Numerical Analysis

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Program Learning Outcomes

Relevant to

- ▶ PLO7: an ability to search for, process and analyse information from a variety of sources and to communicate in a professional way orally and in written form)

- ▶ PLO5: an ability to design mathematical models in a broad range of intellectual domain

- ▶ PLO4: an ability to identify, formulate, abstract and solve mathematical problems applying analytical, symbolic and computatioanl methods together with computing facilities

- ▶ PLO3: understanding of limitations of mathematical methods and the constraints on their applicability

Problem 2.1

Interpolation, sound wave (6 points)

1. Consider sound as a univariate function. For example you can write text and convert it to speech. Consider application of libraries (from gtts import gTTS , import librosa). You may need to cut sound in 20 milisecond frames.

2. Explore the potential of three different interpolation methods for sound representation. Describe the methods used and justify your approach.

3. Present visual examples to illustrate both successful and unsuccessful findings.

Please use a separate slide for each of the sub-tasks mentioned above.

Problem 2.2

Digital Images, radial basis functions, compression (6 points)

1. Consider digital images. remove some $(10\%, 25\%, 50\%, 75\%)$ pixels randomly.

2. Explore the potential of three different radial basis functions for restoring digital image. consider adjusting of shape parameter. Describe the method used and justify your approach.

3. Present visual examples to illustrate both successful and unsuccessful findings.

Please use a separate slide for each of the sub-tasks mentioned above.

Assessment

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- ▶ CP is worth 12 points.
- ▶ The problem/sub-problem will receive a score of 0 if any of the following conditions are met:
    - ▶ The same set of student-defined parameters is used by two or more students.
    - ▶ The answer cannot be replicated, for example, the code is not submitted.
    - ▶ The solution to the sub-problem is submitted without an accompanying explanation or proof.
    - ▶ The code fails to produce correct results when tested on new data.