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BSCS 4B

BLURRING TECHNIQUES COMPARISON

TECHNIQUES	BLURRING	NOISE REDUCTION	EDGE PRESERVATION	ARTISTIC EFFECT	SHARPENING
GAUSSIAN BLUR	APPLIES A SMOOTH BLUR ACROSS THE ENTIRE IMAGE	MODERATELY REDUCES NOISE BUT ALSO SMOOTHS FINE DETAILS	POOR EDGE PRESERVATION EDGES TEND TO BLUR ALONG WITH THE REST OF THE IMAGE	CREATES SOFT DREAMY EFFECTS USEFUL IN PHOTOGRAPY TO REDUCE SHARPNESS	DOES NOT SHARPEN, PRIMALY A SMOOTHING EFFECT
MEDIAN BLUR	BLURS BY REPLACING EACH PIXEL WITH THE MEDIAN OF ITS NEIGHBORHOOD	VERY EFFECTIVE FOR REDUCING NOISE, ESPECIALLY SALT AND PEPPER NOISE	GOOD EDGE PRESERVATION SINCE THE MEDIAN FUNCTIONS EDGE SPREADING	MINIMAL ARTISTIC EFFECTS MOSTLY FUNCTIONAL FOR NOISE REMOVAL	DOES NOT, SHARPEN BUT RETAINS EDGES BETTER THAN GAUSSIAN BLUR
BILATERAL FILTER	COMBINES BLURRING WITH EDGE PRESERVATION BYCONSIDERING BOTH SPATIAL DISTANCE AND PIXEL INTENSITIVITY	EXECELLENT NOISE REDUCTION WHILE PRESERVING EDGES	BEST EDGE PRESERVATION AMONG THESE TECHNIQUES	SOFTEN TEXTURES WHILE KEEPING EDGES INTACT, OFTEN CREATING A PAINTERLY LOOK	NOT A SHARPENING FILTER BUT IT MAINTAINS SHARP EDGES WELL.
BOX FILTER	AVERAGE PIXEL VALUES OVER A BOX-SHAPED WINDOW, CAUSING SIGNIFICANT	BASIC NOISE REDUCTION NOT VERY EFFECTIVE COMPARED TO OTHER METHODS	POOR EDGE PRESERVATION EDGES ARE BLUURED ALONG WITH THE REST OF THE IMAGE	LIMITED ARTISTIC EFFECT, MAINLY USED FOR BASIC SMOOTHING OR DOWNSA	DOES NOT SHARPEN, JUST A SIMPLE BLUR

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MOTION BLUR	SIMULATES EFFECT OF A CAMERA MOVEMENT BLURRING THE IMAGE ALONG A SPECIFIC DIRECTION	MINIMAL NOISE REDUCTION, INTRODUCES DIRECTIONAL BLUR INSTEAD	POOR EDGE PRESERVATION ESPECIALLY ALONG THE AXIS OF THE BLUR.	CREATES A SENSE OF A MOVEMENT OR SPEED IN THE IMAGE USED FOR DYNAMIC ARTISTIC EFFECTS	NOT FOR SHARPENING INTRODUCES MOTION EFFECTS INSTEAD.
UNSHARP MASK	SHAPRNESS IMAGES BY ENHANCING EDGES	NO NOISE REDUCTION AS IT IS DESIGNED FOR SHARPENING NOT BLURRING	GOOD EDGE ENHANCEMENT BUT CAN INTRODUCE NOISE AND ARTIFACTS IF OVERUSED.	INCREASES IMAGE CONTRAST AND CRISPNESS ADDS DETAIL TO ARTISTIC EFFECTS BY EMPHASIZING EDGES	VERY EFFECTIVE FOR SHARPENING THE PRIMARY GOAL IS EDGE ENHANCEMENT

EXPLAIN:

In image processing, different filters like Gaussian blur, median blur, bilateral filter, box filter, motion blur, and unsharp mask have their own uses depending on how they affect the image. Gaussian blur makes the whole image smoother and reduces some noise, but it also makes the edges less sharp. Median blur is great for reducing noise, especially tiny dots of noise, and it keeps edges clearer than Gaussian blur. The bilateral filter is the best at reducing noise while keeping edges sharp, making images look soft but still detailed. Box filters are simple and blur everything equally, but they don’t do well at keeping edges clear. Motion blur creates the effect of movement, making the image look like it’s moving in a certain direction, but it doesn’t reduce noise much and blurs the edges. The unsharp mask is different because it sharpens the edges instead of blurring, making details stand out more, though it can sometimes add noise. Each filter works best in different situations, depending on whether you want to smooth the image, keep edges sharp, or make details clearer.

EDGE DETECTION TECHNIQUES

Techniques	Sensitivity to Noise	Edge Thinness	Edge Continuity	Computational Efficiency
SOBEL EDGE DETECTION	Moderately sensitive to noise; the derivative operation amplifies noise.	Produces thicker edges, can be improved with post-processing.	Good edge continuity but may miss finer details.	Computationally efficient due to simple gradient calculations.
LAPLACIAN EDGE DETECTION	Highly sensitive to noise due to the second derivative operation.	Thicker edges, often results in false edges without post-processing.	Poor edge continuity; requires combination with other methods like Gaussian smoothing.	More computationally intensive due to second-order derivative.
PREWITT EDGE DETECTION	Moderately sensitive to noise, similar to Sobel.	Produces slightly thicker edges than Sobel.	Good edge continuity but less accurate with finer details.	Slightly more efficient than Sobel as it uses simpler kernels.
CANNY EDGE DETECTION	Low sensitivity to noise, due to built-in Gaussian smoothing.	Produces thin, precise edges.	Excellent edge continuity, as it traces connected edges.	More computationally intensive, due to multi-step processing (smoothing, gradient calculation, and non-maximum suppression).

EXPLAIN:

In edge detection, techniques like Sobel, Laplacian, Prewitt, and Canny are used to find the edges in an image, and each has different strengths. Sobel and Prewitt are similar because they handle noise okay and create thicker edges, with Sobel taking a bit more time to compute. Laplacian is very sensitive to noise, making it less reliable because it often produces thick and messy edges without extra work to clean it up. Canny is the best for getting thin, smooth edges and isn’t as affected by noise, but it takes more time and processing steps. Overall, Canny gives the best results, but Sobel and Prewitt are faster and simpler for easier tasks.