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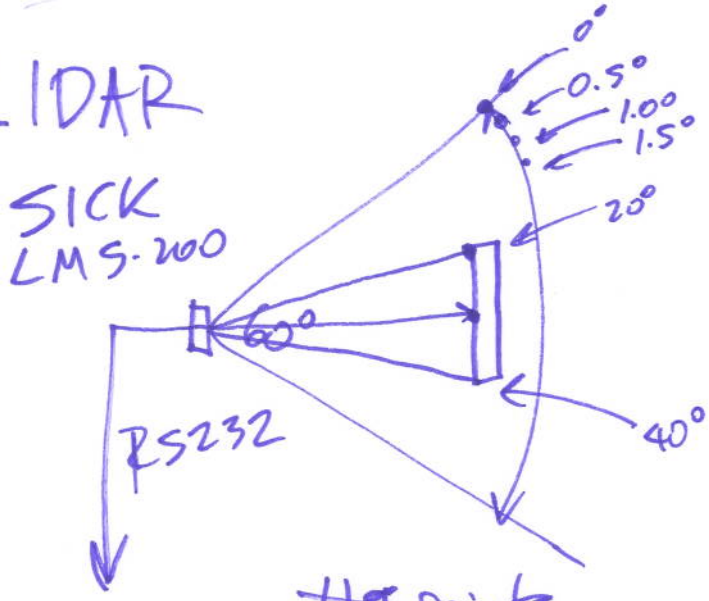
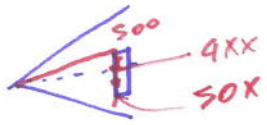
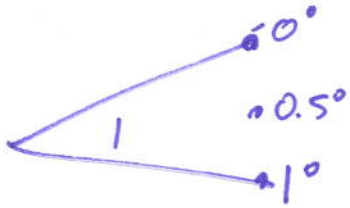
LECTURE 10

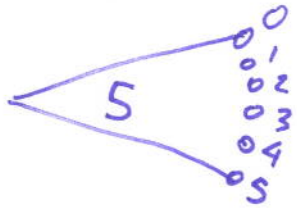
LIDAR

SICK
LMS-200







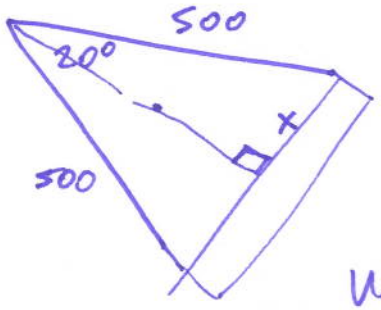


~~114~~ points
121

41st

00000 .... 500 499 499 498... 495 496.... 499 500 00...

Question - what is the length of the wall

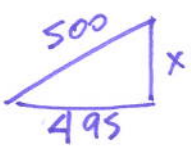


$\sin 10° = \frac{x}{500}$

$x = (500 \sin 10°)$

$x = 86.8$

Wall = 2x = 173.6



~~$x^2 = 500^2 + 495^2$~~

$500^2 = x^2 + 495^2$

$x = \sqrt{500^2 - 495^2}$

$x = 70.53$

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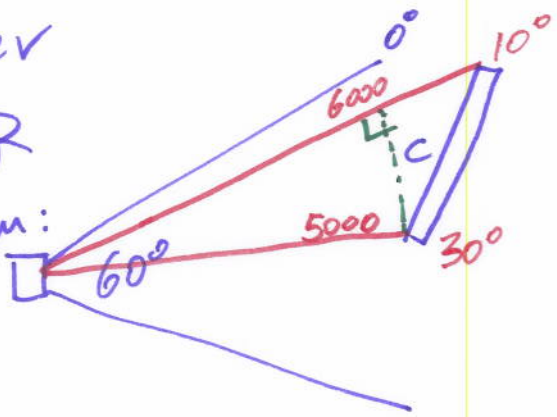
(2)

Another LIDAR Problem:



Question: what is the length of the wall?

Law of ~~Cosigns~~ Cosines

$C^2 = 5000^2 + 6000^2 - (2 * 5000 * 6000 * \cos 20°)$

$C = 2149.06$

Steps:

1) Find the angle of first non-zero point.
2) Find the angle of last non-zero point.
3) Examine distance data
   a) if it decreases, the increases, assume it is perpendicular
   b) if it decreases,

3) Law of Cosines.

