Group 03: Project Update

Robot System Control for Automating Mosquito Microdissection

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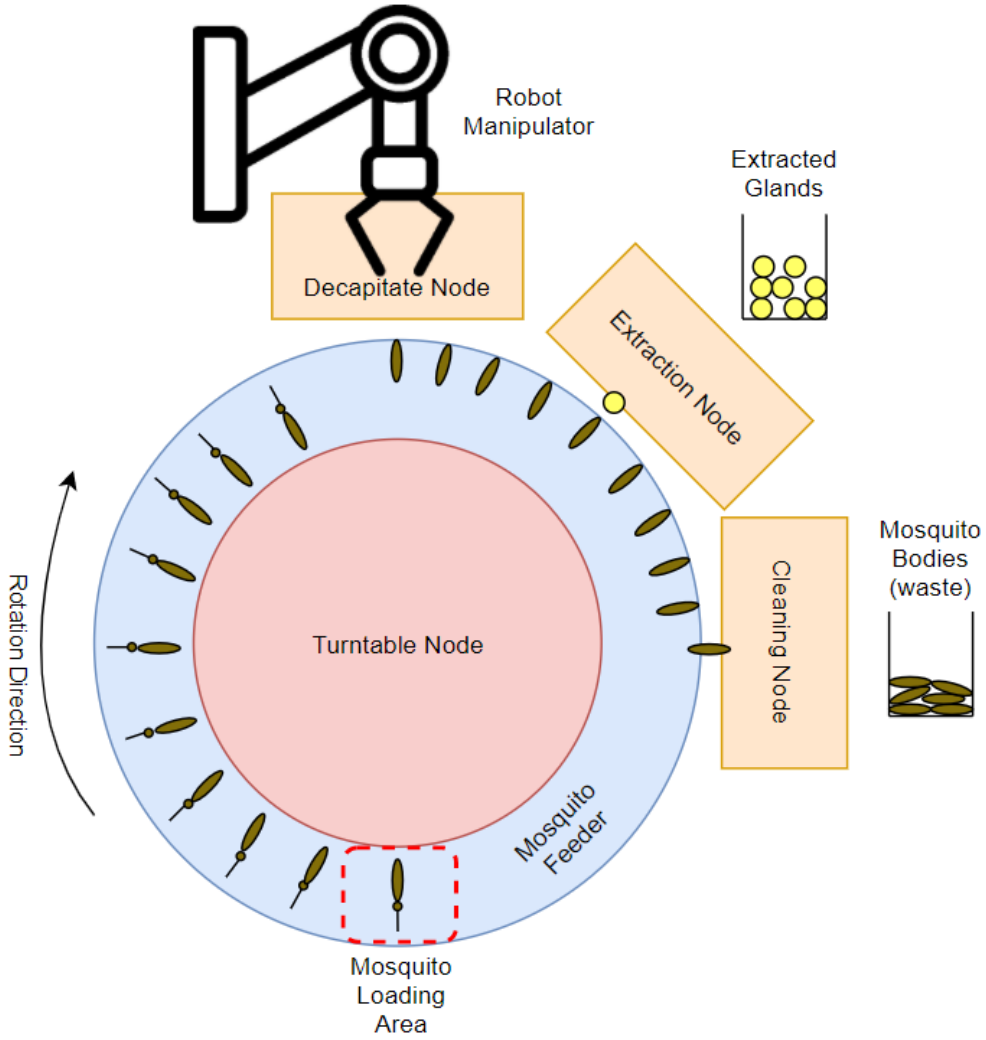
Project Summary



- **Problem:** Sanaria needs to increase the production rate of *Plasmodium falciparum* sporozoites (PfSPZ) from infected mosquito glands to help produce a promising malaria vaccine.
- **Overall Goal:** Automate the gland dissection process using a robot system. Our goal is to dissect 600 mosquitoes per hour (mph).
- **CIS Project Goal:** To develop a *robot system control algorithm* that introduces parallel processes, error checking, and error recovery.

