Motor Encoders → Motor Interfacing

GrovePi Ultrasonic Readings → Grove Ultrasonic Interfacing

Lego Ultrasonic Readings → Lego Ultrasonic Interfacing

IR Readings → IR Sensor Interfacing

IMU Data → IMU Interfacing

Motor Interfacing → (Motor Dta) → Driving/Propulsion

Grove Ultrasonic Interfacing → (Ultrasonic Data) → Wall/Corridor Sensing

Lego Ultrasonic Interfacing → (Ultrasonic Data) → Wall/Corridor Sensing

IR Sensor Interfacing → (IR Data) → Hazard Sensing

IMU Interfacing → (Magnet Data) → Magnet Sensing

IMU Interfacing → (Velocity Data) → Global Positioning

Hazard Sensing → (Hazard Existence) → Wall/Corridor Sensing

Magnet Sensing → Hazard Sensing

Driving/Propulsion → (Driving) → Turning/Proper Turning

Driving/Propulsion → (Driving) → Stay Between Walls

Wall/Corridor Sensing → (Relative Wall Data) → Wall/Corridor Processing

Wall/Corridor Sensing → (Relative Wall Data) → Maze Navigation

Hazard Sensing → (Hazard Data) → Hazard Processing

Hazard Processing → (Hazard Location and Type) → Hazard Output/Storage

Hazard Processing → (Hazard Data) → Maze Navigation

Global Positioning → (Global Location) → Hazard Processing

Global Positioning → (Global Location Data) → Maze Building

Wall/Corridor Processing → (Wall Data) → Turning/Proper Turning

Wall/Corridor Processing → (Wall Closeness) → Stay Between Walls

Wall/Corridor Processing → (Wall Data) → Maze Output to Navigational Instructions

Wall/Corridor Processing → (Path Exist.) → Maze Navigation

Maze Navigation → (Next Location to go to) → Maze Output to Navigational Instructions

Maze Navigation → (Actions Taken/Storage Data Structure) → Maze Building

Maze Output to Navigational Instructions → (Maze Instructions) → Turning/Proper Turning

Maze Building → (Final Map) → Maze Output

External Communication

Cargo Release?

Descriptions:

| Name | Description | Inputs | Outputs |
|---|---|---|---|
| Motor Interfacing | Handles Low level communication with motors, such as motor encoders, turning the motors at specific speeds or distances, etc. The most basic motor Code. Should be built first. | Motor Encoders | Motor Action Motor Encoder Data |
| Grove Ultrasonic Interfacing | Handles low level communication and error handling with the Grove Ultrasonic Sensor. Mainly just a read function that takes the part and outputs the reading from the sensor. | Surroundings | Grove Ultrasonic Readings Data |
| Lego Ultrasonic Interfacing | Handles low level communication and error handling with Lego Ultrasonic. Mainly just reading the sensor data. | Surroundings | Ultrasonic Readings Data |
| IR Sensor Interfacing | Low level communication and error handling with IR sensor. | Surroundings | IR Detection True or False |
| IMU Interfacing | Low level communication and error handling with IMU | Surroundings | Magnetic Field Intensity Data Velocity Data |
| Driving/Propulsion | Communicates with motor interfacing to engage the motors in potentially more complex maneuvers. Tells the motor interfacing what to do. Most driving code should at least go through here. | Motor Data Caller's Data | Driving the vehicle |
| Turning | Turn the robot appropriately. Must be able to do proper 90 degree turns and keep the robot between the walls as it changes corridors. | Driving Wall Data Maze Navigational Instructions | Turning Robot |
| Stay Between Walls | Keeps the robot from bumping into the walls while driving through corridors. Should implement basic control theory (as discussed in class). | Wall Closeness Driving State Corridor Data | Driving Robot |

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|---|---|---|---|
| Wall/Corridor Sensing | Interfacing between ultrasonic data and various processing. Determines whether or not a corridor is passable or not and sends that to processing to turn into usable data. | Ultrasonic Data<br>Hazard Existence | Wall/Corridor Data |
| Hazard Sensing | Senses hazards, outputs to hazard processing. | IR Data<br>Magnet Data | Hazard Existence<br>Hazard Data |
| Magnet Sensing | Determines whether or not there is an electromagnetic magnet threat nearby. | Magnet Data | Magnet Hazard Data |
| Global Positioning | Determines the current relative location of the GEARS based on velocity data from the IMU. Used to know where the GEARS is at any given moment. | Velocity Data | Global Location Data |
| Hazard Processing | Determines where and of what type the given hazard is. Turns into usable data for the final hazard outputting. | Global Location<br>Hazard Data | Hazard Location and Type |
| Wall/Corridor Processing | Takes the wall data from previous areas and turns it into usable formats for the various functions that require wall/corridor data | Relative Wall Data | Path/Corridor Existence<br>Wall Data<br>Wall Closeness |
| Maze Output to Navigational Instructions | Turns the output from Maze Navigation into actually usable navigational instructions for propulsion. Should be in simple to understand forms, likely through the use of a more complex data structure. Most complex part will be backtracking and the simplest part will be forward navigation. | Wall Data<br>Maze Navigation Decisions | Maze Instructions (where to go) |
| Maze Navigation | Responsible for actually navigating the maze. Will most likely implement DFS with Backtracking. At any given location, takes corridor existences and creates data structures to store the form of the maze. Also outputs the next direction/set of instructions for the GEARS to properly navigate the maze. Still need to determine if this is what handles backtracking. | Relative Wall Data<br>Hazard Data<br>Path Existence | Maze Navigation<br>Maze Data Structure (Graph) |

| | | | |
|---|---|---|---|
| Hazard Output | Outputs the location and type of each hazard. | Hazard Location and Type | Formal Hazard Output |
| Maze Building | Takes the data structure from maze navigation and rebuilds the maze into graphical output. Optionally returns the optimal path through the maze. | Global Location Data | Maze Data Structure |
| Maze Output | Outputs the graphical representation of the maze | Final Map | Final Map |
| Cargo Release? | If implemented, releases the cargo to the target group. | | |
| External Communication | Handles all external communication to make sure target groups understand the pacifistic nature of GEARS. | | Communication |