Nanotechnology to Robotics

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Problem Set 6 Applied Concepts

Due Week 13 May 13 2023

1. During one cycle, the diesel engine of a lawn tractor absorbs 310 J of thermal energy and exhausts 220 J of thermal energy. What is the efficiency of the heat engine? [solution: $ΔU\_{int}=Q\_{H}+W+Q\_{C}=0;W=-310J-\left(-220J\right)=-90J. efficiency=\frac{90J}{310J}=0.29.$]
2. An engine is to be built to extract power from the temperature gradient of the ocean. If the surface and deep-water temperatures are 25degC and 10degC, respectively, what is the maximum theoretical efficiency of such an engine? [solution: 0.0503]
3. Open the LowLightImageEnhancementExample.mlx. This method relies on the imreducehaze to create an image that looks more colorful, brighter and less dulled. The underlying principle relies on the dark channel prior, or dcp, an observation that unhazy images of outdoor scenes usually contain pixels that have low signal in one or more color channels. Refining the total atmospheric light in the dark channel prior and modifying the transmitted map of light dehazes the image, providing better contrast. Try to use impixel(A) to locate x and y pixel values on an image and see the values at specific locations. Define x and y lines, for example x=1:1:100; y=1:1:100; then use improfile(A,x,y), grid on; to study the values of the pixels at those locations in the image.