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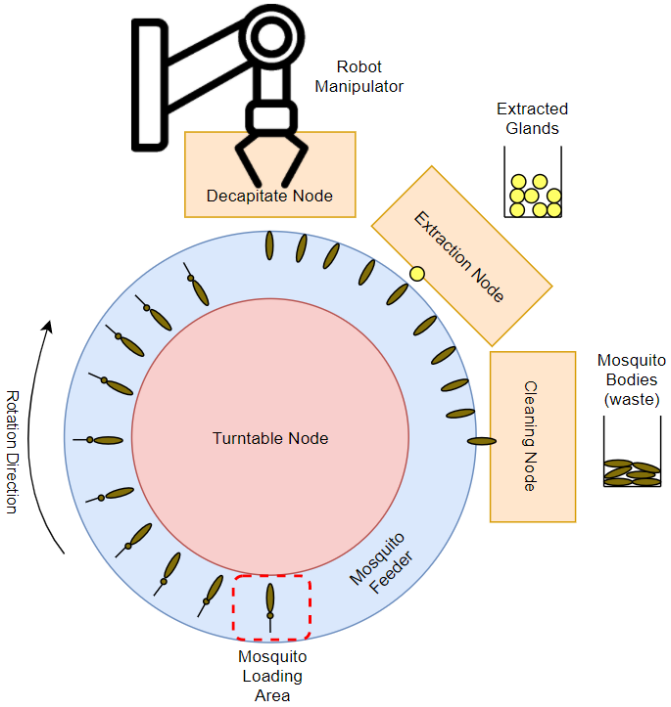
Accomplished Works



- Turntable Node
  - Fully Implemented.
  - Testing on physical system using manual calls to node.
- Mosquito Pick, Place, and Decapitate Node (MPPD)
  - Fully Implemented (with potential bugs).
  - Testing stalled (Arduino/Galil connection error -> followed up).
- Cleaning and Extraction Nodes
  - Partially Implemented
  - No testing

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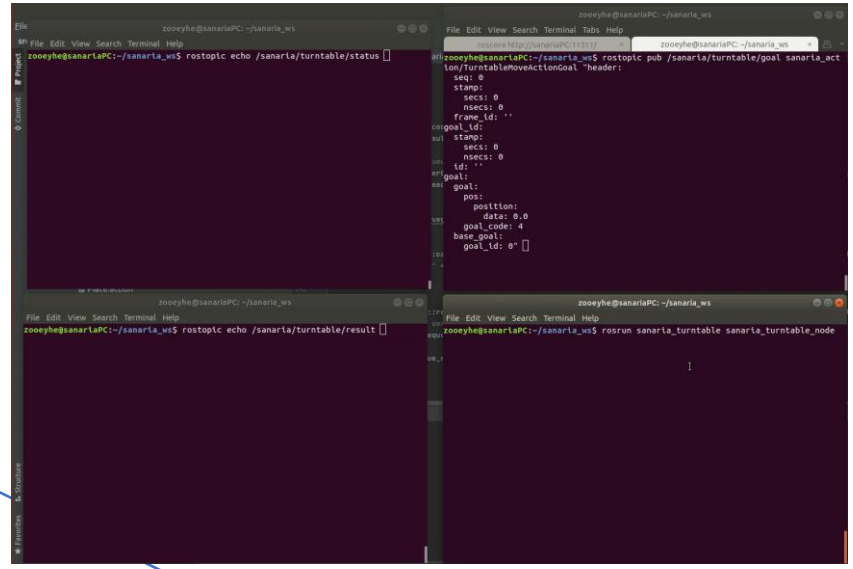
Turntable Node

