

Thirty Gallon Robot Part II

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Sponsored by Dr. Michael Leverington, Mentored by Scooter Nowak



QR Code to the NaviBot
Systems Website

A Tour Guide Robot

The purpose of the Robot-Assisted Tour robot, also known as R.A.T., is to serve as a cost-effective teaching tool to gain interest in computer science, engineering, and the university as a whole. We at NaviBot Systems were tasked with creating a robot that could not only give tours of the Engineering Building on Northern Arizona University's campus, but navigate using Wi-Fi localization and be tracked with a GUI.



Figure 1. Phase II R.A.T.

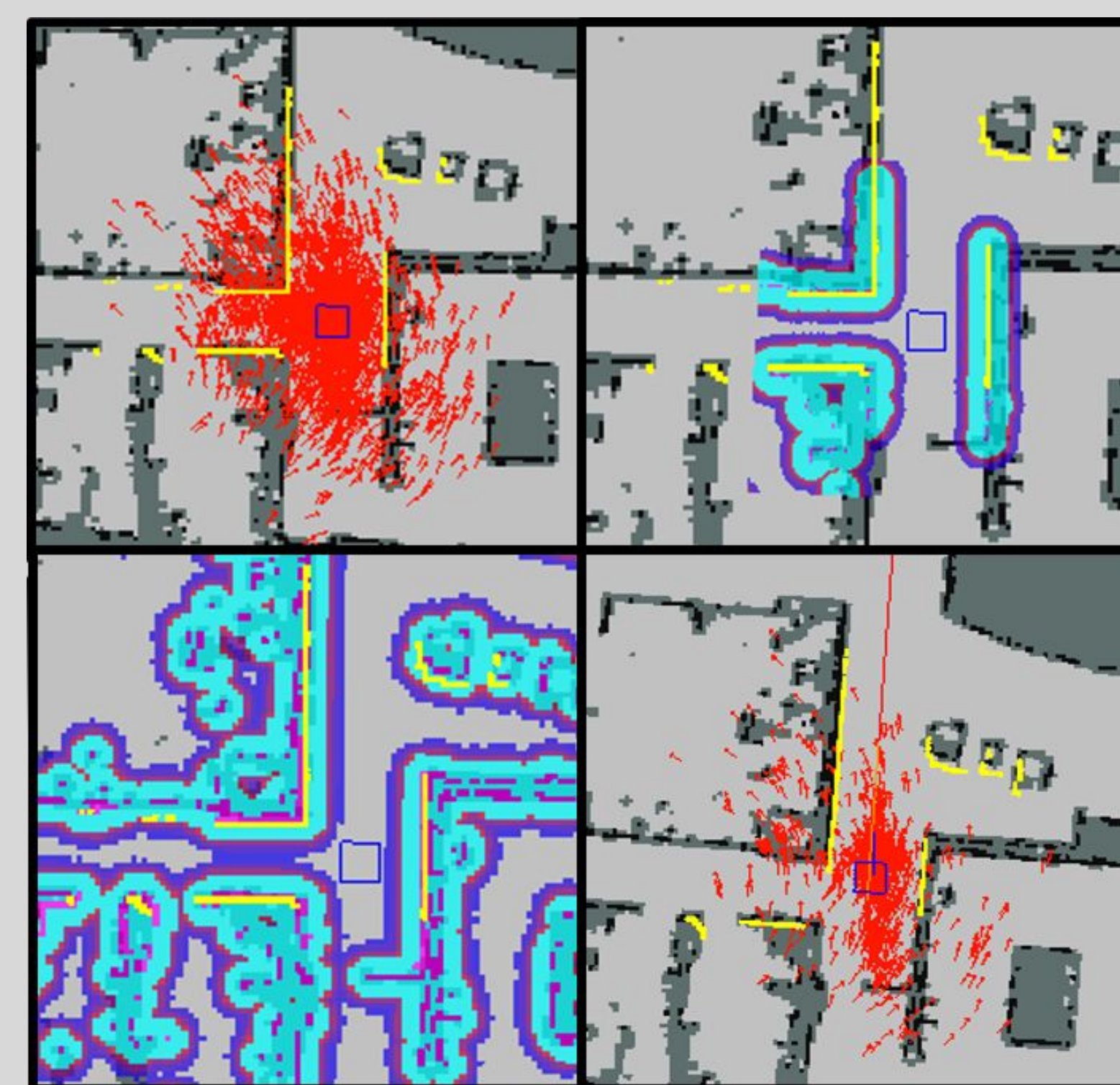


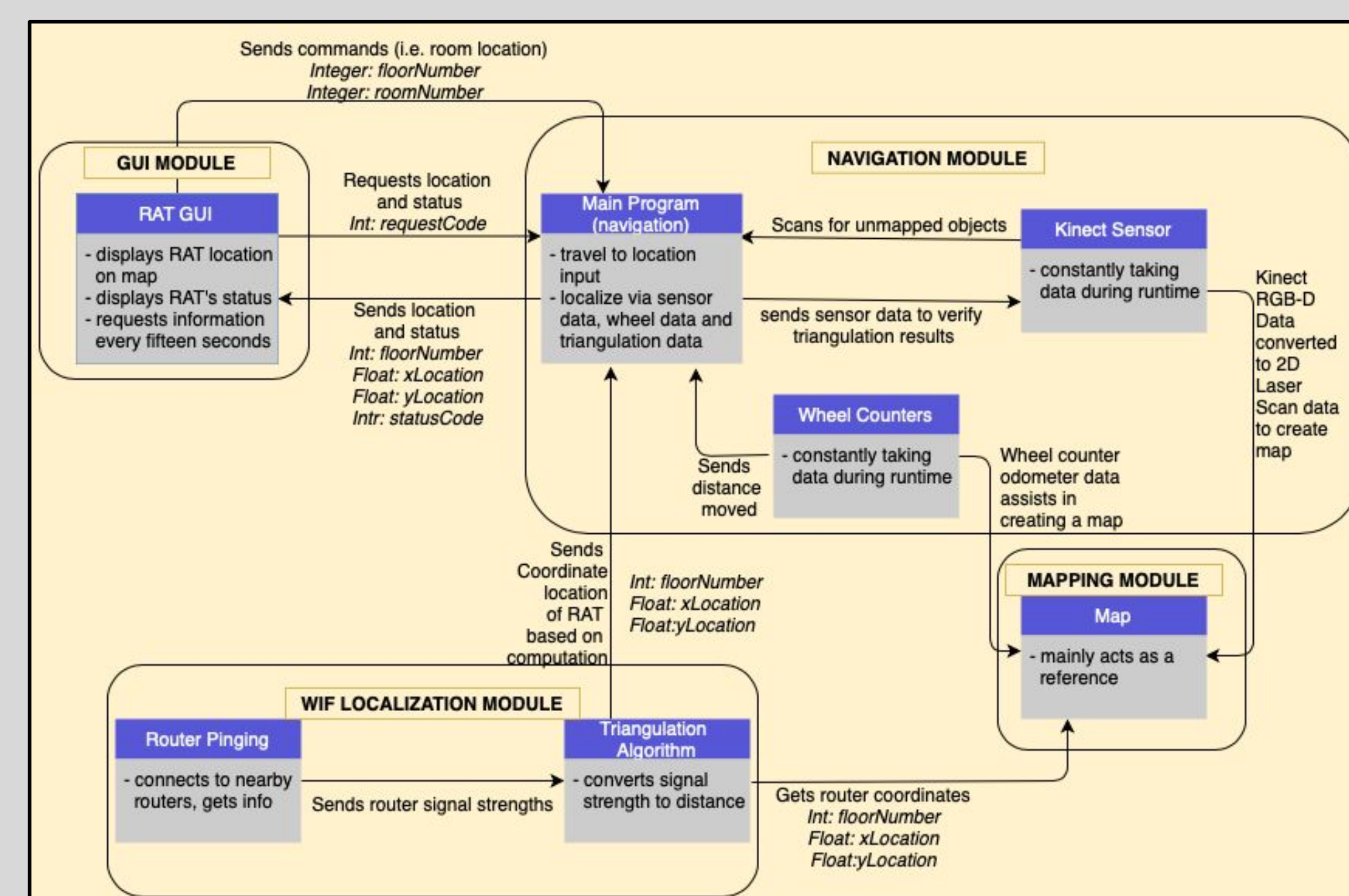
Figure 2. Local map creation

Solution Overview

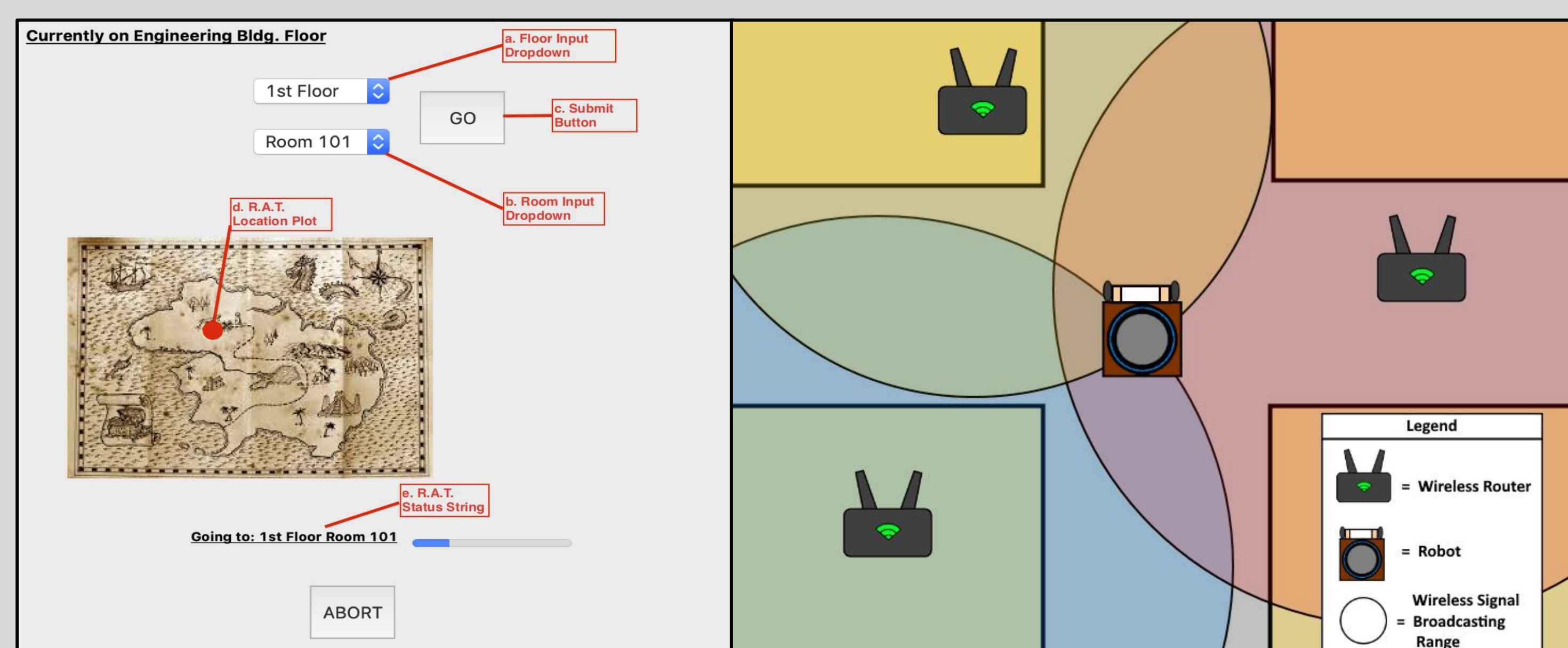
In cooperation with Dr. Leverington, NaviBot Systems proposed four modules necessary to meet his needs.

1. **GUI + Server Connection:** allows a user to interact with the robot, send commands, and read status information.
2. **Wi-Fi Localization:** allows R.A.T. to find itself anywhere in the building by scanning nearby routers and calculating an approximate distance they each may be from the robot.
3. **Mapping:** allows R.A.T. to understand the layout of the building, providing the base as to how the robot can navigate throughout each floor of the Engineering Building.
4. **Navigation:** allows R.A.T. to move itself appropriately throughout the building based upon instructions from the mapping module, providing the ability to avoid obstacles such as stairs, objects, and people.

