

Processamento e Análise de Imagens

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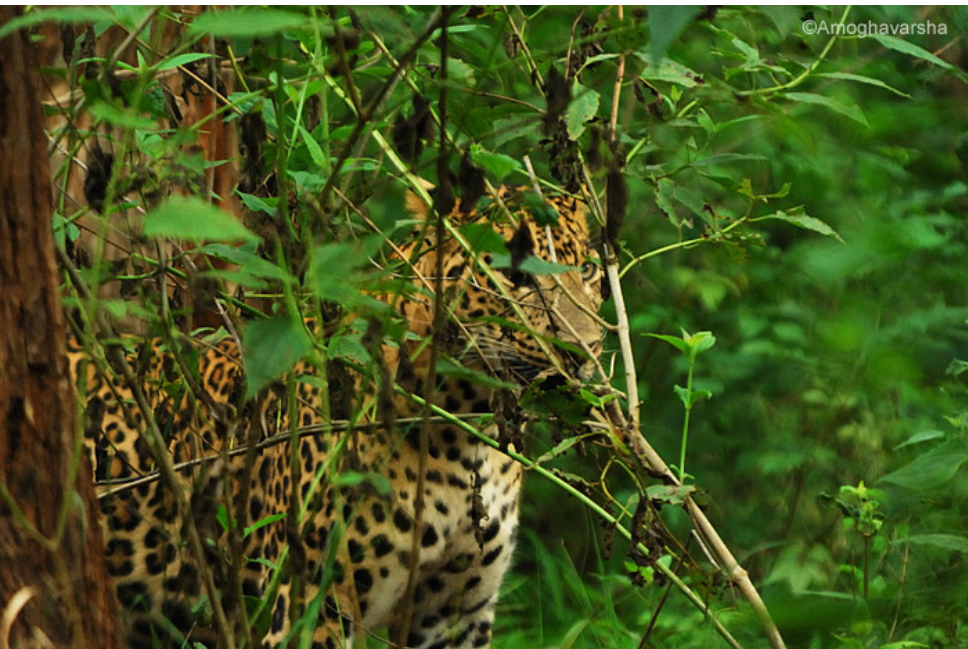






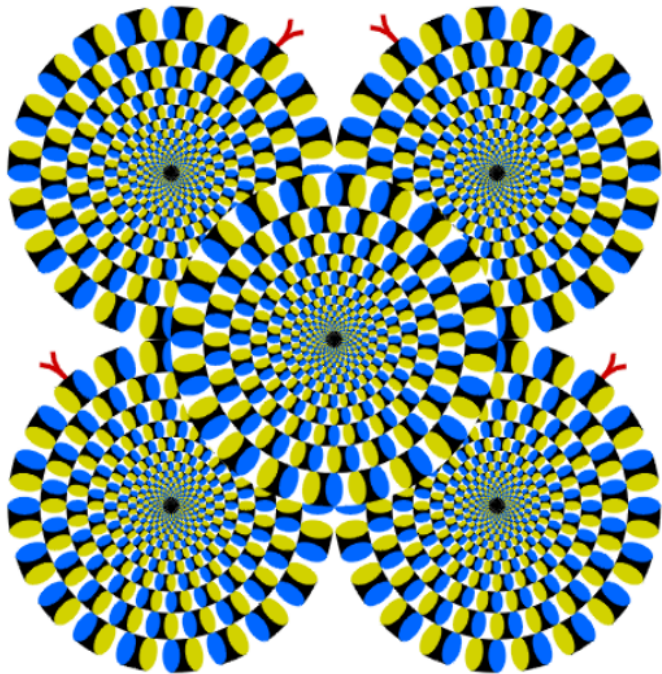


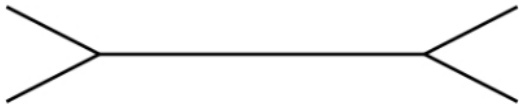
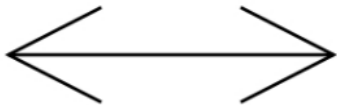


