



B.E DEGREE EXAMINATIONS: NOV/DEC 2022

(Regulation 2018)

Seventh Semester

MECHATRONICS ENGINEERING

U18MCT7001: Mobile Robotics

COURSE OUTCOMES

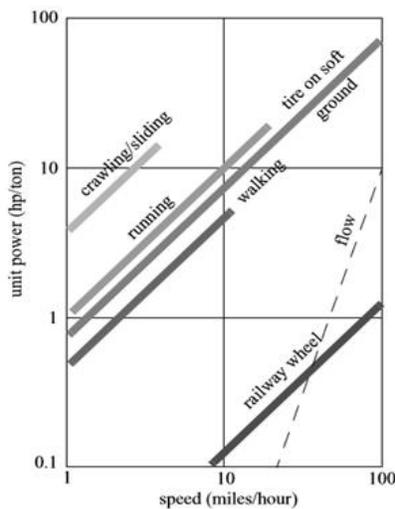
- CO1: Explain different types of mobile robot locomotion
 CO2: Apply mobile robot kinematics and constraints
 CO3: Choose sensors for the perception of mobile robots.
 CO4: Implement robot localization techniques
 CO5: Explain planning and navigation in robotics
 CO6: Apply obstacle avoidance techniques in mobile robots

Time: Three Hours

Maximum Marks: 100

**Answer all the Questions:-
 PART A (10 x 2 = 20 Marks)
 (Answer not more than 40 words)**

1. List the key issues in robot locomotion. CO1 [K₁]
 2. Interpret the locomotion mechanism in the picture below in your own words CO1 [K₂]



Specific power versus attainable speed of various locomotion mechanisms

3. Compare the platform velocity and wheel velocity of the robot CO2 [K₂]
 4. Compare Proprioceptive and Exteroceptive sensors. CO3 [K₂]
 5. Identify the function of encoders. CO3 [K₂]
 6. Distinguish Univariate and multivariate Gaussian. CO4 [K₂]
 7. Describe condition probability. CO4 [K₂]
 8. Explain the steps to choose a heuristic function in the A* path planning algorithm CO5 [K₂]
 9. List any four obstacle avoidance algorithms CO6 [K₂]

10. Describe the formula for calculating cost function (G) in the vector-field histogram CO6 [K₂]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11. a) Explain the legged locomotion and wheeled locomotion in mobile robots in detail. 12 CO1 [K₂]

b) Compare the stability, maneuverability, and controllability of mobile robot. 4 CO1 [K₂]

12. a) Explain a wheeled robot's kinematics analysis and compare it with a kinematic analysis of a robotic arm. 12 CO2 [K₂]

b) Compare holonomic and non-holonomic robot. 4 CO2 [K₂]

13. a) Illustrate the principle of Range sensors and explain its application in mobile robots. 10 CO3 [K₂]

b) Explain the accelerometer principles with neat sketches. 6 CO3 [K₂]

14. a) Explain the challenges in mobile robot localization. 4 CO4 [K₂]

b) Describe the importance of the Bayes filter in Markov Localization and explain the Localization algorithm to estimate the state of the robot in the below picture. 12 CO4 [K₃]

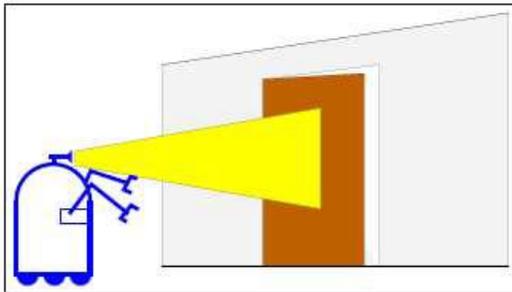


Figure 2.2 A mobile robot estimating the state of a door.

15. a) Explain the working of the A* algorithm for the path planning of a mobile robot. 10 CO5 [K₂]

b) Describe the principle and working of the Dijkstra Algorithm. 6 CO5 [K₂]

16. a) Explain the vector-field histogram algorithm to avoid obstacles. 8 CO6 [K₂]

b) compare Bug I and Bug II algorithm with neat sketches. 8 CO6 [K₂]
