling asynchronous tasks during autonomous robot operation.
Plan:

- Research two potential approaches: creating a custom task system vs. leveraging the PROS library's task management system.
- Determine how events can be triggered within the system to better manage robot actions.

Next Steps:

- Research both options: creating a custom task system vs. leveraging PROS.
- Determine how events can be triggered within the system to better manage robot actions.

Web Dashboard

Status: Paused / Peripheral
Objective: Update and integrate the internal path planning interface to export JSON data.
Plan:

- The web dashboard interface, developed a few years ago, needs updates to ensure compatibility with our current system.
- Initial review of legacy code has not yet been conducted.

Next Steps:

- Review the legacy code to assess the current implementation.
- Ensure the dashboard can export JSON data for use in other areas of the project.

Website Maintenance

Group: Salvin, Andy
Objective: Modernize the website and update the content.
Plan:

- The website is outdated and has dependency issues with npm, preventing updates in its current state.
- Initial steps will involve resolving these dependency issues to make the site functional in modern environments.

Content Updates Considered:

- Sponsor list.
- Links to relevant GitHub repositories (pneumatic reverse engineering, senior design projects, web dashboard, website).
- Past engineering notebooks, Onshape designs (past robots), and updated tournament statistics.
- Contact information update.

Next Steps:

- Fix the dependency issues.
- Begin content updates as discussed, starting with sponsor lists and repository links.

Wednesday Integration Meeting

Timestamp: [10/09/2024] - Luke Gagnon, Leigh Goetsch
Attending: Miles,

Meeting Goals

- Implement a simple program for exploring VEXlink communication

Discussion

Using

Results

- Wrote a simple program to test VEXlink communication
- We can send signals, but not with remotes connected
- Wrote some basic tests to try to get to connected

Tuesday Strategy Meeting

Timestamp: [10/22/2024] - Luke Gagnon, Leigh Goetsch
Attending: Peter Wolfgramm, Andrew Needham, Miles Trompeter

Meeting Goals

- Try to figure out the reason behind VEXlink issues
- VEXlink documentation reading
- Get VEX AI team members GHOST project setup and running

Discussion

- VEXlink Docs
- Excerpts:
  - When multiple radios are connected to a V5 brain, the radio in the highest numbered smart port will be used for the controller VEXnet connection, to avoid errors
  - Data Rate:
    * Maximum data rate for manager to worker robot is 1040 bytes/second.
    * Maximum data rate for worker to manager robot is 520 bytes/second.

Results

- VEXlink issues are likely due to the order of the controller and the VEXlink device ports

Action Items

VEXU Team Tasks

- VEXlink
  Leigh, Miles
- LebLib
  Andrew

VEX AI Team Tasks

- Nano -> V5 microcontroller communication:
  - How is the nano and the V5 microcontroller working together?
  - What is being processed on what?
  - Create a simple program to send a message from one to the other
- ROS2 serial robot messaging
  - How is ROS architected?
  - How is this useful in our use-case?
  - Write a publisher and subscriber script (or run the one in GHOST's example)

- robot -> robot messaging (VEXlink)
  - What messages should robots send each other
  - What message protocol do robotic systems usually use?
  - What message protocol should we use?
  - Use VEXlink PROs API to write a simple program to send a message from one robot to another.
- Simulation - GHOST
  Evan, Salvin, Leigh
  - The sim software that GHOST uses is called Gazebo Sim
  - The python that the bash file ./scripts/launch_sim.sh runs can be found at 04_Sim/ghost_sim/launch/
  - There is a typo that causes the world to not load in the sim env, will post the fix later tonight.
  - What information can the sim env store?
  - What is the filetype of the world and the model files?
- Path planning - GHOST
  - GHOST uses https://web.casadi.org/ for path planning
  - What does this library do?
  - What are the input and outputs for their algorithm?
- MSOE Senior Design - Adversarial Strategy VEX Robot Program
  - This is a senior design project from two years ago using RL
  - If you are itching for more project setup, load up this project
  - How does this project represent a robot?
  - What information does the robot store?
  - How does the robot choose actions?

Specific People:

- Nano Setup
  Evan, Salvin
  - Try following the instructions in this repo to setup your nano and run the example code
- Rosie Newbie
  Andrew
  - Go to the AI Club Learning Tree and follow the instructions to practice requesting rosie and running jobs
  - I will have some files for you in the next couple days for this

Wednesday Controls Group Accomplishments

Timestamp: [10/23/24] - Luke Gagnon
Attending: Miles, Gideon

Discussion

port maps:

- left drive: 11, 12, 13
- right drive: 14, 15, 16
- tandem motor: 17, 18
- solo motor: 19

Results

- Library Research project (Luke)
  - Continued investigation of pros vs. custom libraries
- Main Robot project (Luke)
  - Started getting code set up for the current robot project
- Vex Link project (Miles, Gideon)
  - Continued research for vex link for use in Vex AI

Action Items

- Library Research project: Continue to investigate pros vs. custom libraries
  Luke
- Main Robot project: Do whatever design needs
  Luke
- Vex Link project: Continue vex link work
  Miles, Gideon

Friday Controls Group Accomplishments

Timestamp: 10/25/24 - Luke Gagnon
Attending:

Results

- Main Robot project (Luke)
  - Fixed some problems with the current robot project
  - Got pneumatics working on the current robot
  - Looked into setting up odom

Action Items

- All project
  - Touch base with everyone to see what's happening with teams and members who have been busy and might not have been at all meetings

Friday Controls Group LemLib Accomplishments

Timestamp: 11/08/24 - Andrew Needham
Attending:

Results

- LemLib (Andrew)
  - Figured out the old version of LemLib was causing problems when calculating robot position
  - Created a new PROS project with the latest version of LemLib which worked correctly
  - Created constants to initialize EZTemplate and LemLib robot configurations **LemLib Test Project**

```
const vector<int> leftMotorPorts = {-5,8,-9};
const vector<int> rightMotorPorts = {-3,4,-11};
const int motorRPM = 600;
const pros::motor_gearset_e_t motorGearSet =
    pros::motor_gearset_e_t::E_MOTOR_GEAR_600;
const int imuPort = 16;
const float driveWheelDiameter = 3.25;
const float trackingWheelDiameter = 2;
const float driveRPM = 360;
const float driveTrackWidth = 10.75;
const float verticalTrackingWheelOffset = 1.625;
const float horizontalTrackingWheelOffset = 2.75;
const int verticalEncoderPortTop = 3;
const int verticalEncoderPortBottom = 4;
const int horizontalEncoderPortTop = 2;
const int horizontalEncoderPortBottom = 1;
```

  - Created a PROS task to control the claw without interrupting the main leftMotorPorts **LemLib Test Project**

```
bool clawOn = false;
void toggleClaw(){
pros::Task claw_task([&]() {
        if(clawOn){
            Claw2.set_value(0);
            pros::delay(100);
            Claw1.set_value(0);
        }else{
            Claw1.set_value(1);
            pros::delay(100);
            Claw2.set_value(1);
        }
        clawOn = !clawOn;
    });
}
```

Action Items

- All project
  - Continue development of the new PROS project OR update the current vex-base to new version of LemLib
  - Create a GitHub repo for the new project