Sisteme software de prelucrarea imaginilor

Filtre de baza
Blur, Noise, Sharpen, etc



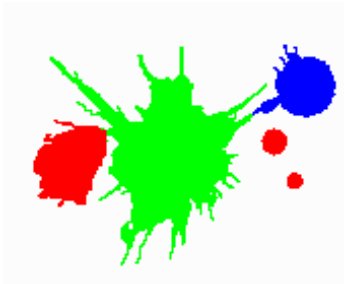
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LAPI



Filtre

- Exista numeroase **tipuri de filtre** incluse
- Fiecare tip contine intre 2 si 15 filtre distincte – particularizari ale tipului general -



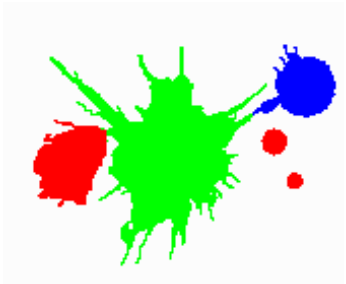




Filtre - Utilizari

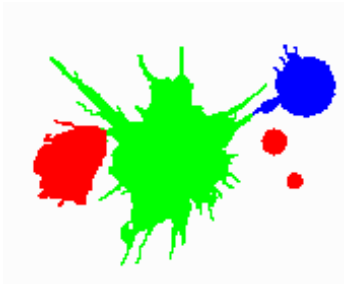


- Imbunatatirea imaginilor prin reducerea zgomotului
- Imbunatatirea contrastului imaginilor
- Modificari artistice asupra imaginilor
  - Imaginile se pot filtra in vederea obtinerii unor efecte artistice (ex: efectul de "pastelizare" a imaginilor)



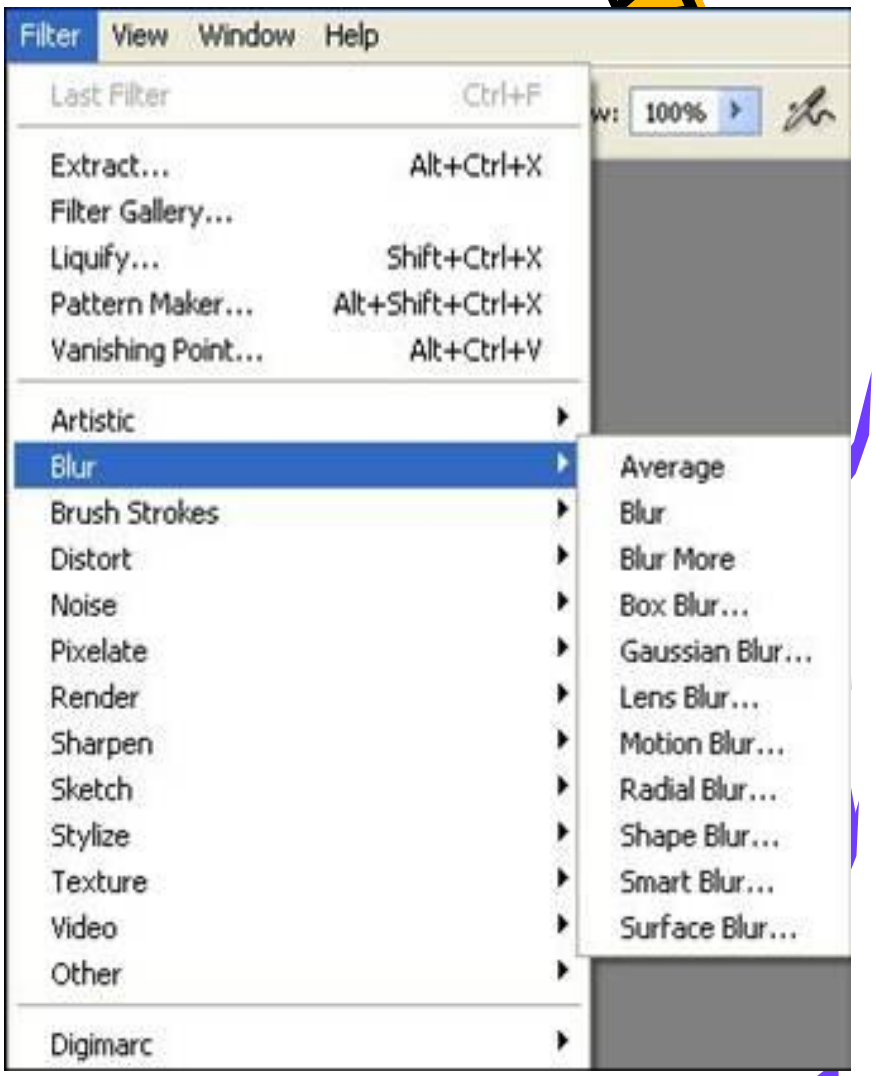
Moduri de utilizare

- Integral, pe toata imaginea
- Selectiv, doar asupra anumitor portiuni din imagine
  - Pentru a le pune mai mult in evidenta
  - Pentru a le reduce importanta perceptuala si deci pentru a pune in evidenta alte sectiuni din imagine