MPPD Node
Caller ID: 1

Extraction Node
Caller ID: 2

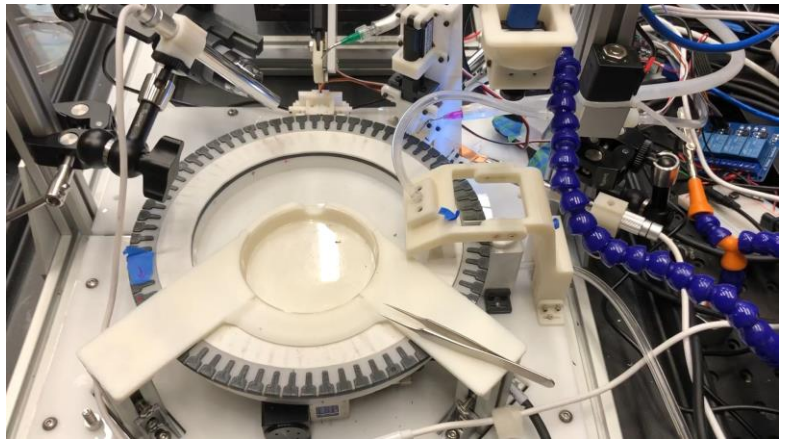
Cleaning Node

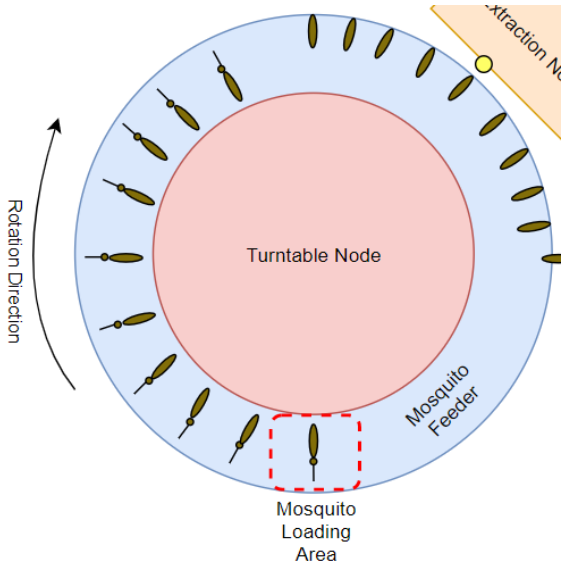


Turntable Node

Topic: turntable/goal
Message:
goal_code: INCREMENT
goal_id: 102931840
caller_id: 1

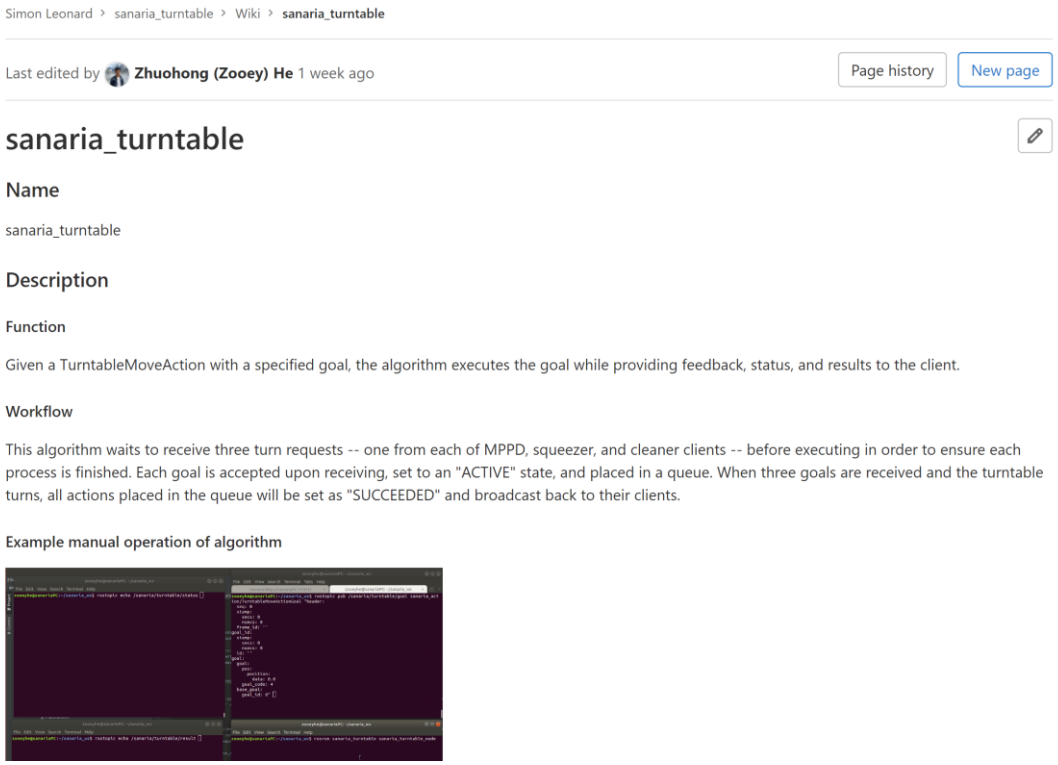
Hardware





Documentation

- Wiki page for turntable: https://git.lcsr.jhu.edu/sleonar7/sanaria_turntable/-/wikis/home