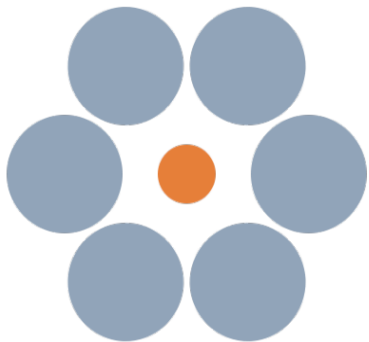


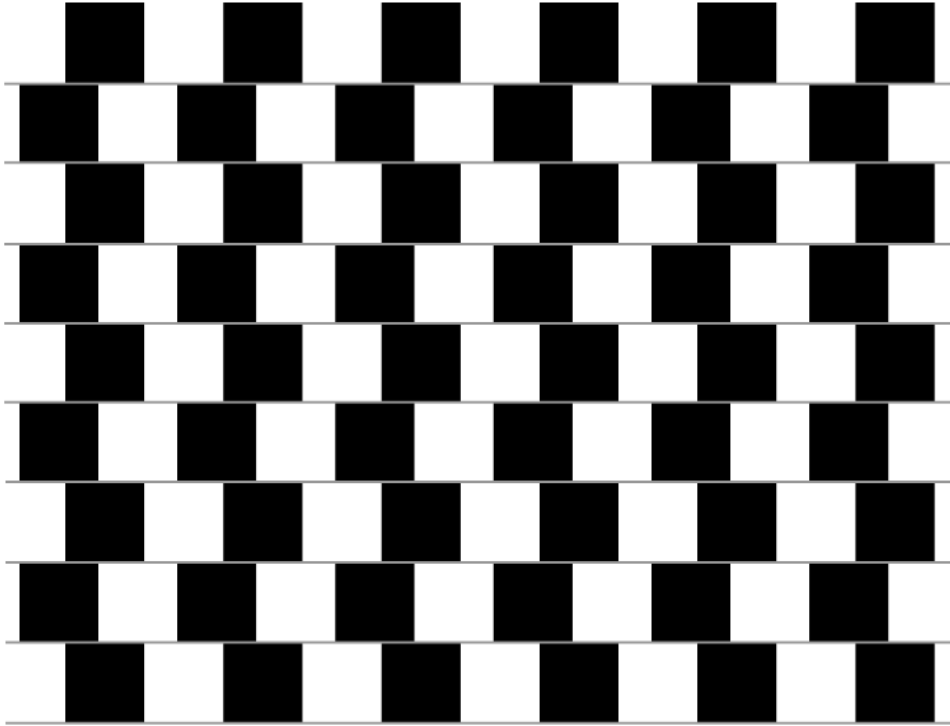


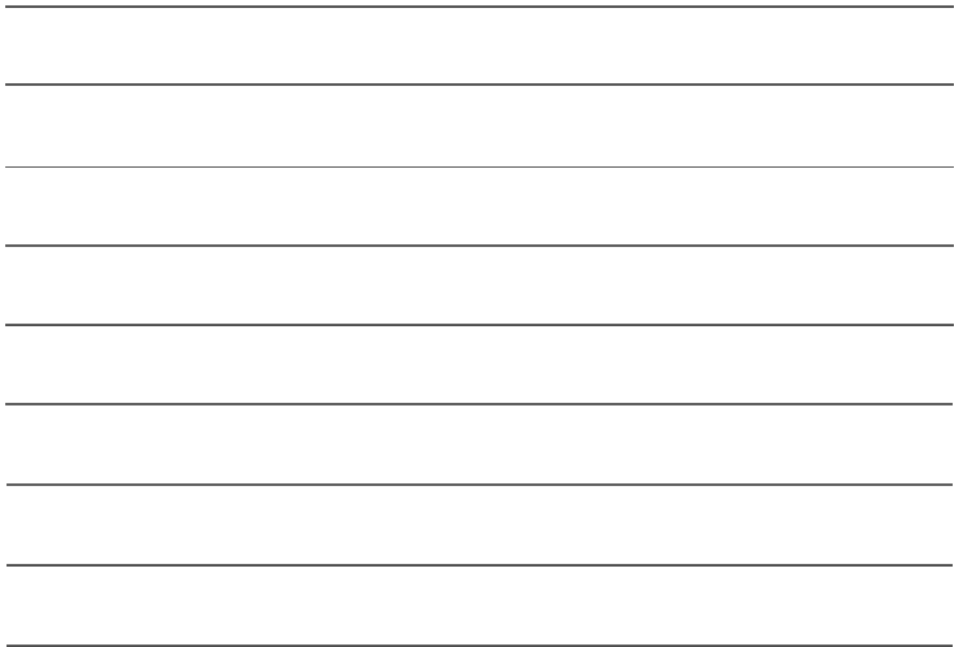




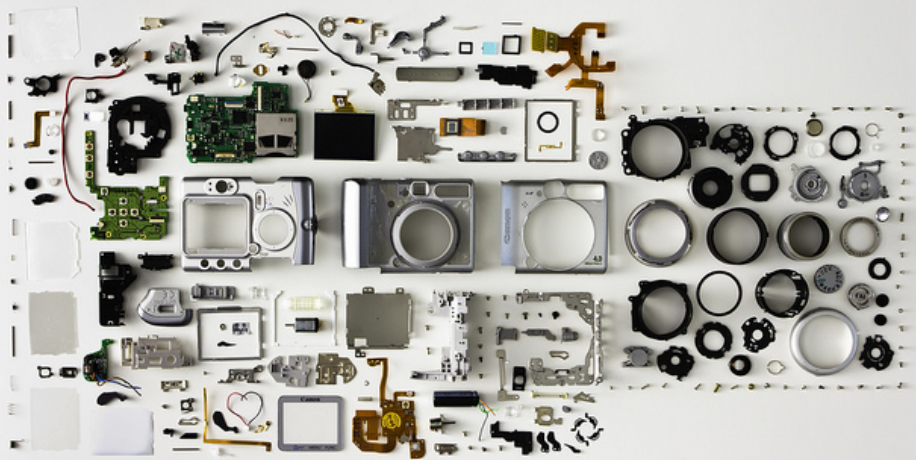










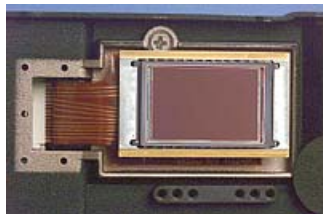
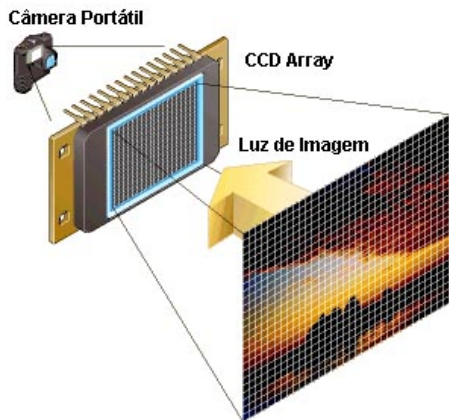


Imagem

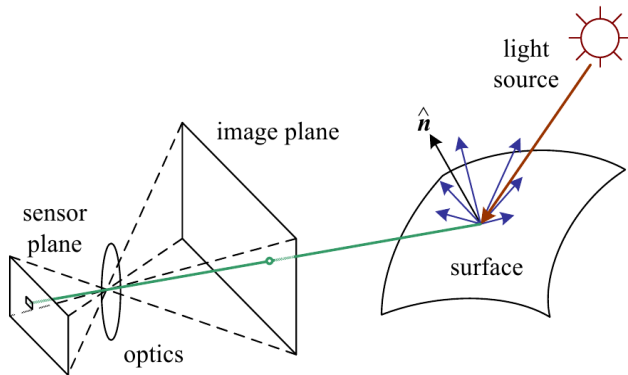
- Função bidimensional (2-d) de intensidade de luz $f(x, y)$:
 - x e y são as coordenadas espaciais
 - f no ponto (x, y) representa a intensidade ou cor naquela coordenada
 - na prática, são definidas em regiões retangulares
- Contínua no espaço
- Contínua em amplitude