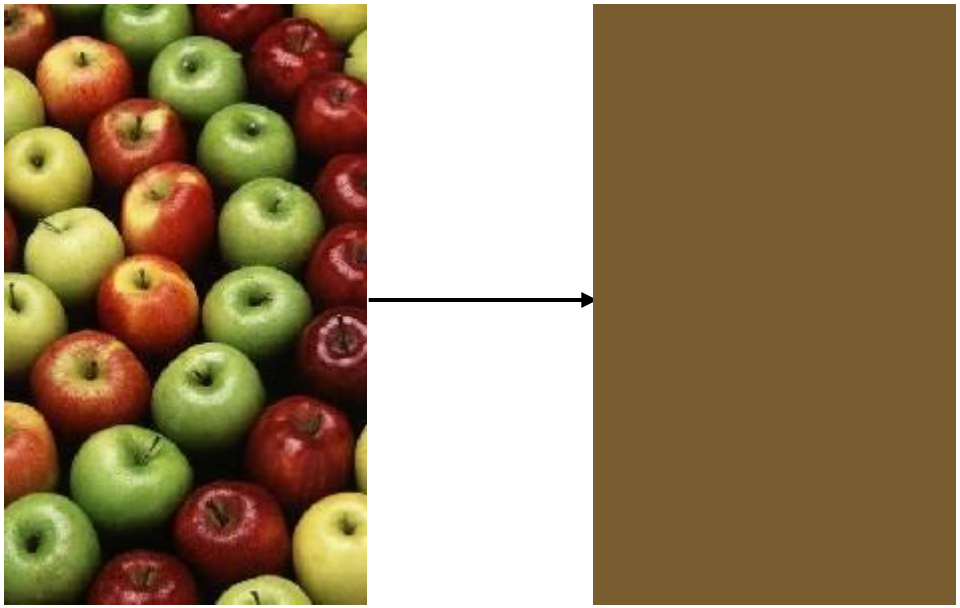
Blur

- Exista 11 efecte de blurare a imaginii, fiecare cu particularitatile sale
- In general produc tranzitii line in imagine, obtinute prin **medierea ponderata** a valorilor pixelilor adiacenti



Average

- Calculeaza culoarea medie a imaginii sau a zonei selectate si umple imaginea/zona selectata cu aceasta culoare

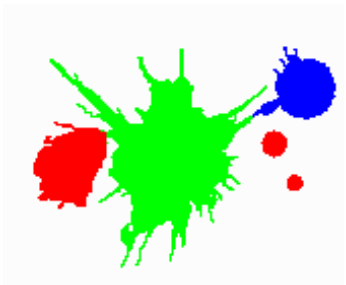


Box Blur

- "Blureaza" o imagine pe baza medierii valorii pixelilor dintr-o vecinatate a pixelului curent
- Se poate selecta dimensiunea ferestrei de filtrare