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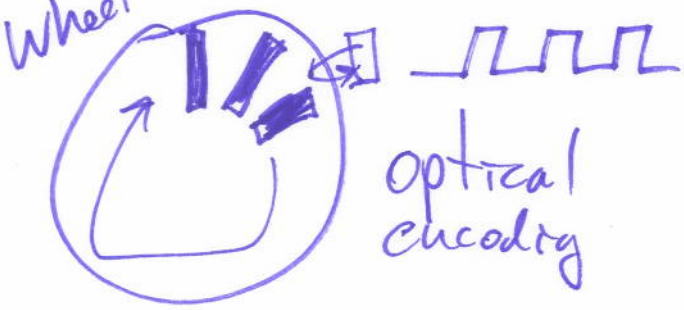
first problem (3)

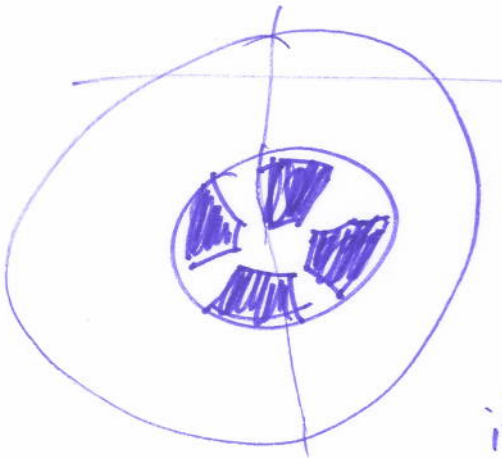
$C^2 = 500^2 + 500^2 - (2 * 500 * 500 * \cos 20^\circ)$

$= 173.6$

$\therefore$ QED



50% duty cycle when the high & low part of the pulse is same size



so....
4 dark regions
wheel diameter is 10cm

if you see exactly 20 rising edges of the pulse, how far have you traveled?

$$20 \text{ pulses} \times \frac{1 \text{ wheel rotation}}{4 \text{ pulses}} \times \frac{\pi \ 10 \text{ cm}}{1 \text{ wheel rot}} = 50\pi \text{ cm}$$

$= 157 \text{ cm}$

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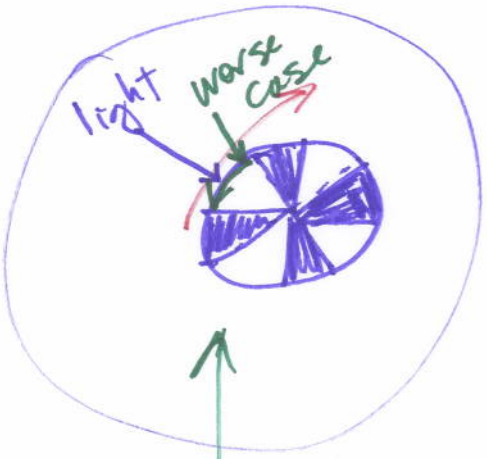
(4)



if I have no pulses, how many cm could I have traveled?
10 cm diameter wheel

1/8 of circumfrence

$$\frac{1}{8} * \pi 10 = \frac{5}{4}\pi = 3.925 \text{ cm}$$

What if the wheel is 80 cm diameter?

$$\frac{1}{8}\pi 80 = 10\pi$$
$$= 31.416 \text{ cm}$$

Lesson learned

~~Make it completely black! NOT~~

Lots of resolution

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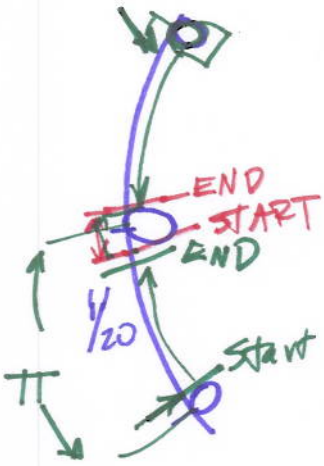
(5)

Wheel & encoder
radius 10cm 20 pulses

Your μController has measured 307 pulses for the wheel.
Assume no slippage
What is the range of distances the wheel traveled? Hint Draw it out



± 1/20

long = distance + 1/20 circum.
short = distance - 1/20 circumfrence

$$\text{distance} = 307\text{pulses} \times \frac{1\text{circum.}}{20\text{pulses}} \times \frac{20\pi\text{ cm}}{1\text{circum}}$$

$$= 307\pi$$

$$= 964.47\text{cm}$$

long = $307\pi + \pi = 308\pi = 967.61$ cm
short = $307\pi - \pi = 306\pi$ 961.32cm