Aquisição



Formação da imagem



Pipeline de geração de imagem digital

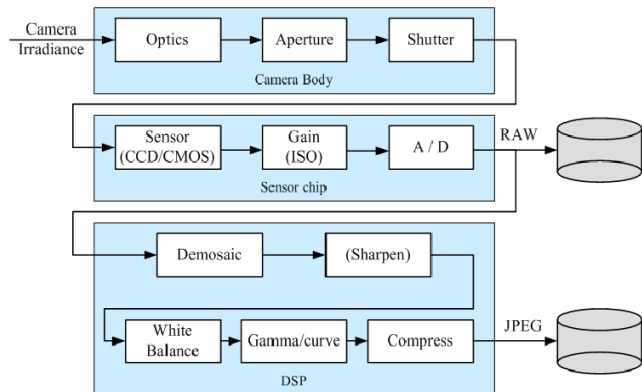
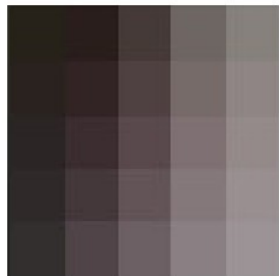
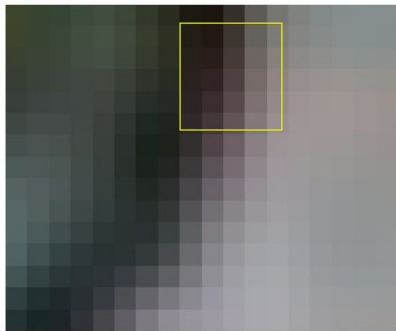
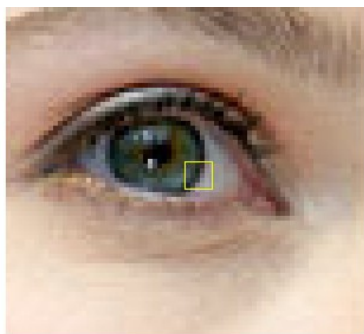
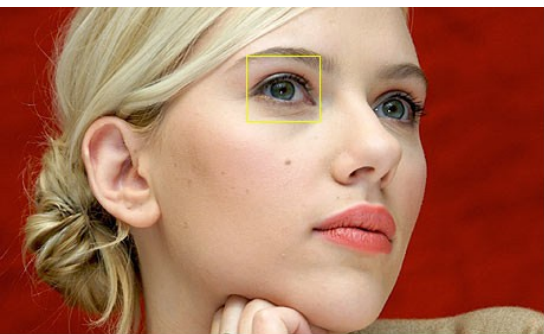
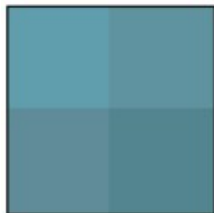


Imagem Digital

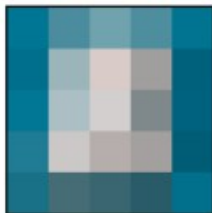
- Ao adquirir a imagem a função contínua é **amostrada** e sua amplitude **quantizada**.
- Como resultado, a **imagem digital** é a representação da imagem contínua por um *array 2-d de amostras discretas*.
- Cada elemento da matriz é chamado de **pixel**.



