Quiz 1

Complete

1- .... inventor of word robot

2- SONAR is based on ... effect

3- all sensors are based on ... principle

4. "robota" literally means ….

5- "automaton is considered a robot" this statement is …

(true , false)

6- "one strong and powerful sensor is better than many cheap sensors. " this statement is … (true , false)

Answer

1. Karel Capek

2. Doppler effect

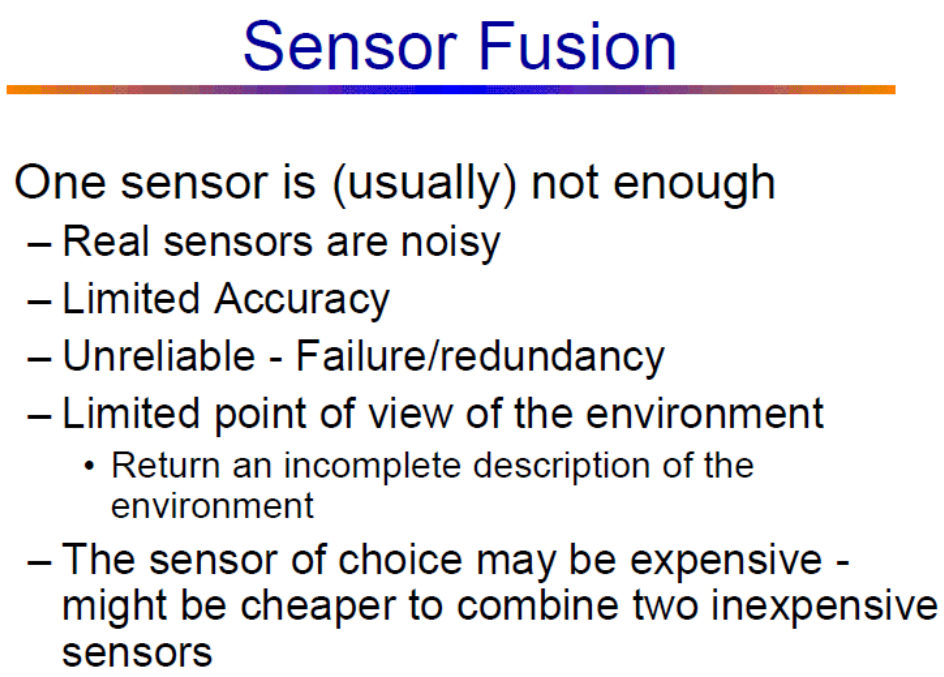
3. transduction

4. work

5. True.

6. false

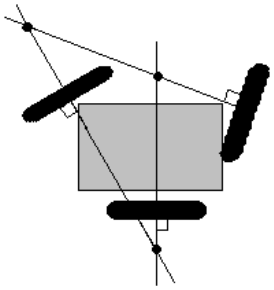
Important slide on "Fusion"