fereastra mare->filtrare puternica





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Box Blur





Radius = 5

Radius = 10



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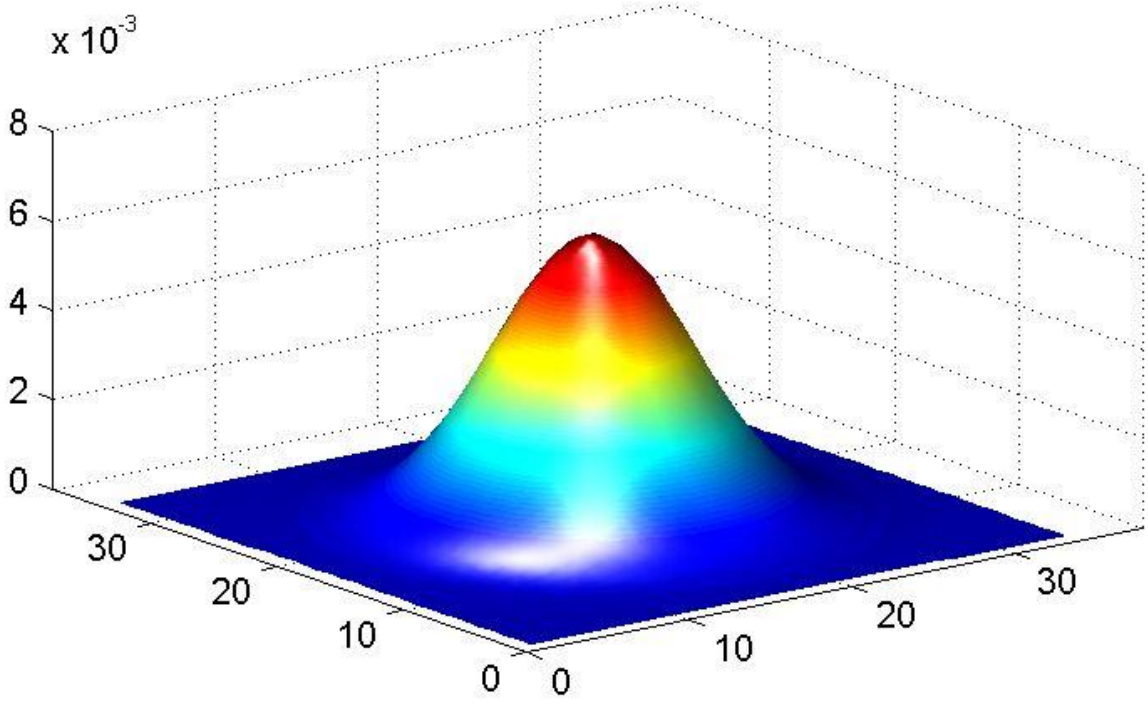
Blur Gaussian

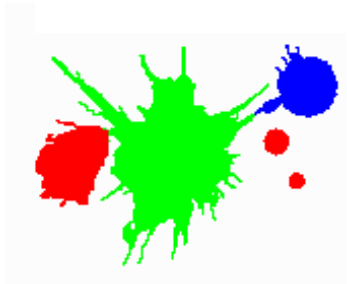
- Face filtrare liniara de **medie ponderata**, **cu ponderi** date pe baza distributiei **Gaussiene** bidimensionale

- Pixelul curent (centrul ferestrei) va avea o pondere mai mare si aceasta scade pe masura ce ne apropiem de marginea ferestrei



Blur Gaussian





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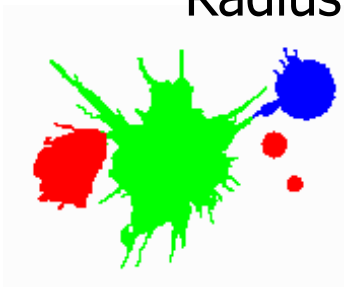
Blur Gaussian



Radius = 5



Radius = 10



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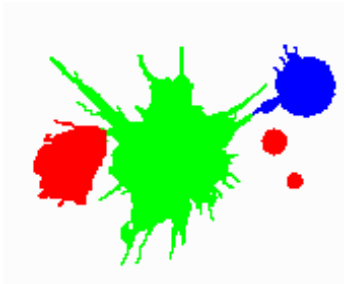


Gaussian Vs. Box Blur



- **Blur Gaussian**
  - Lent
  - Imagini cu treceri mai moi (“smooth”)
  - Lipsa artefacte in imagini

- **Box Blur**
  - Rapid
  - Prezinta artefacte in imagine (linii orizontale si verticale pronuntate)