2 x 2



5 x 5



10 x 10



20 x 20



50 x 50

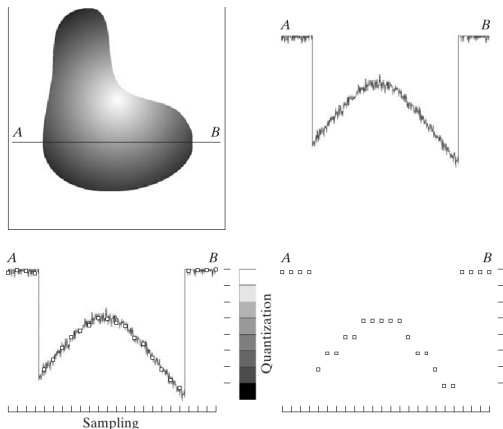


100 x 100

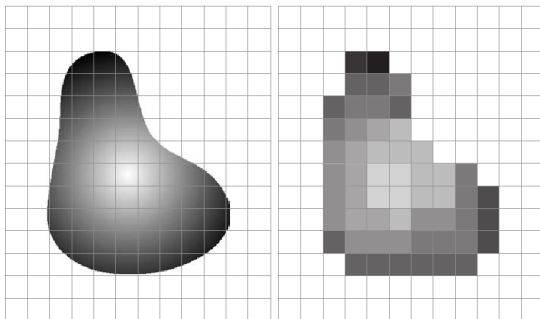


Número de cores: quantização

- Após amostrar a imagem o sensor ainda precisa converter cada observação “real” em uma observação discreta, definida pelo número de bits usados para armazená-lo.



Número de cores: quantização





Componentes de cor



Vermelho (R)



Verde (G)



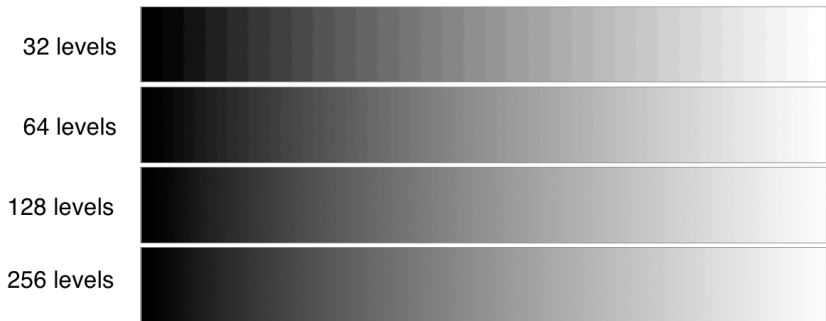
Azul (B)



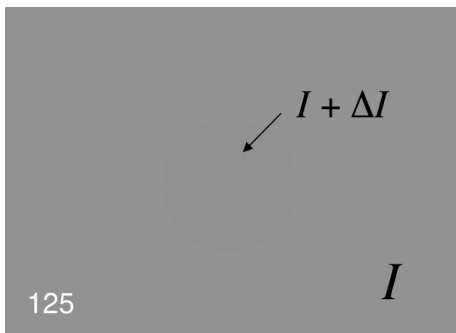
24 bits (8 + 8 + 8)

Níveis de cinza

Ao visualizar em sequência os níveis de cinza utilizando quantização diferente, é possível ver falsos contornos gerados:



Níveis de cinza: discernimento de brilho



- O limiar de visibilidade foi determinado experimentalmente por Weber:

$$\Delta I / I \approx K_{\text{Weber}} \approx 1.2\%,$$

chamada: fração de Weber ou lei de Weber.

Número de cores: quantização



Imagem binária (0-1)

Número de cores: quantização



(Domício Pinheiro / Agência Estado)

Imagem binária (0-1)



Componentes de cor



Vermelho (R)



Verde (G)

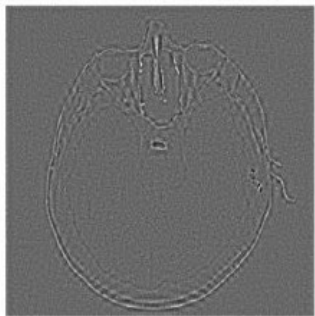
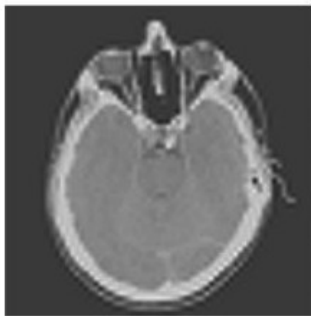
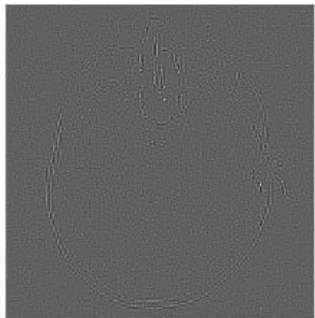