Simon Leonard › sanaria_turntable › Wiki › **sanaria_turntable**

Last edited by **Zhuohong (Zooey) He** 1 week ago

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sanaria_turntable

Name

sanaria_turntable

Description

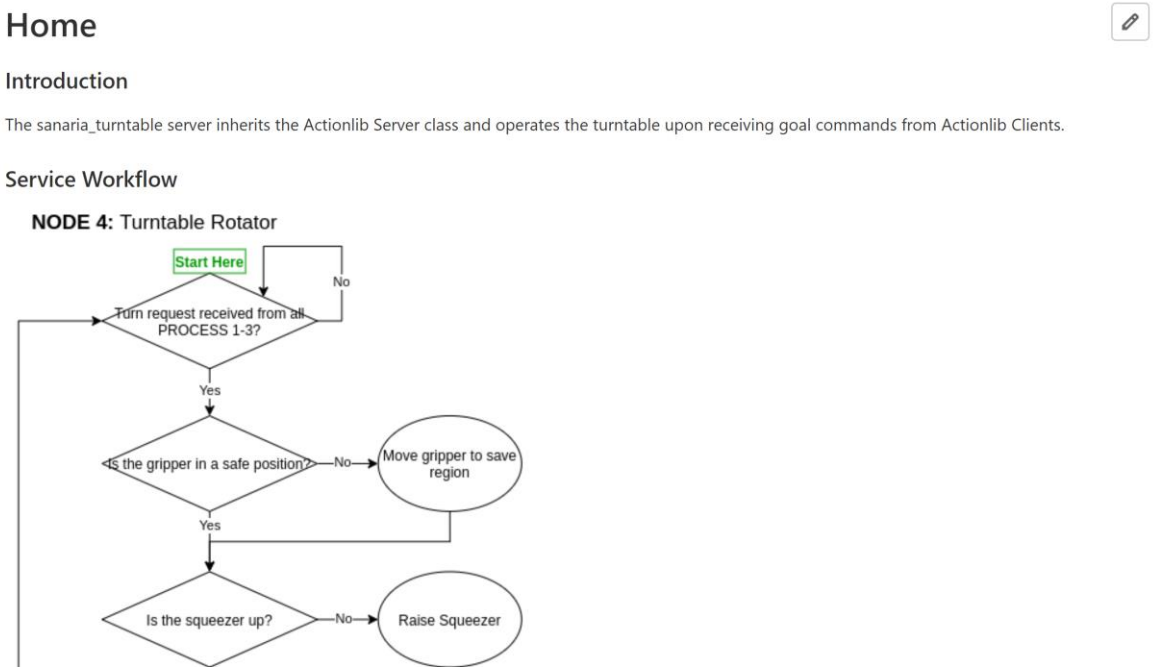
Function

Given a TurntableMoveAction with a specified goal, the algorithm executes the goal while providing feedback, status, and results to the client.

Workflow

This algorithm waits to receive three turn requests -- one from each of MPPD, squeezer, and cleaner clients -- before executing in order to ensure each process is finished. Each goal is accepted upon receiving, set to an "ACTIVE" state, and placed in a queue. When three goals are received and the turntable turns, all actions placed in the queue will be set as "SUCCEEDED" and broadcast back to their clients.

Example manual operation of algorithm



Home

Introduction

The sanaria_turntable server inherits the Actionlib Server class and operates the turntable upon receiving goal commands from Actionlib Clients.

Service Workflow

NODE 4: Turntable Rotator

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Timeline

- Currently about one week behind schedule
- On track to deliver minimum by 4/12, expected by 4/26

