CHAPTER 3

METHODOLOGY

3.1 PROBLEM DESCRIPTION

In the present work AT89C2051 micro controller, touch sensor, infrared (IR), radio frequency (RF) sensors and computer vision with H-bridge driving, steering circuits with necessary elements are proposed for fabricating three different types of mobile robots in-house for performing the proposed tasks.

The architecture of the mobile robot must be known in advance, in order to implement the appropriate algorithm for completing a specific task like box pushing, path planning etc. So, dedicated and simple controlled mobile robots are proposed to be developed in-house. A pair of homogeneous mobile robot with touch sensors is proposed for box pushing task. A single mobile robot with IR and RF sensors is proposed for path planning with obstacle avoidance task. Another single mobile robot for path planning with obstacles avoidance task with computer vision is proposed for path planning with obstacle avoidance task. The important point to be noted with reference to the literature survey is that the heuristic algorithm must have simple structure to effectively implement for industrial applications.

3.2 OBJECTIVE OF THE PRESENT WORK

Objectives of the present dissertation work has been formulated, based the research gap identified in field of mobile robots through literature survey:
• To develop a pair of homogeneous mobile robot with touch sensors for box pushing task.

• To develop a mobile robot with IR and RF sensors for path planning with obstacle avoidance task.

• To develop another mobile robot for path planning with obstacle avoidance task with computer vision.

• To implement the simplified reinforcement learning, potential field and wave front heuristic algorithms respectively for the three different types of mobile robots for navigation.

• To develop a computer vision based positional error compensation procedure for an existing IR52C industrial robot using linear regression analysis for experience and learning purposes, which will be forerunner for the mobile robots used in box pushing and path planning tasks.

• To apply linear regression analysis to obtain the generalized equation to check or compensate the positional deviation in path planning.

• To apply the analysis of variance (ANOVA) statistical test to ensure the reliability and stability of the experimental procedures proposed in order to realize simple and effective navigation methodology for real time applications.

3.3 FLOW CHART OF COMPLETE METHODOLOGY

The flow chart shown in Figure 3.1 describes the overall process of the proposed work. It includes, the description about the fabrication of mobile robots for box pushing with touch sensors, path planning with obstacle avoidance with IR and RF sensors and path planning with obstacle avoidance
with computer vision along with the respective algorithm implementation procedure, experimental setups and applications of statistical tools for the proposed work.

**Figure 3.1 Flow chart for the overall process of the proposed methodology**
Figure 3.1 Flow chart for the overall process of the proposed methodology (Continued)