**Module 7 Lab 1 – Distance Sensing with Computer Vision**

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**PRELAB**

* 1. *Directions*:
     1. Answer the following questions BEFORE the corresponding lab. These are due by the time lab starts. *You may use any resource you find online or in text, but you may not work with your fellow students.*
  2. *Resources:*
     1. [Kinect Video](https://www.youtube.com/watch?v=uq9SEJxZiUg)
     2. Kinect Hardware:

Depth Sensor – An infrared projector and a monochrome CMOS (complimentary metal-oxide semiconductor) sensor work together to “see” the room in 3-D regardless of the lighting conditions.

* 1. *Questions:*
     1. Watch the Kinect Video in the Resources tab. In a few sentences, explain what Kinect is, how Kinect senses depth and why it has been very popular in the computer vision research area.
     2. The depth sensor uses a monochrome CMOS with the IR projector.
        1. What is a CMOS sensor?
        2. How does a CMOS sensor work?
        3. In what other technologies is a CMOS sensor used?
     3. The following is a C++ code fragment. Explain what the bold line does *in terms of x and y*.

if (event == EVENT\_LBUTTONDOWN)

{

x\_one = x;

y\_one = y;

**val = sqrt(pow(x\_one,2)+pow(y\_one,2));**

cout << "Left button of the mouse is clicked - value

(" << x << ", " << y << "), val (data value" << result << ")" << endl;

}

* + 1. The statement below the bold line prints the following sentence. x, y and result are variables that are underlined for clarification.

Left button of the mouse is clicked - value (x, y), val (data valueresult)

Based on your observation, write a line of code that prints the following sentence. Notice z is a variable.

Right button of the mouse is clicked - value (x, y, result), val (data z)

* + 1. Express the focal length f of a convex lens in terms of **u, w and x**, where u is the object distance, w is the width of the object and x is the pixel width.

Hint: use similar triangles and the relation .