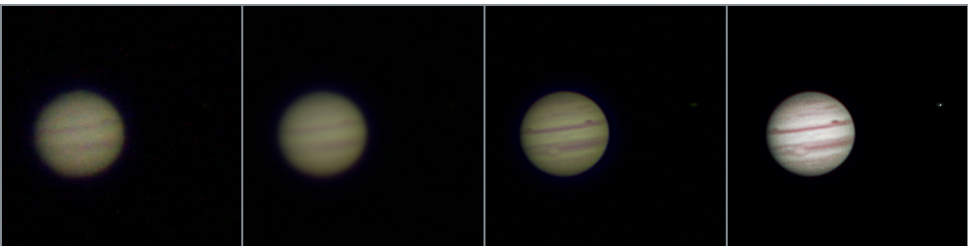
Azul (B)

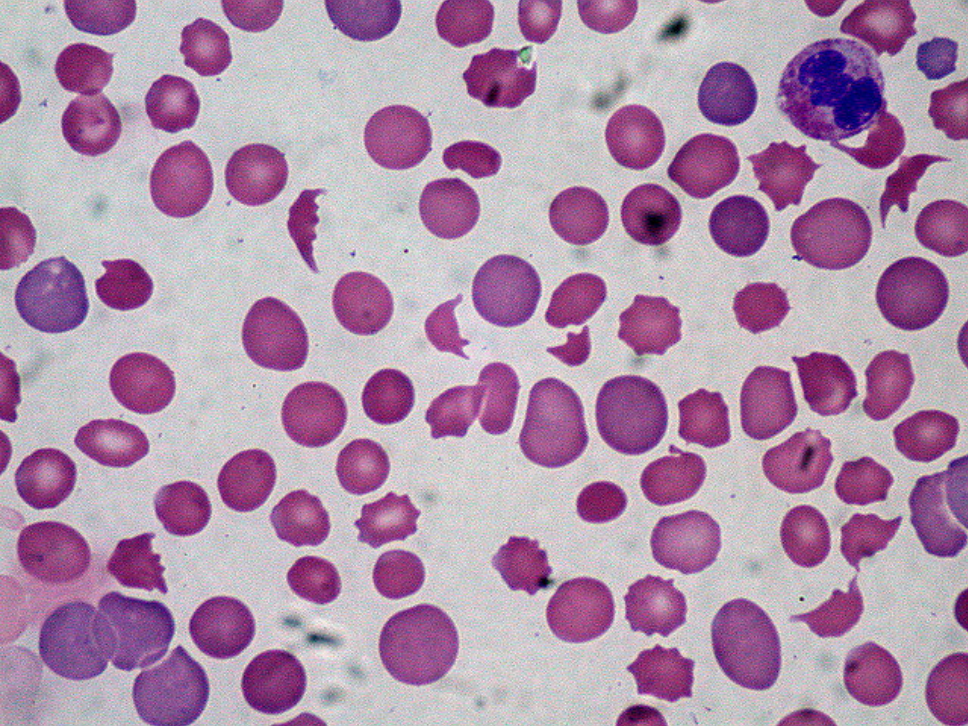


24 bits (8 + 8 + 8)













