Chapter 6

Conclusions and Future Works

This chapter concludes all the work of implementation of composing Scorpion Robot's behavior, which has been presented in this thesis.

6.1 Conclusions

From the implementation and experiments described in earlier chapters, it can be concluded as follows.

First, the mapping mechanism of obstacles surround Scorpion Robot has been implemented, by using the 13 infrared range sensors. The mapping mechanism was not intended to produce a precise mapping of an obstacle, instead only to produce a rough approximation of an obstacle location. There were unknown factors affecting the sensors on the measurements. The sensor measurement might varied despite the unchanged distance between the sensor and the obstacle.

Second, odometry information has been incorporated, in order to produce a better mapping from previously saved obstacle mapping. In some cases, odometry features in Odo-Map subsystem, might introduce a degraded map, when one or more sensors measured an incorrect distance. The effect of this error can be reduced by giving a small scaling value, for example scaling value of 0.8 ($0 \leq$ scaling ≤ 1) retains the error (if there is an error in the mapping) for at least 25 cycles, and scaling value of 0.3 retains the error for only 5 cycles.

Finally, customizable behavior based on fuzzy perception has been implemented on Scorpion Robot. Behavior of the robot can be easily modified by adding, removing, or changing the rules. The advantages of this feature was shown in the experiment when experimenting with complex movement, in chapter 5. In experiment 1 and experiment 2, the robot were always having difficulty when encountered with corner, and this problem was easily fixed by adding another rule to improve the robot's behavior.

6.2 Future Works

Implementation in this thesis was specifically developed for Scorpion Robot, as described in [Evolution, 2004e]. Some modification are needed if another robot is used. It depends on the specification of mounting position and location of the sensors. In this case, the specification of mounting position and location of the sensors in Build-Map subsystem should be updated. This is because the position and the orientation of the sensors are hard coded inside the Build-Map subsystem, and the only way to

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change it is by changing the array that define the position and orientation of the sensors.

It would be more convenient if the way of Build-Map subsystem obtaining information about the position and orientation of the sensors is changed, by referencing information from the robot's resource configuration file. So that, the need of recompiling, when implemented on a robot with different setup, can be eliminated.

Further, camera on Scorpion Robot has not been used in this implementation. In future works, this camera should be incorporated to improve the awareness of the robot of its surroundings. An ERSP vision algorithm can be used to recognize an object and to determined its location in real world coordinate system. Once the location of the object is determined, a decision whether the object should be approached or avoided, can be made based on a certain set of fuzzy rules. By incorporating camera resource, an object with a specific shape or color can be recognized, and a more advanced behavior can be implemented on Scorpion Robot.

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