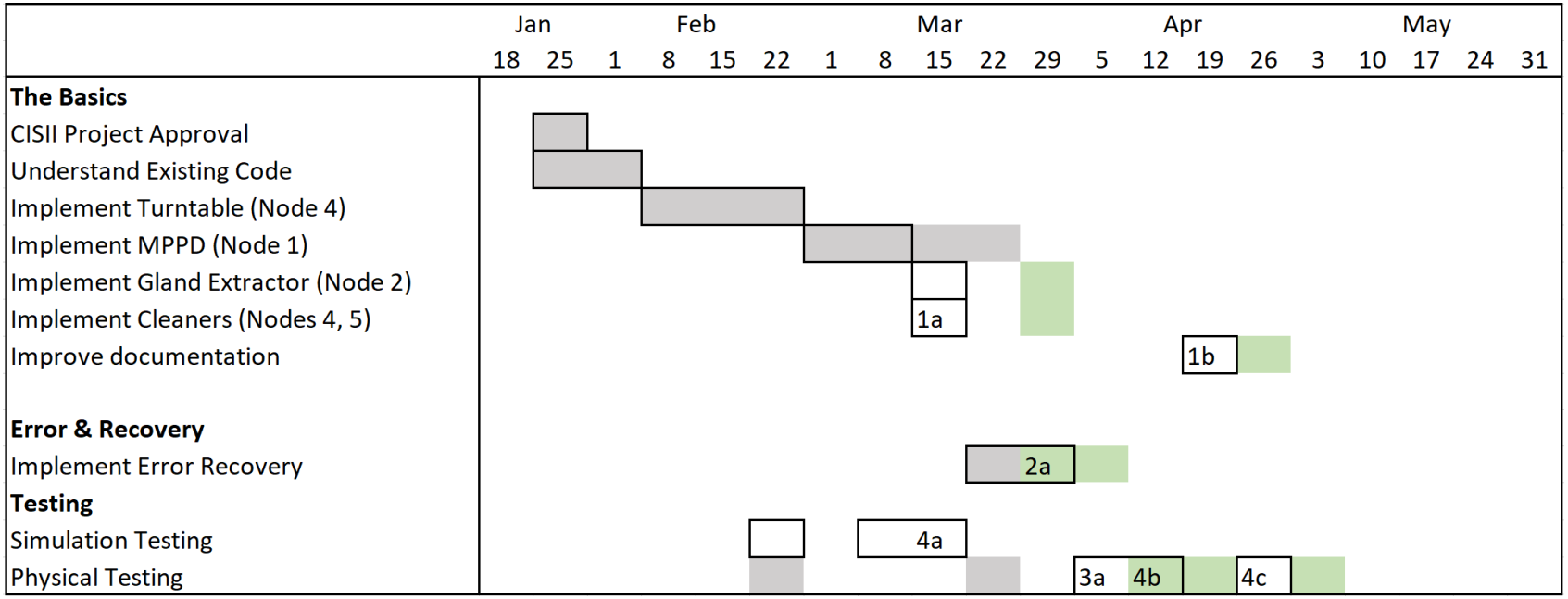

Figure: Proposed Timeline (Outline) vs Actual Timeline (Completed: Grey Shading, Expected: Green Shading)

Unforeseen Challenges

- **Turntable**: needed to go beyond simple Client/Server structure.
  - Solved: Inherited from base ROS client/server instead of simple client/server
- **MPPD**: physical testing had several challenges (Arduino), require help.
  - In progress: Meeting with Dr. Leonard tonight
- **Simulation Testing**: collaborator within lab busy with paper.
  - Cancelled: after conversation with mentor (Dr. Leonard)

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Dependency Updates

Dependency	Need	Status	Followup	Contingency Plan	Deadline
Swipe Access to Robot in Lab	Testing and Debugging during development	Resolved	N/A	Update and test through simulation instead	2/1/2021
Error CNN from Computer Vision team	Used for initiating some recovery paths in flowchart	Resolved (CV Algorithms provided, need testing)	Contact and provide details for CV team	Use placeholder services for error detection	3/22/2021
Server/Client Structure is Insufficient	We use this structure to ensure robust communication	Resolved	Understand more about ActionLib	Develop a node without ActionLib, or override functions to support needs.	3/22/2021
JHU Remains in semi-open state	Needed to conduct testing on the physical hardware	N/A	Be vigilant to changes, and keep an eye out for JHU COVID status	Update and test through simulation instead	4/20/2021
Simulator needs to be developed	The simulator is an important bridge to hardware testing	Cancelled (Wanze has been busy)	Follow-up with another lab member (Wanze Li) who is working on this	Create a cautious plan to move to the hardware immediately	3/15/2021

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Testing Plan

Level 1: Component Testing (On-going)

- Manually send goals to the component to observe reaction. Attempt to break / trick node.

Level 2: System Testing (April 5th to April 19th)

- Test the system on 100 mosquitoes.
- Determine throughput speed, success rate, and others.

Level 3: Error Simulation and Recovery

- Simulate errors by hard-coding error throws. Observe error recovery by system.

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Thank You

Questions?