Quiz 2

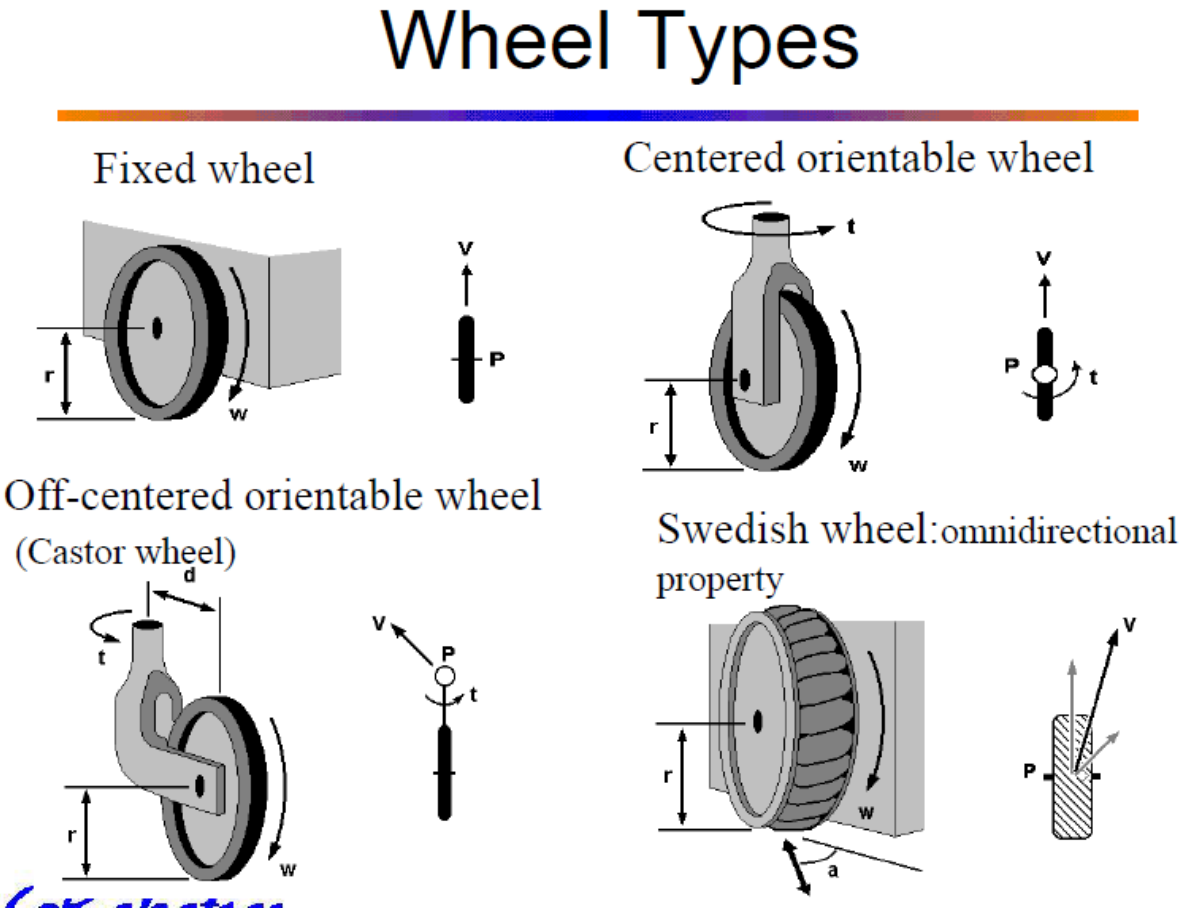
Q1 True or false

1. ICR =ICC صح
2. The following vehicle has 3 ICC غلط



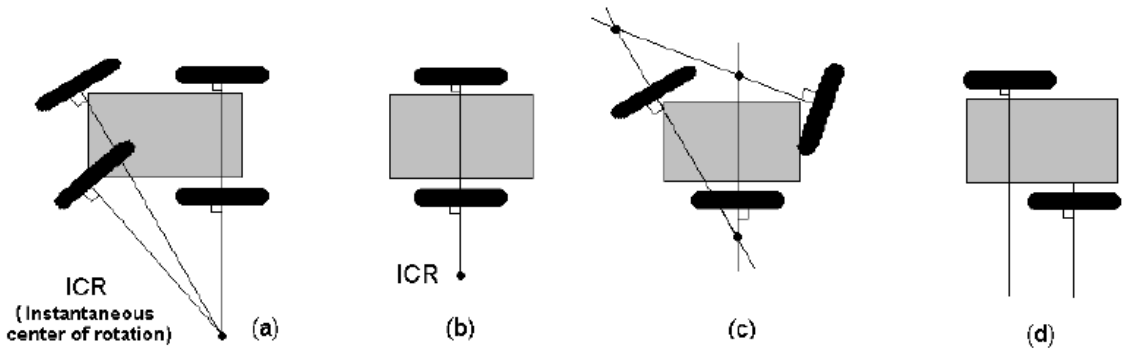
3. In Differential Drive, if **R = ∞,** the vehicle moves **straight forward** صح
4. Bug algorithm is full-knowledge motion planning غلط
5. The goal of **Cell decomposition** is to account for all of free space صح