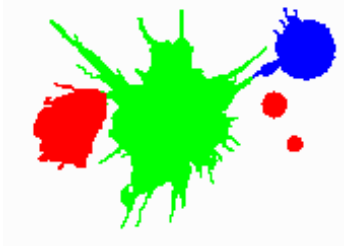
Gaussian Vs. Box Blur



Blur Gaussian Radius = 10



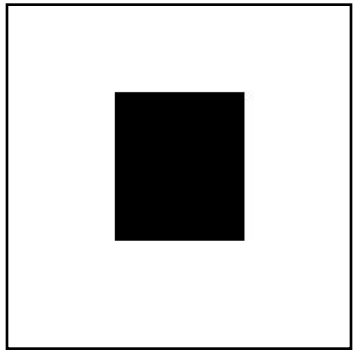
Box Blur Radius = 10



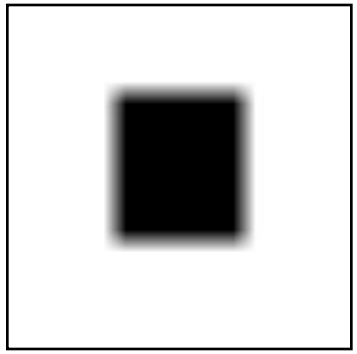
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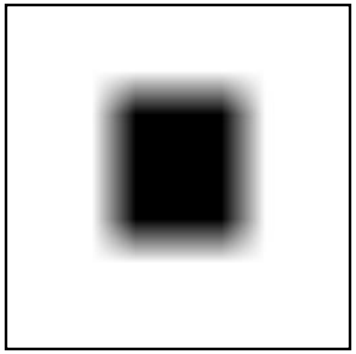
Gaussian Vs. Box Blur



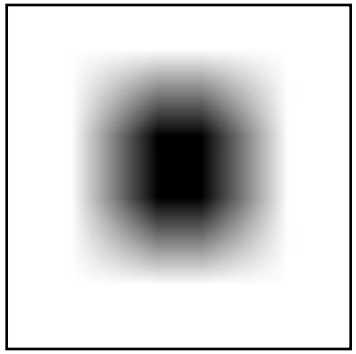
Box Blur



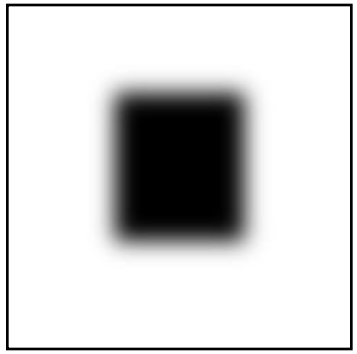
Radius = 8



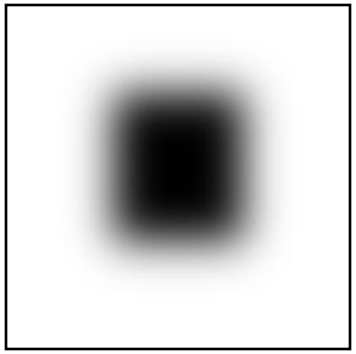
Radius = 16

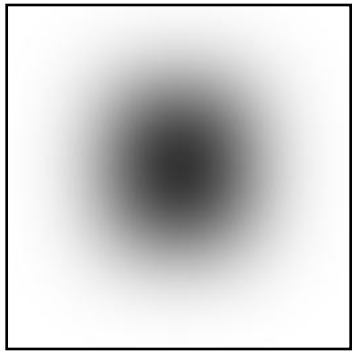


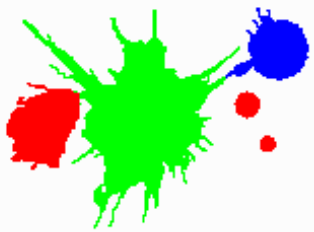
Radius = 32



Gaussian blur







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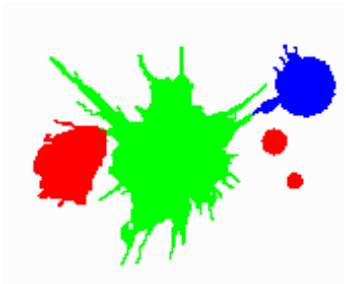
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Blur si Blur More

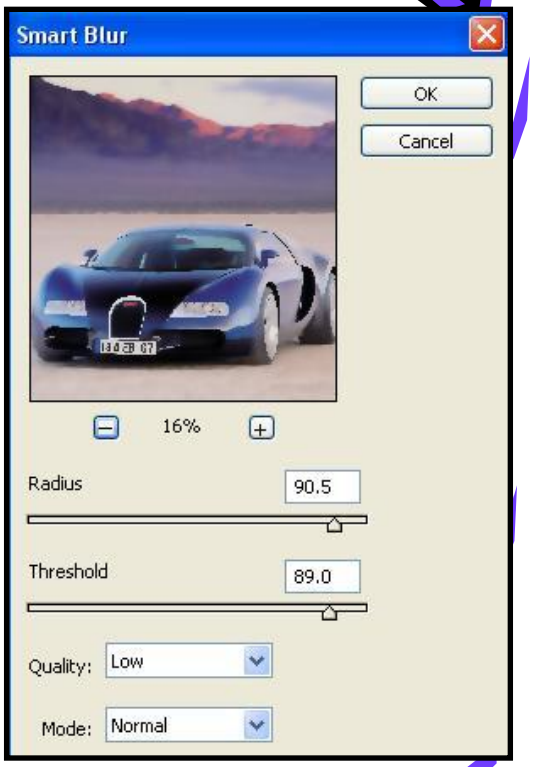


- Variatii ale filtrului de **blur gaussian** cu raza mica **fixata**
- Efectele sunt mai puternice sau mai putin puternica in functie de rezolutia imaginii
- Blur More produce un efect de 3-4 ori mai puternic decat cel al lui Blur (raza mai mare)



