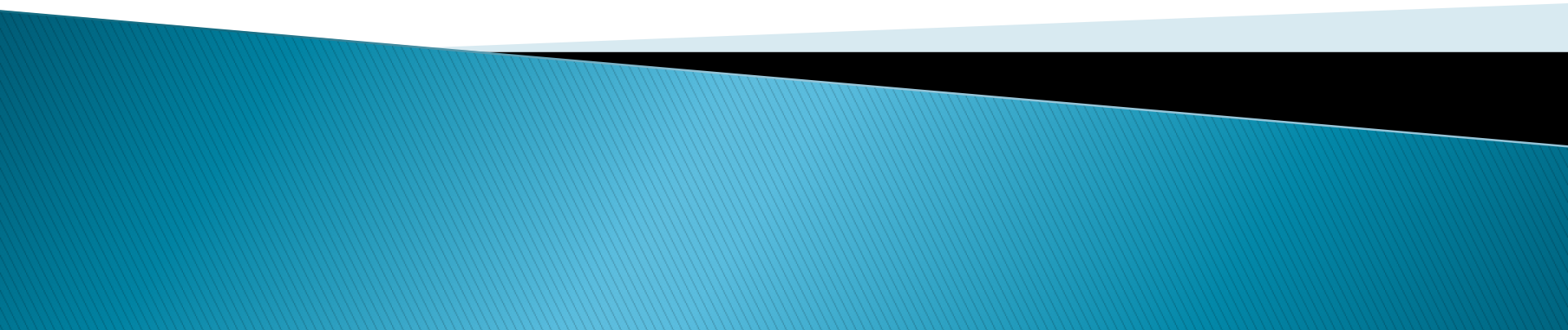


41012 Programming for Mechatronic Systems

Class: Week 10



ROS

- ▶ Ros is a complete ecosystem, containing Middleware (connecting components), Libraries and Utilities
- ▶ Complete ROS Tutorials 1–6 and 11
<http://wiki.ros.org/ROS/Tutorials>

ROS Nodes / Topics

- ▶ Publish and Subscribe to chatter Data
 - <http://wiki.ros.org/ROS/Tutorials/WritingPublisherSubscriber%28c%2B%2B%29>
- ▶ Amend the code to :
 - Publisher
 - Sends doubles from a Gaussian distribution (0–1) and
 - Subscriber
 - Creates a histogram of the numbers (each bin is 0.1)
 - On 50th number received shows as percentage of numbers received the numbers in each bin
 - Questions:
 - Do you need to change the StdMsg?
refer http://wiki.ros.org/std_msgs
 - Will you use a container for the histogram?

OpenCV

- ▶ http://docs.opencv.org/2.4/doc/tutorials/introduction/linux_gcc_cmake/linux_gcc_cmake.html
- ▶ Exercise:
 - Can you create a histogram of grey scale image?
 - Convert color image to grayscale
 - Create a array of length 255
 - Loop though each pixel of and increment the corresponding element
 - Print on screen

OpenCV Help

Accessing Pixel Values

```
cv::Mat img = cv::imread("lenna.png");  
// Before changing  
cv::imshow("Before",img);  
// change some pixel value for(int j=0;j<img.rows;j++) {  
    for (int i=0;i<img.cols;i++) {  
        if( i== j) img.at<uchar>(j,i) = 255; //white  
    }  
}  
// After changing  
cv::imshow("After",img);
```

Library

- ▶ Can you refactor your code that produces a histogram to be a library?
 - `add_library (histo histo.cpp)`
 - `target_link_libraries (demo histo)`
- ▶ <https://cmake.org/examples/>

Using a Library – OpenCV

- ▶ Example

- http://docs.opencv.org/2.4/doc/tutorials/introduction/linux_gcc_cmake/linux_gcc_cmake.html

- ▶ Can you compute the edges of an image and display it

- HINT – Canny Edge

- http://docs.opencv.org/2.4/doc/tutorials/imgproc/imgtrans/canny_detector/canny_detector.html

OpenCV – ROS

- ▶ Create a node that
 - Loads an image
 - Converts it to grayscale
 - Publishes the image on a topic
- ▶ Create a node that
 - Subscribes to the image topic
 - Computes an intensity histogram on received image
 - Displays the histogram
- ▶ HINTS
 - http://wiki.ros.org/vision_opencv