OREGON
6-17-11

MOTOROLA
MSR



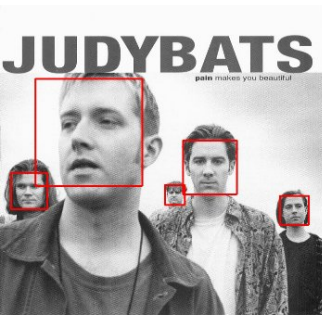


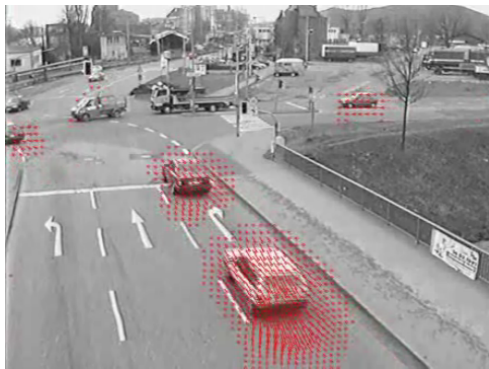
MSD
MOTOROLA
SUNOCO

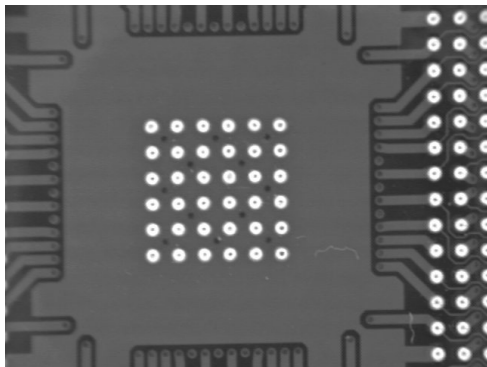
OREGON
FRATEL

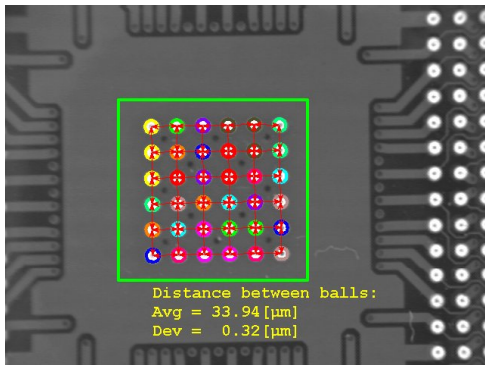
MSD
MOTOROLA
SUNOCO

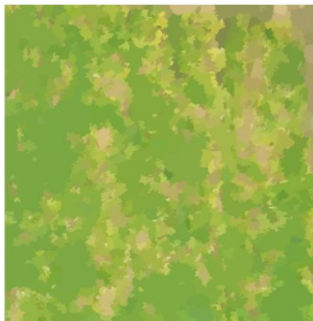
MSD
MOTOROLA
SUNOCO



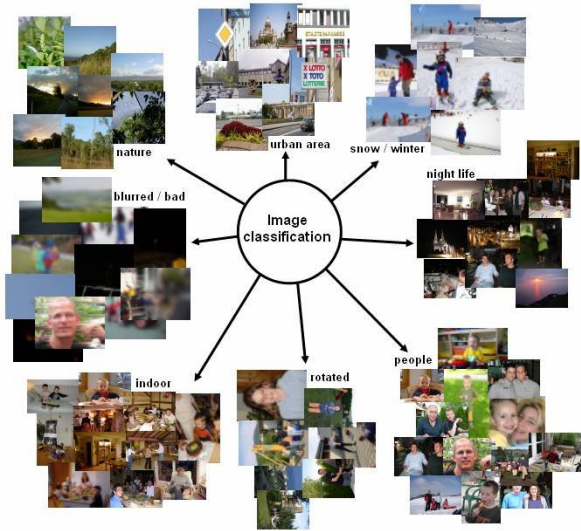


















ICMC: pesquisadores

VICG: Visualização, Imagens e Computação Gráfica

- Moacir Ponti
- João E.S. Batista Neto
- Maria Cristina Oliveira
- Rosane Minghim

Outros pesquisadores

- Luis Gustavo Nonato (VICG / Processamento Geométrico)
- Afonso Paiva Neto (VICG / Processamento Geométrico)
- Agma Traina (laboratório GBDI)

Disciplinas da área e correlatas

- scc0250 — Computação Gráfica
- scc0251 — Processamento de Imagens
- scc0252 — Visualização Computacional

Bibliografia I

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Prentice-Hall, 1988.






-  SZELISKI, R. **Computer Vision: algorithms and applications**
Springer, 2011.

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-  OpenCV (Open Source Computer Vision)
<http://docs.opencv.org>.
-  GNU Octave
<http://www.gnu.org/software/octave/>
-  R (GNU S)
<http://www.r-project.org>