Smart Blur

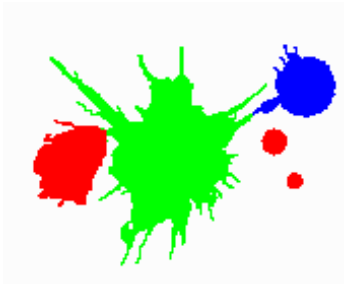
- Blureaza o imagine folosind tehnici de disimilaritate. Modul de blurare e similar cu Gaussian Blur
  - *Radius*: determina aria din imagine in care se cauta pixeli similari
  - *Threshold*: determina cat de diferiti pot fi pixelii pentru a fi afectati
  - Calitate: Mica/Medie/Mare
  - Modul de Realizare:
    - Normal (pe toata imaginea)
    - Edge Only aplica contururi alb-negru
    - Overlay aplica contururi albe



Smart Blur







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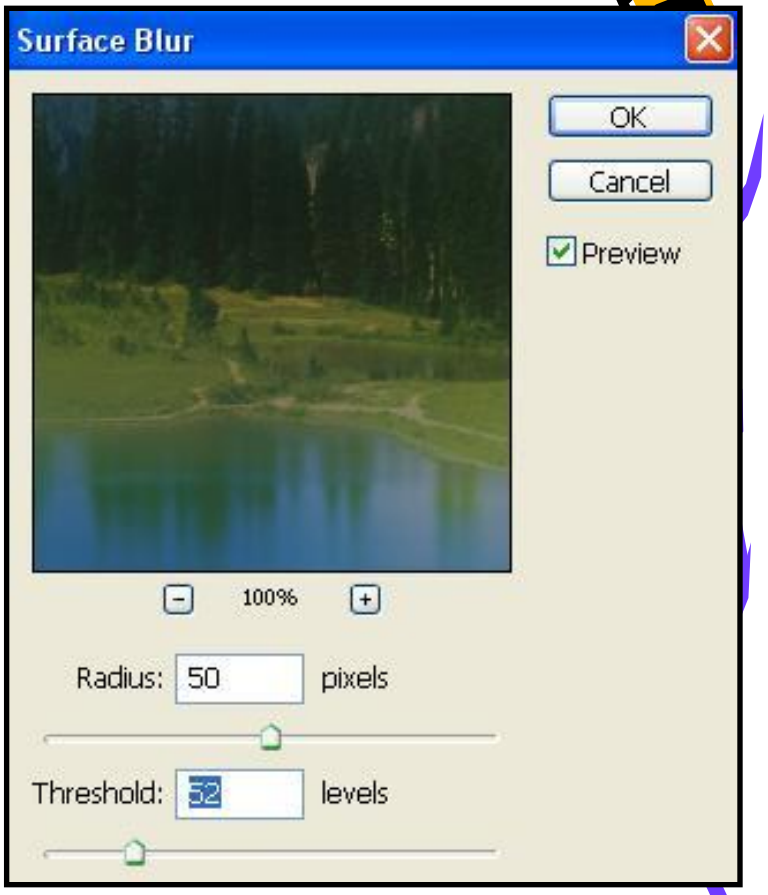
Smart Blur



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Surface Blur

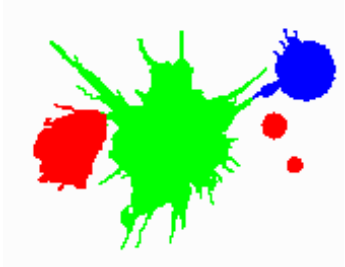
- Blureaza o imagine incercand sa pastreze contururile intacte. Modul de blurare e similar cu Box Blur.
  - *Radius*: dimensiunea feresteri de blurare
  - *Threshold*: diferenta maxima ce poate exista intre valoarea pixelilor din vecinatate si cea a pixelului curent pentru ca acestia sa fie inclusi in blur



