Methodology

I. Algorithms

Occupancy Grid Mapping Algorithm

- Prior occupancy probability = 0.5
- Probability that cell is occupied with total confidence = 0.9
- Probability that cell is free with total confidence = 0.3
- Using ratio <-> probability conversion equations from the lecture.

Bresenham's line drawing algorithm (from computer graphics course)

SLAM:

Linear and angular velocities are taken from the odometry sensor and the motion model is applied to predict the state then the map is built based on the new state.

II. Nodes and messages

Node	Subscribe to	Publish to
robot_control	**-**	**/robot/robotnik_base_control/cmd_vel**
sensors_incorporate	**/scan_multi** **/robot/robotnik_base_control/odom**	**/sensors_gamda**
map	**/sensors_gamda**	**/map_gamda**
slam	**/sensors_gamda**	**/slam_loc** **/slam_map**

III. Packages

1. Ira_laser_tools:

    - to incorporate the 2 laser scans into 1.

2. Summit XL Simulation: Robot simulation and modelling on Gazebo and Rviz

IV. Modules Summary

Req	Done (T/F)	Algorithm (write names)	From scratch (T/F)	Used Packages (write names)
Robot Control	T	Non-blocking reading	T	-
Sensor Incorporating and Alignment	T	Time Synchronisation	F	Ira_laser_tools
Mapping with known poses	T	Occupancy Grid	T	-
Simultaneous localization and mapping	T	Motion Model + Occupancy Grid for mapping	T	-

Team Members

Names	**Sec**	**BN**	**Workload**
غياث عمر صالح	2	8	SLAM + Mapping
يوسف عاطف توفيق	2	40	Mapping with known poses + SLAM
عمر عبدالفتاح حماد	2	5	Installation + Robot Control + Sensors Merging
عبدالله محمود	1	41	Installation + Robot Control + Sensors Merging