EE6310 Image and Video Processing, Spring 2023

Indian Institute of Technology Hyderabad
Homework 6, Assigned 17.04.2023, Due **11:59 pm on 24.04.2023**

When we think we know, we cease to learn. – Sarvepalli Radhakrishnan

Instructions:

- Use the images *first_frame.png* and *second_frame.png* posted along with this HW.
- Please turn in Python Notebooks with the following notation for the file name: `your-roll-number`-hw6.ipynb.
- Do not use built-in functions.
- Divide each frame into *non-overlapping macroblocks* of size 16×16 pixels. Note that the images are of size 176×144.
- Generate motion vectors at each macroblock in the *second* frame from the *first*.

1 Motion Estimation

In this problem you will implement the most critical part of the video codec – the motion estimator. Do the following:

1. Use the 3-step search to find motion vectors (check slides for description). (10)
   - Use mean absolute distance (MAD) as your metric.
   - Step 1: Search at 8 location ± 4 pixels around current macroblock including (0, 0) (relative to current macroblock).
   - Step 2: search at 8 location ± 2 pixels around best match location in Step 1 including best match location.
   - Step 3: search at 8 location ± 1 pixels around best match location in Step 2 including best match location.
2. Plot the motion vector at each macroblock. You can use the *arrow* function in *matplotlib*. (1)
3. Generate the motion compensated predicted frame using the motion vectors and the first frame. (3)
4. Compute the error between the second frame and its motion compensated predicted version and display it. (1)