Surface Blur



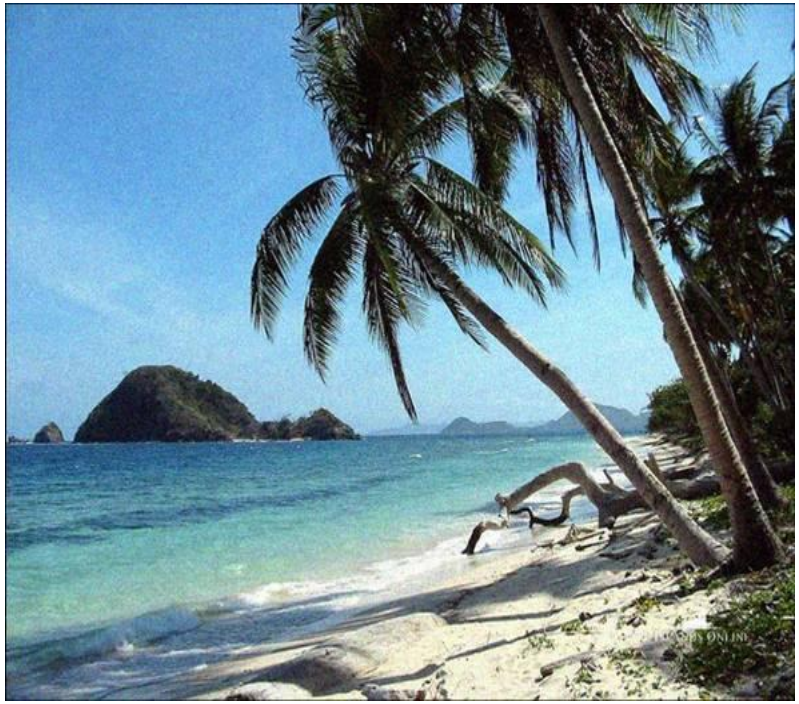




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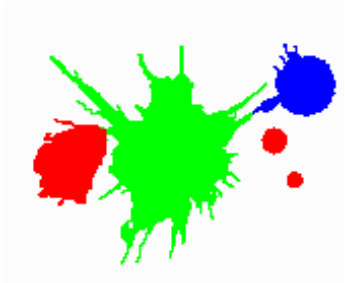
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Surface Blur





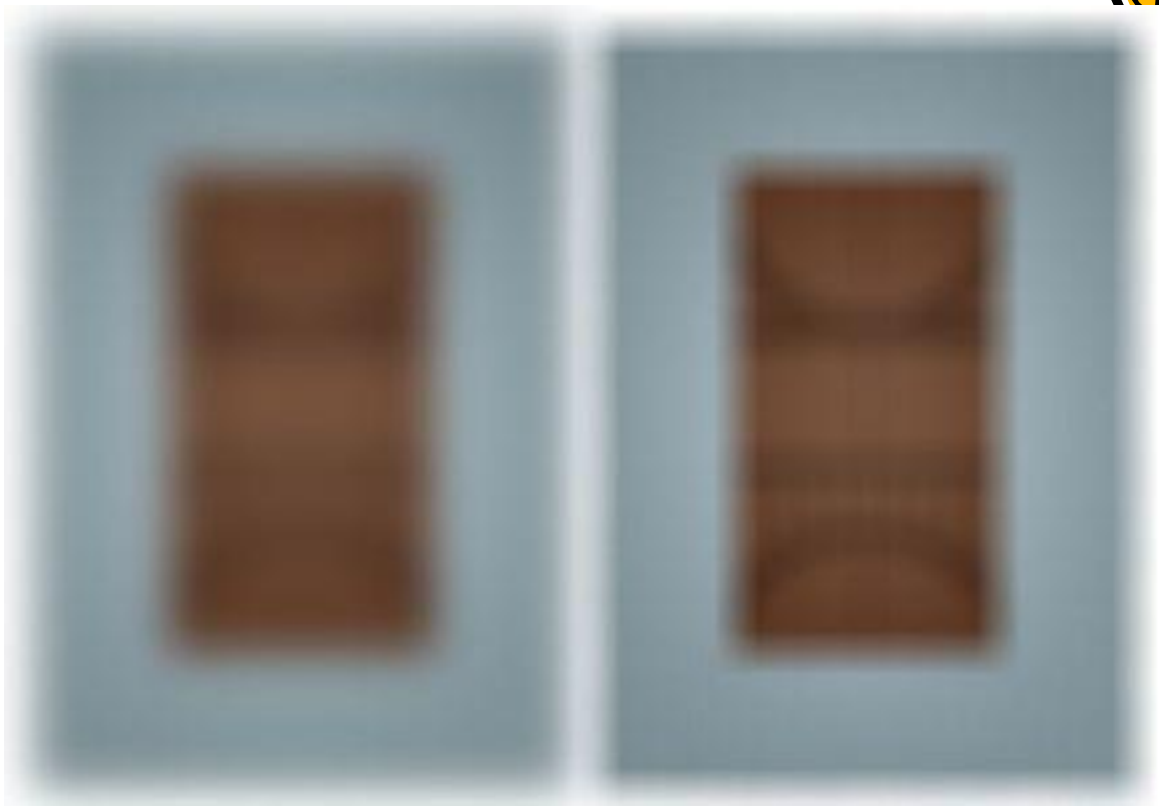
Eliminare Zgomot Gaussian Color. Intensitate 5%



