Individual Goal Statement of Will Chabala

Roles:

I will be taking lead of designing the navigation systems for the AuBi robot. I'll also be working on the drive system external communication subsystems due to their dependency on each other.

Navigation System Roll Outputs:

Team:

As leader of the navigation team, it is my responsibility to delegate certain tasks to my team members Trey Fallon and Sanem Leblebici. Trey is also taking charge of the drive system development. The navigation system and drive system are heavily dependent on each other. As such, I'll be working closely with Trey to ensure that the two subsystems can be integrated together.

Deliverables and Contributions

It is my responsibility to develop the navigation subsystem. This includes but isn't limited to validating operation of all the sensors, creating wiring schematics detailing how the components interface, and developing the navigation software.

The navigation system, in conjunction with the drive system, will satisfy the "Go to a location" and "Move in a pattern" goals of our project. This will require the robot to be able to localize its pose through various means, determine destination of travel, calculate the most efficient path, translate the path to motor commands, and update its location as it travels. All while avoiding obstacles and humans. The system will allow the robot to reacquire its location in the event it loses its position. Various sensors will enable this. The robot will use the RSSI value of various Wi-Fi routers on its network to determine a coarse localization. Then, a Lidar sensor will be able to determine its exact location. An IMU and wheel encoders will aid in maintaining the robot's dead-reckoned position. The robot's camera will also be used to detect obstacles outside of the Lidar's view. It's my responsibility to develop software and delegate software development to groupmates. which will integrate these sensors to satisfy our group goals.

Our team has been given a partially assembled robot which includes two motors and a mounting plate. This smaller robot will be used to demonstrate the navigation system's capabilities until the main robot is ready for integration. I'll be taking charge of the development of this "demobot".

Since I'll also be on the power and drive system teams, I'll be better able to ensure their compatibility with each other and the navigation system. If there are hardware or power requirements for the navigation system, I'll communicate said requirements to the respective groups.

The navigation system is key to the success of this project. I will ensure that its operations and capabilities will be delivered on-time to the group and that the relevant goals laid out in our proposal are met.
Weekly breakdown of SMART goals:

WEEK	Navigation		
NOV 1st 2021	Finalize wiring Schematics of demo bot and main robot. Conduct design review. Completed when design has been verified. Submit final parts list and order parts. Completed when parts have arrived	JAN 24TH 2022	Conduct SLAM navigation of AEC fourth floor. This will create a higher quality mapping of the floor for the robot to use. Deliverable will be mapping of 4th floor as indication of robot's performance.
NOV 8th 2021	Measure RSSI readings and compare with calculations. Present error, accuracy, and how this will affect subsystem operation.	JAN 31ST 2022	Demonstrate localization and obstacle avoidance capabilities of Demo bot. Includes RSSI coarse-localization capabilities. Will need to communicate with external comms. group on wi-fi routers.
NOV 15TH 2021	Create binary map of floor for simulation. Simulate Aubi on Nano inside floorplans. Demonstrate simulated path planning and obstacle avoidance capabilities to group. Conduct code review	FEB 7TH 2022	Transition navigation equipment from demo bot to final Aubi drive system. Make necessary software adjustments as needed. Will be achieved when all parts are properly installed.
THANKSGIVING	Break	FEB 14TH 2022	
NOV 29TH 2021	Connect Lidar system to Nano. Create Lidar maps at key locations on floor. Present range and error calculations and compare with calculations. Complete Construction of Demo bot. Included on system will be Jetson Nano, Lidar system, IMU, Motor Controller, Arduino Nanos, and camera system.	FEB 21TH 2022	Demonstrate localization and obstacle avoidance capabilities of Demo bot. New SLAM operation will be done to create new map.
DEC 6TH 2021		FEB 28TH 2022	Integrate Jetson Nano with other subsystems (Navigation, UI, etc) so that all software assigned to the nano can run simultaneously. Demonstrate software running with each other on Nano.
DEC 13TH 2021	Demonstrate powered movement of demo-bot. Simple forward, turning, and path following operations. Will be measured by how well robot succeeds in this task. Does robot veer when moving ? Does it misinterpret how far its traveled?	MARCH 7TH 2022	Integration of all systems, Completion of final design. Conduct testing of final robot.

		SPRING BREAK	
		MARCH 21TH 2022	