**ESCUELA SUPERIOR POLITÉCNICA DEL LITORAL**

**Procesamiento de Audio y Video - Examen Mejoramiento**

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1. Considere una cámara digital no profesional que contiene un filtro de bayer (CFA) que le permite capturar las imágenes en color. De tal forma que al capturar una imagen de color la cámara crea tres matrices de cada componente de color capturado de forma individual, R,G,B respectivamente, de la siguiente forma:

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| Matriz capturada | Matriz canal R | Matriz canal B | Matriz canal G |

* 1. Cuál es la relación (en monto de información) entre el número de muestras capturadas por los canales G y el número de muestras capturadas por los canales R,B. (**5 puntos**)
  2. Por qué razón la cámara captura mayor cantidad de información del color verde (G). (**5 puntos**)
  3. Considere la siguiente matriz de información capturada por la cámara (0 a 255 por cada canal). Llene las tablas correspondientes para cada canal de color en las siguientes matrices que fueron capturadas por la cámara. (**5 puntos**)

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| |  |  |  |  |  | | --- | --- | --- | --- | --- | | 10 | 8 | 9 | 15 | 12 | | 4 | 5 | 7 | 8 | 8 | | 4 | 5 | 8 | 9 | 9 | | 52 | 6 | 2 | 3 | 9 | | 12 | 14 | 15 | 12 | 5 | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |
| Matriz capturada | Matriz canal R | Matriz canal G | Matriz canal B |

* 1. El resto de valores no capturados por la cámara son interpolados utilizando un método interpolación bilineal. Llene las siguientes matrices con los valores obtenidos en la interpolación. (**15 puntos**).

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| |  |  |  |  |  | | --- | --- | --- | --- | --- | | 10 | 8 | 9 | 15 | 12 | | 4 | 5 | 7 | 8 | 8 | | 4 | 5 | 8 | 9 | 9 | | 52 | 6 | 2 | 3 | 9 | | 12 | 14 | 15 | 12 | 5 | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | | |  |  |  |  |  | | --- | --- | --- | --- | --- | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |
| Matriz capturada | Matriz canal R | Matriz canal G | Matriz canal B |

1. Considere la transmisión de una señal de **audio analógico**.
   1. Explique detalladamente y utilizando un gráfico que es el balanceo de cargas (**10 puntos**).
   2. Por qué se utiliza este método de transmisión en audio profesional (**5 puntos**).
2. Considere el proceso de convolución de dos imágenes digitales de una imagen I(m,n) con un kernel K(p,q).

A continuación se muestra la información capturada por una cámara digital en niveles de gris (0,255), así mismo como un kernel que desea ser utilizado para realizar una convolución.

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| |  |  |  |  |  | | --- | --- | --- | --- | --- | | 2 | 3 | 6 | 90 | 23 | | 12 | 9 | 48 | 19 | 34 | | 7 | 8 | 45 | 8 | 9 | | 3 | 6 | 56 | 9 | 9 | | 5 | 6 | 57 | 67 | 24 | | |  |  |  | | --- | --- | --- | | 0 | 0 | 0 | | -1 | 1 | 0 | | 0 | 0 | 0 | | |  |  |  |  |  | | --- | --- | --- | --- | --- | | 2 | 3 | 6 | 90 | 23 | | 12 | 9 | 48 | 19 | 34 | | 7 | 8 | 45 | 8 | 9 | | 3 | 6 | 56 | 9 | 9 | | 5 | 6 | 57 | 67 | 24 | |
| Imagen original | Kernel | Resultado de la convolución |

* 1. Llene la matriz con el resultado de la convolución entre la imagen y el kernel mostrada en la tabla superior (**15 puntos**)
  2. Cuál es el efecto visual de aplicar dicho kernel (**5 puntos**).

1. Considere la digitalización de un fichero de audio digital que recibe una señal de audio 22Khz, sin embargo la tarjeta de audio capturadora puede muestrear una señal de un máximo de 11Khz.
   1. Qué problemas puede ocurrir al realizar la captura de audio. (**5 puntos**)
   2. Cómo pudiéramos resolver dicho problema (**5 puntos**).
2. Se desea crear un comercial de un nuevo Centro Comercial, en el se desea que aparezcan dos personas conversando frente al centro comercial ya terminado. El problema es que no se terminará el centro comercial sino hasta dentro de 6 meses, pero se desea que el comercial aparezca el próximo mes. Lo único con que cuentan es con un archivo en 3D con el modelo del edificio, que se puede renderizar con una apariencia casi real. Describa el procedimiento que llevaría a cabo para realizar este comercial (**25 puntos**).