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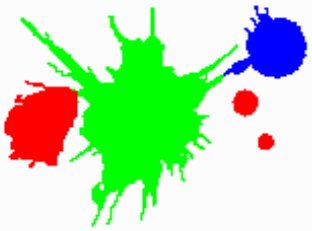
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Gaussian blur (radius=16)

Box Blur

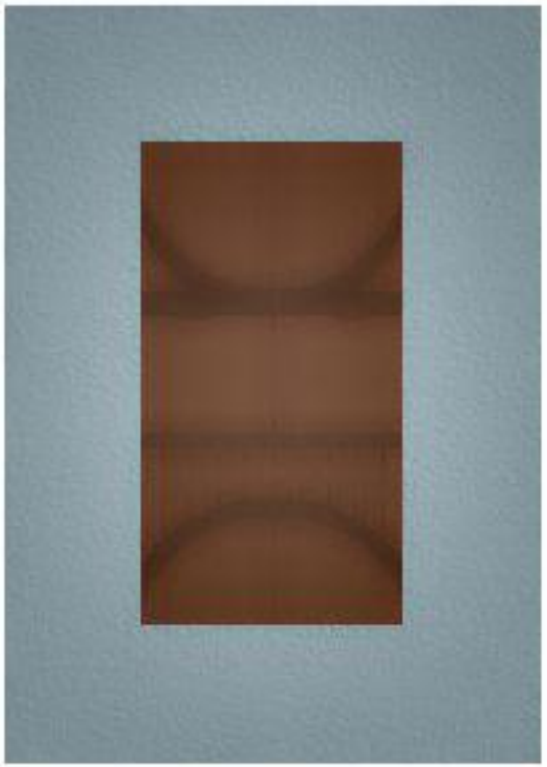


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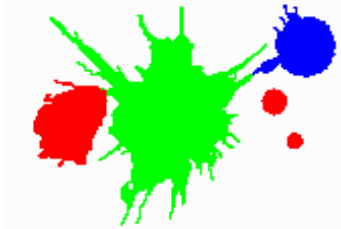






Smart Blur Surface Blur

(radius=16, threshold=30)

