**Arithmetic operations between images**

**Example: if the pixel value lies between 0 and 255, then min=0, max=255**

**ADDITION**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Input image A** | | | **Operation** | **Input image B** | | |  | **Resultant image C** | | |
| 0 | 100 | 10 | **Addition (+)** | 10 | 100 | 5 | **=** | 10 | 200 | 15 |
| 4 | 0 | 10 | 2 | 0 | 0 | 6 | 0 | 10 |
| 8 | 0 | 5 | 0 | 0 | 10 | 8 | 0 | 15 |

**SUBTRACTION**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Input image A** | | | **Operation** | **Input image B** | | |  | **Resultant image C** | | |
| 0 | 100 | 10 | **Subtraction (-)** | 10 | 100 | 5 | **=** | 0 | 0 | 5 |
| 4 | 0 | 10 | 2 | 0 | 0 | 2 | 0 | 10 |
| 8 | 0 | 5 | 0 | 0 | 10 | 8 | 0 | 0 |

**0 because 0 – 10 = -10 and 5 – 10 = -5 are negative so assume min =0**

**MULTIPLICATION**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Input image A** | | | **Operation** | **Input image B** | | |  | **Resultant image C** | | |
| 0 | 100 | 10 | **Multiplication (\*)** | 10 | 100 | 5 | **=** | 0 | 255 | 50 |
| 4 | 0 | 10 | 2 | 0 | 0 | 8 | 0 | 0 |
| 8 | 0 | 5 | 0 | 0 | 10 | 0 | 0 | 50 |

**255 because 100 \* 100 = 10000 so assume max = 255**

**DIVISION**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Input image A** | | | **Operation** | **Input image B** | | |  | **Resultant image C** | | |
| 0 | 100 | 10 | **Division**  **(/)** | 10 | 100 | 5 | **=** | 0 | 1 | 2 |
| 4 | 0 | 10 | 2 | 0 | 0 | 2 | 0 | 0 (infinity) |
| 8 | 0 | 5 | 0 | 0 | 10 | 0 (infinity) | 0 | 0 (because 5/2 is 0.5 and hence round off |

**Logical operations between images**

**AND truth table Example:**

|  |  |  |
| --- | --- | --- |
| **A** | **B** | **A\*B** |
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Input image A** | | | **Operation** | **Input image B** | | | **Resultant image C** | | |
| 1 | 1 | 0 | **AND** | 0 | 1 | 0 | 0 | 1 | 0 |
| 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 |



**SET Operations (Union and Intersection) – can also be applied: Refer Slides**

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