Software Structure & MQTT Topic Table

Ver. 1.1

# General Structure:

|  |  |
| --- | --- |
| Laptop | * Remote Control Module |
| Raspberry Pi | * MQTT Server * BSP\_CAN Module * Chassis PID Module |
| Jetson 1 | * Gun Control Module * AMCL Module * UBW Module * Inertial Navigation Module * Localization Module |
| Jetson 2 | * Strategy Module * Detection Module |

# Laptop:

|  |  |
| --- | --- |
| Remote Control Module | Remote control from laptop |
| Input:  Subscribe:   * # | Publish:   * /REMOTE/   Output:   * Display Robot Status |

# Raspberry Pi:

|  |  |
| --- | --- |
| BSP\_CAN Module | S-T PID and direct motor control |
| Input:  Subscribe:   * /REMOTE/ * /CONFIG/ | Publish:   * /MOTOR/   Output:   * [Motor Signal] |
| PID Module | Chassis & cradle head PID based on status inputs |
| Input:   * [Gun gyro input]   Subscribe:   * /CHASSIS\_SET/ * /CHASSIS\_STATUS/ * /GUN\_SET/ * /MOTOR/ | Publish:   * /CONFIG/   Output: |

# Jason 1:

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| --- | --- |
| Gun Control Module | Gun PID based on CV |
| Input:   * [Gun camera input]   Subscribe:   * /CHASSIS\_STATUS/ * /GUN\_STR/ | Publish:   * /GUN\_SET/   Output: |
| AMCL Module | Localization based on AMCL |
| Input:   * [LiDAR input]   Subscribe: | Publish:   * /LOCA\_A/   Output: |
| UBW Module | Localization based on UWB |
| Input:   * [UWB input]   Subscribe: | Publish:   * /LOCA\_U/   Output: |
| Inertial Navigation Module | Localization based on inertial navigation |
| Input:   * [G&A Sensor input]   Subscribe: | Publish:   * /LOCA\_I/ * /CHASSIS\_STATUS/   Output: |
| Localization Module | Output usable location based on various localization |
| Input:  Subscribe:   * /LOCA\_A/ * /LOCA\_U/ * /LOCA\_I/ | Publish:   * /LOCATION/   Output: |

# Jason 2:

|  |  |
| --- | --- |
| Strategy Module | Global strategy and decision making |
| Input:  Subscribe:   * /LOCATION/ * /ENEMIES/ * /CHASSIS\_STATUS/ | Publish:   * /CHASSIS\_SET/ * /GUN\_STR/   Output: |
| Detection Module | Locate enemies by 360 cameras |
| Input:   * [360 camera input]   Subscribe: | Publish:   * /ENEMIES/   Output: |

# MQTT Topic Table:

|  |  |  |
| --- | --- | --- |
| Topic | Description | Massage Items |
| /REMOTE/ | Remote control massage from the laptop. | “XSpeed”:  “YSpeed”:  “PhiSpeed”: |
| /MOTOR/ | Status of all motors | “ID”: List of IDs (int) of motors  “Angle”: List of angles (double) of motors  “Speed”: List of speeds (double) of motors  “Torque”: List of torques (double) of motors |
| /CONFIG/ | Speed PID set points of motors | “SetPoint”: List of speed set points of motors |
| /CHASSIS\_STATUS/ | Motion status of the robot chassis | “XSpeed” : Chassis’ x-axis speed  “YSpeed” : Chassis’ y-axis speed  “PhiSpeed” : Chassis’ angular speed  “Angle” : Chassis’ angle |
| /CHASSIS\_SET/ | Chassis motion set points | “XSet” : Chassis’ x-axis speed set point  “YSet” : Chassis’ y-axis speed set point  “PhiSet” : Chassis’ angular speed set point |
| /GUN\_SET/ | Cradle head angle set points and feeder speed set point | “HSet” : Cradle head’s horizontal angle set point  “VSet” : Cradle head’s vertical angle set point  “FSet” : Feeder speed set point |
| /LOCA\_A/ | Robot’s location based on AMCL | “XCoord” : Absolute X coordinate  “YCoord” : Absolute Y coordinate  “Angle”: Absolute robot angle |
| /LOCA\_U/ | Robot’s location based on UBW | “XCoord” : Absolute X coordinate  “YCoord” : Absolute Y coordinate  “Angle”: Absolute robot angle |
| /LOCA\_I/ | Robot’s location based on inertial navigation | “XCoord” : Absolute X coordinate  “YCoord” : Absolute Y coordinate  “Angle”: Absolute robot angle |
| /LOCATION/ | Robot’s usable location based on various localization methods | “XCoord” : Absolute X coordinate  “YCoord” : Absolute Y coordinate  “Angle”: Absolute robot angle |
| /ENEMIES/ | Location and status of enemies | “EnemyXC” : List[2] of absolute X coordinate  “EnemyYC” : List[2] of absolute Y coordinate  “EnemyAngle” : List[2] of absolute angle  “EnemyXS”: List[2] of absolute X speed  “EnemyYS”: List[2] of absolute Y speed  “EnemyPhi”: List[2] of angular speed |
| /GUN\_STR/ | Gun strategy by Strategy Module | “Direction” : Relative direction for gun |