Cyber-Physical Modeling and Machine-Learning Towards Smart Electrical Equipment Systems

Report for Course 7

**Milestone 1: The Finite Element Approximation**

**1. ’s and ’s**

*You can type your solution here or paste a scan of your written solution. If you paste your written calculation, neatness will be rewarded.*

**2. and**

*You can type your solution here or paste a scan of your written solution. If you paste your written calculation, neatness will be rewarded.*

**3. Nodal displacements**

*Node 2:*

*Node 3:*

*Node 4:*

*Node 5:*

*Node 6:*

*…*

*Notice that you do not need to report node 1 displacement, as it is fixed to the ground.*

**4. Maximum nodal displacement**

*Write down your discussion.*

**5. Safety check**

*Write down your discussion.*

**6. Extra credit #1**

*Write down your results and discussion.*

**7. Extra credit #2**

*Write down your results and discussion.*

**Milestone 2: SDOF Insulator System**

**1. Frequency and natural period**

*Frequency:*

*Natural period:*

**2. Maximum absolute displacement**

*Maximum absolute displacement:*

**3. Time versus displacement**

*You can plot it in the spreadsheet and copy/paste it to your submission.*

**4. Effect of loading amplitude**

*Maximum absolute displacement:*

*Write down your discussion.*

**5. Effect of loading frequency**

*Maximum absolute displacement:*

*Write down your discussion.*

**6. Effect of damping ratio**

*Maximum absolute displacement:*

*Write down your discussion.*

**7. Other effects**

1. **:**

*Maximum absolute displacement:*

*Plot.*

1. **:**

*Maximum absolute displacement:*

*Plot.*

1. **:**

*Maximum absolute displacement:*

*Plot.*

1. **:**

*Maximum absolute displacement:*

*Plot.*

**8. Extra credit #3**

*Write down your results and discussion.*

**Milestone 3: Basic Convolutional Neural Network**

**1. Horizontal edge detector**

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |

**2. Diagonal edge detector**

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |

**3. Same padding**

The dimension of the image after the convolutional operation is ( & , in terms of , , , and ):

where is the floor operation, i.e., round down. For example, , .

**4. Padding size**

By using the relationship derived in item 3, the padding size is:

**Milestone 4: Transmission Tower Classification**

**2. Larger dataset**

*Write down your observations.*