Important slides



Mobile Robot Locomotion

- Instantaneous center of rotation (ICR) or Instantaneous center of curvature (ICC)
  - A cross point of all axes of the wheels

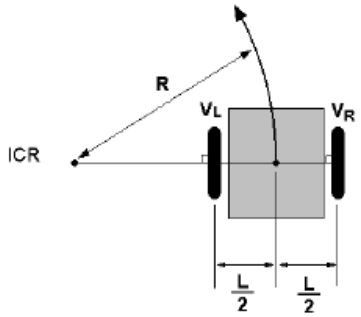


Types of driving (steering)

1. Differential Drive
   - two driving wheels (plus roller-ball for balance)
   - simplest drive mechanism
   - sensitive to the relative velocity of the two wheels (small error result in different trajectories, not just speed)
2. Steered wheels (tricycle, bicycles, wagon)
   - Steering wheel + rear wheels
   - cannot turn ±90°
   - limited radius of curvature
3. Synchronous Drive
4. Omni-directional
5. **Car Drive (Ackerman Steering)**

Differential Drive

- Instantaneous center of rotation



$$(V_R - V_L)/\ L\ =\ V_R\ /(R+\frac{L}{2})$$

$$R = \frac{L}{2}\frac{V_R + V_L}{V_R - V_L}$$

R : Radius of rotation

- Straight motion

  R = Infinity → $V_R = V_L$

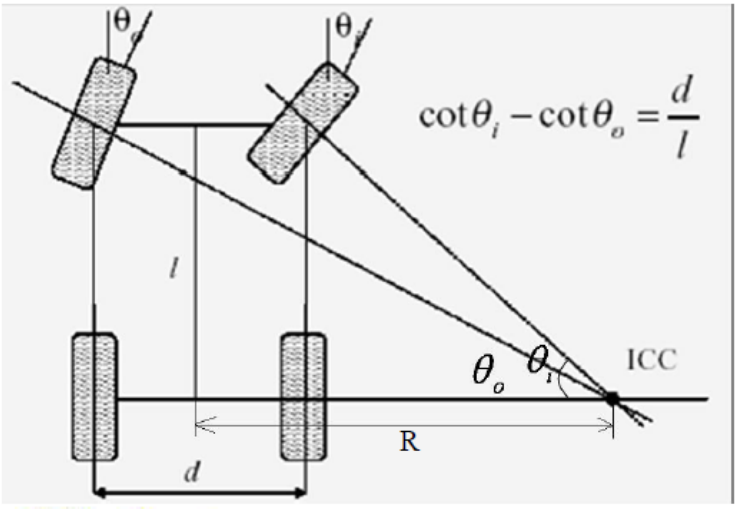
- Rotational motion

  R = 0 → $V_R = -V_L$

Ackerman Steering

- The Ackerman Steering equation:

$$\cot\theta_i - \cot\theta_o = \frac{d}{l} \qquad \cot\theta = \frac{\cos\theta}{\sin\theta}$$



$$\cot\theta_i - \cot\theta_o$$
$$= \frac{R - d/2}{l} - \frac{R + d/2}{l}$$
$$= \frac{d}{l}$$

Motion Planning Methods

(1) Roadmap approaches — **Goal** reduce the N-dimensional configuration space to a set of one-D paths to search.