Architecture

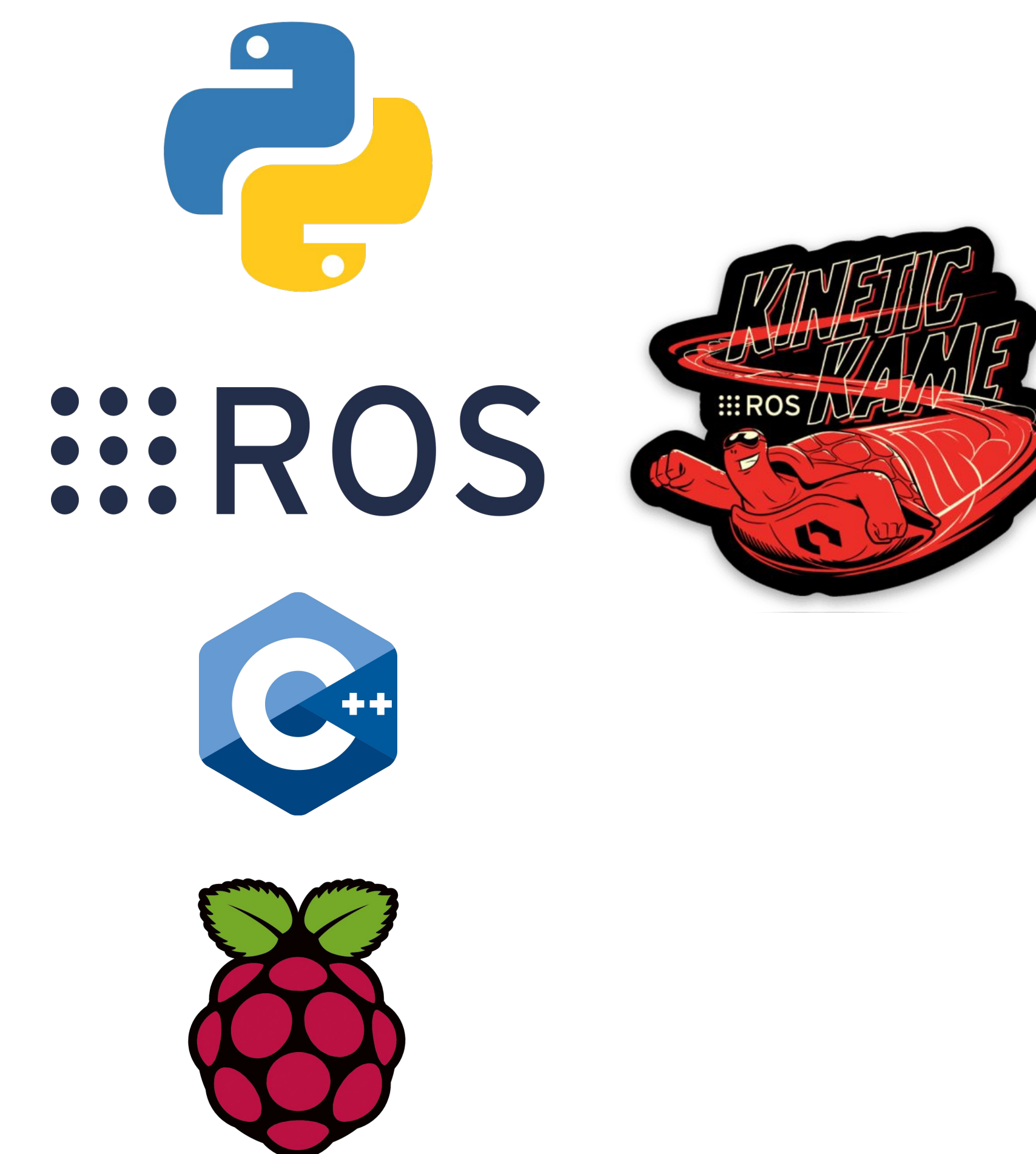


Key Features: The GUI and Wi-Fi Localization



Technologies

- Python
- ROS/Kinetic Kame
- C++
- Raspberry Pi



Challenges

Challenges	Resolutions
Hosting the GUI on a web server that also supports the connection to the Raspberry Pi	Pivoting to Django (Python web framework) and Heroku (cloud platform)
Wifi Signal to Distance equation and power/antenna gain values	Tighter outlier constraints and getting values by testing
Not having accurate control of the wheels	Rewriting the drive system to a PID control system

Future Work

In future iterations of this project, R.A.T. will be able to provide voiced tours of NAU's Engineering Building. That iteration will allow R.A.T. to navigate anywhere in the building, even utilizing an elevator with its very own robotic arm.