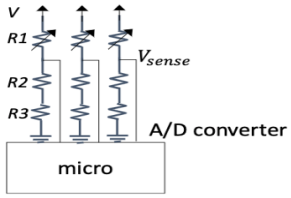
Laura Paulino
CSIT 531 - Robotics
Prof. Wang
09/12/2020

CSIT431/CSIT531 Homework 1

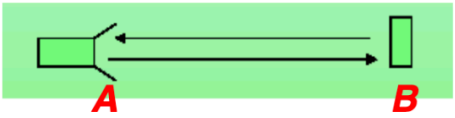
(C) 1. A resistive sensor is shown by the following picture. What's the sensed voltage?



A. $V_{sense} = (R_2) / (R_2 + R_3)V$
B. $V_{sense} = (R_2 + R_3) / (R_1 + R_2 + R_3)V$
C. $V_{sense} = (R_2) / (R_1 + R_2 + R_3)V$
D. $V_{sense} = (R_1 + R_2) / (R_1 + R_2 + R_3)V$

Answer: C

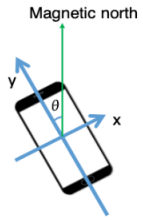
(D) 2. A range finder is shown by the following picture? The elapsed time of its wave is 100 ms. What's the distance from station A to station B? (Suppose the speed of wave propagation is 340 m/s)



A. 17 cm
B. 34 cm
C. 17 m
D. 34 m

formula: D = V * T
where v = speed of wave propagation and t= elapse time
340 m/s * 100 ms = 34 000 m
Answer: D

3. Suppose the phone rotates in 2D by an angle θ, the magnetometer output on x axis is $\sqrt{3}$ Tesla, on y axis is 3 Tesla. We can get the rotation angle θ as _____



$\tan\theta = \frac{\sin\theta}{\cos\theta} = \sqrt{3} / 3$

Arctan = $\pi / 6$

$\tan\theta = \pi + \pi / 6$

$\tan\theta = 7\pi / 6$

$\tan\theta = \pi / 6 + \pi n, 7\pi / 6 + \pi n$, for any integer n

Answer: $\tan\theta = \pi / 6 + \pi n$, for any integer n

4. Please list 4 kinds of range sensors.

Photoelectric/Optical Sensors – emits a light beam (visible or infrared) from the one of its elements where the other element detects the light beam from the first.

Inductive Proximity Sensor—used to detect presence of nearby objects. Works by emitting electromagnetic field or beam of radiation and looking for changes in the field.

Capacitive Proximity Sensors—works by noting a change in the capacitance values and registers as the presences of the object. Used to measure a number of things like proximity, pressure, force, humidity, etc.

Ultrasonic Proximity Sensors—non-contact sensors that generate inaudible ultrasonic waves that detect the target from timing of the received sound waves.