(2) Cell decomposition ← **Goal** account for all of the free space

(3) Potential Fields — **Goal** Create local control strategies that will be more flexible than those above

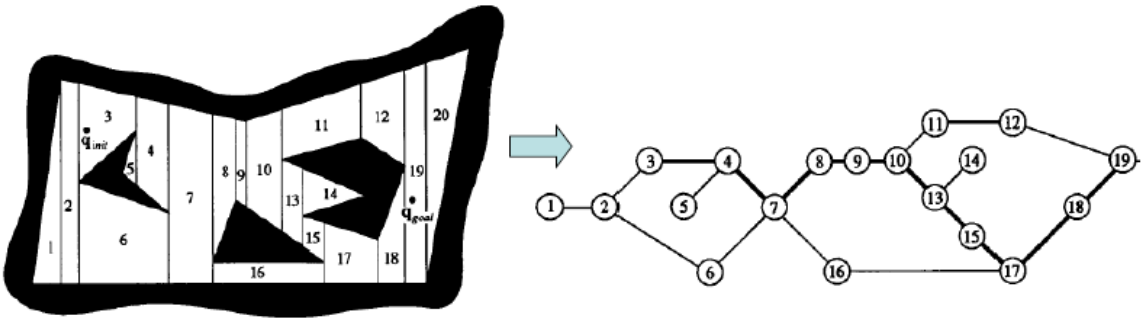
(4) Bug algorithms — Limited knowledge path planning

Exact Cell Decomposition

Trapezoidal Decomposition:

Decomposition of the free space into trapezoidal & triangular cells

Connectivity graph representing the adjacency relation between the cells



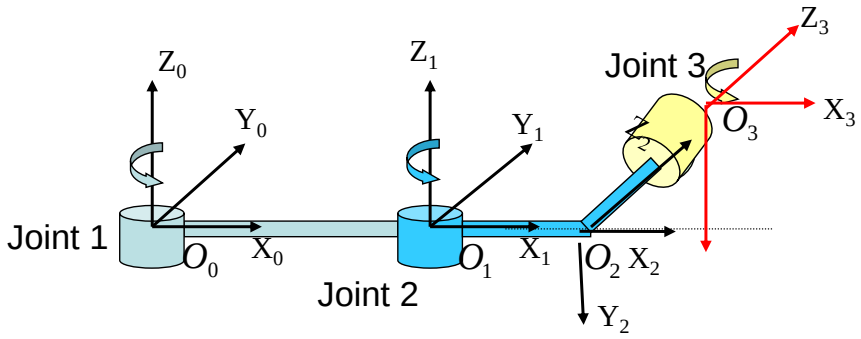
(Sweepline algorithm)

Quiz 3, model 1

Q1. Put √ or X

i. Cartesian Manipulator is PPP
ii. PRP Manipulator is possible
iii. Spherical and SCARA have same configuration
iv. Pitch is rotation about the OX axis
v. DoF of n links is n

Q2 write D-H Parameter Table for following Arm

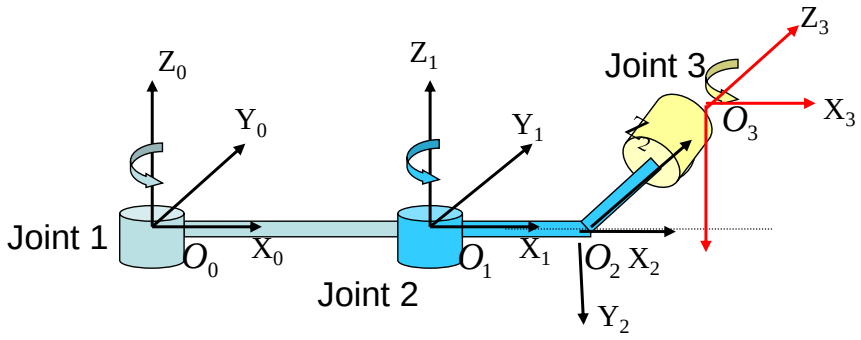


Quiz 3, model 2

Q1 Put √ or X

i. Spherical Manipulator is RRR
ii. PRP Manipulator is possible
iii. Spherical and SCARA have same configuration
iv. Yaw is rotation about the OY axis
v. DoF of n links is n

Q2 write D-H Parameter Table for following Arm



Important Slides: from 1 to 7 & slide 15

http://www.el-dosuky.com/teach/robo_14/lecs/10/kinematics-II.pdf

ومشاهدة فيديو

/kinematics-II

Quiz 4, model 1

Q1. Put √ or X

1. Input: is a control signal, denoted as x.
2. Feedback: is mapping from inputs to outputs
3. An agent without sensors is called Plant
4. Robots in the real world are fully observable
5. To be autonomous, robot has to solve PEAS
6. Quadcopter is over-actuated
7. Quaternion has singularities

Q2 MCQ

1. If robot stops working, it fails the ….. criterion

a)Stability b)Tracking c)Robustness d)Optimality

2. If robot reaches reference, it achieves ….. criterion

a)Stability b)Tracking c)Robustness d)Optimality

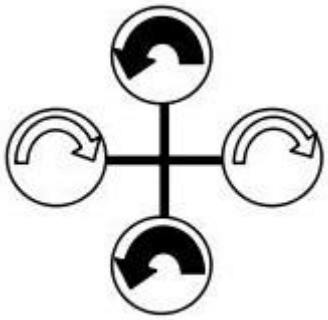
3. Simpler design using few parameters relates to…..

a)Stability b)Tracking c)Robustness d)Optimality

4. Low-cost solution is …..

a)Stability b)Tracking c)Robustness d)Optimality

5. This configuration of following quadcopter is for



a)roll b)pitch c)yaw clockwise d)yaw anti-clockwise

6. The responsive part is …. a)P b) I c)D d)None
7. If … part is big, robot oscillate a)P b) I c)D
8. …part is very sensitive to error a)P b) I c)D

Flying robot is called …. a) UAV b) ROV c) None

Quiz 4, model 2

Q1 Put √ or X

1. Robots in the real world are fully observable
2. To be autonomous, robot has to solve PEAS
3. Quadcopter is over-actuated
4. Quaternion has singularities
5. Input: is a control signal, denoted as x.
6. Feedback: is mapping from inputs to outputs
7. An agent without sensors is called Plant

Q2 MCQ

1. The responsive part is …. a)P b) I c)D d)None
2. If … part is big, robot oscillate a)P b) I c)D
3. …part is very sensitive to error a)P b) I c)D
4. Flying robot is called …. a) UAV b) ROV c) None
5. If robot stops working, it fails the ….. criterion

a)Stability b)Tracking c)Robustness d)Optimality

6. If robot reaches reference, it achieves ….. criterion

a)Stability b)Tracking c)Robustness d)Optimality

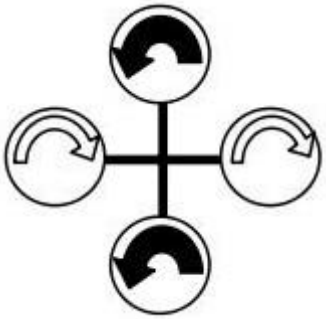
7. Simpler design using few parameters relates to…..

a)Stability b)Tracking c)Robustness d)Optimality

8. Low-cost solution is …..

a)Stability b)Tracking c)Robustness d)Optimality

9. This configuration of following quadcopter is for



a)roll b)pitch c)yaw clockwise d)yaw anti-clockwise

Important Slides: from 1 to 11

http://www.el-dosuky.com/teach/robo_14/lecs/12/control.pdf

ومشاهدة فيديو PID-control/

ايه حكاية BIBO ؟

وايه الفرق بين open loop & Closed loop

مذاكرة البوستر كله و صور أوضاع الطيران من

Lecture 14: Unmanned aerial vehicle (UAV)

Quiz 5

مذاكرة أول ٦ سلايد من

http://www.el-dosuky.com/teach/robo_14/lecs/08/localization.pdf

ومشاهدة فيديو

24 **Markov Decisions Processes (MDP)**