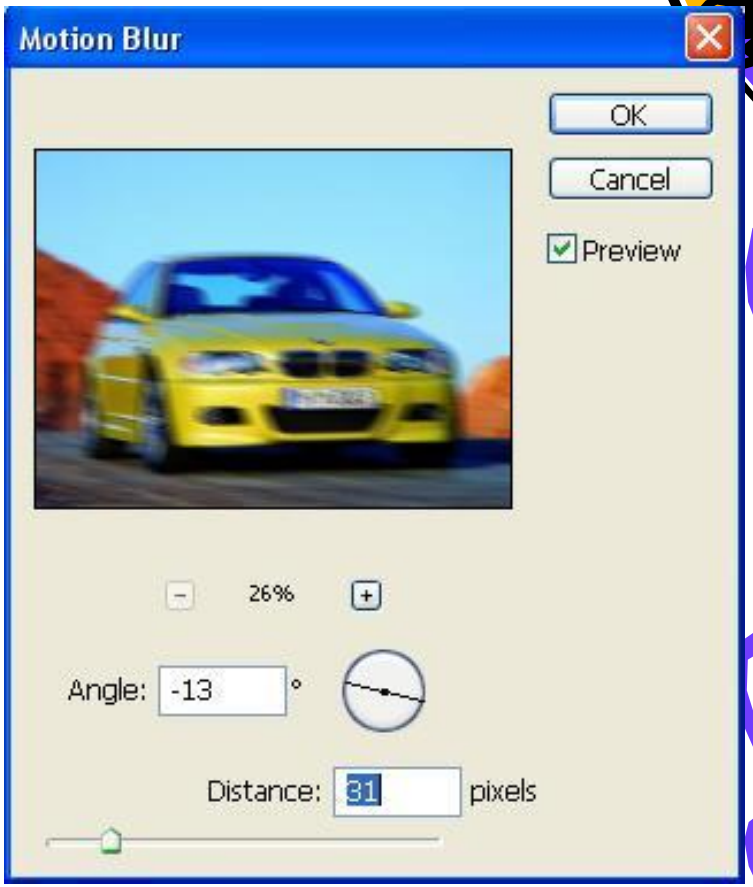


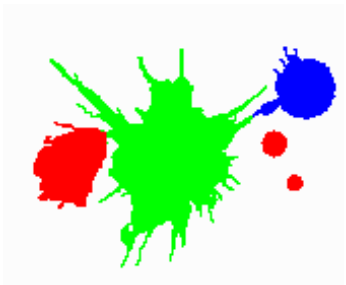
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Motion Blur

- Blureaza imaginea pe o numita directie si cu o anumita intensitate
- Creaza efectul de "obiect in miscare"
- Analog cu a face o fotografie unui obiect in miscare cu un timp de expunere mare
- Se poate simula efectul de 'panning'





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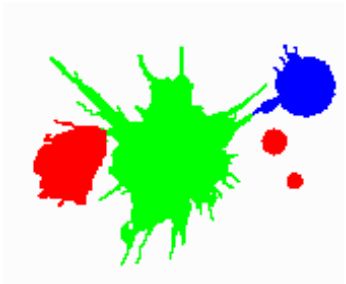
Motion Blur



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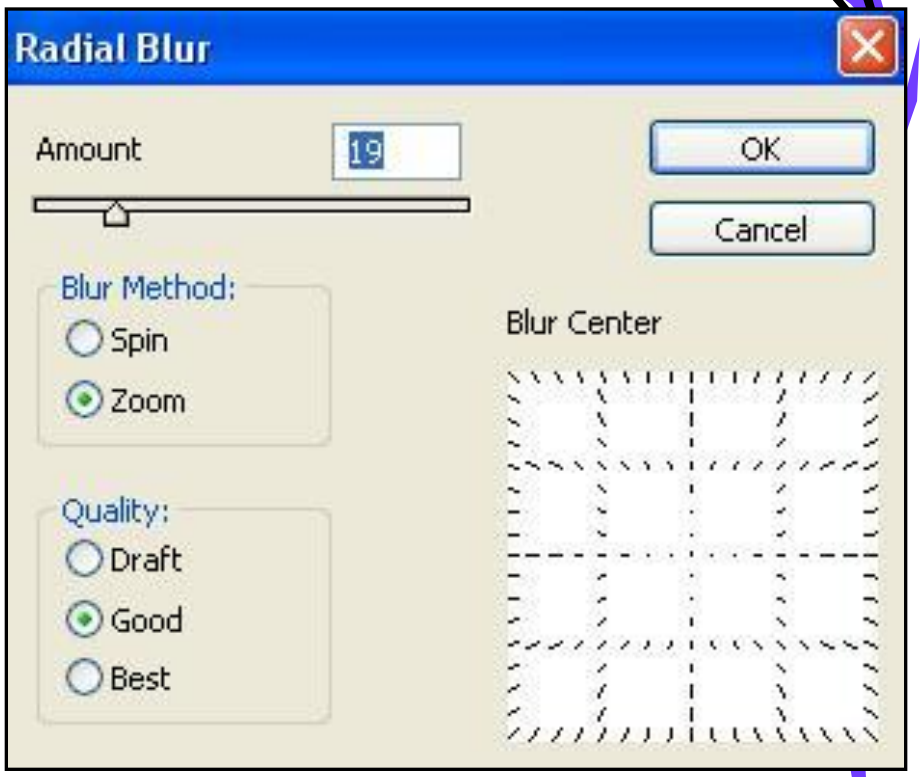


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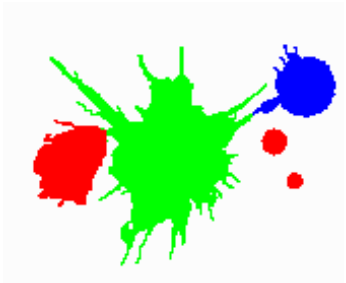
Radial Blur

- Blureaza imaginea creeand efectul de Zoom sau de rotire a camerei foto
  - *Spin*: Se blureaza imaginea in jurul unor cercuri concentice
  - *Zoom*: Se blureaza imaginea in jurul unor linii oblice dispuse astfel incat sa creeze efectul de *Zoom* in imagine



Radial Blur

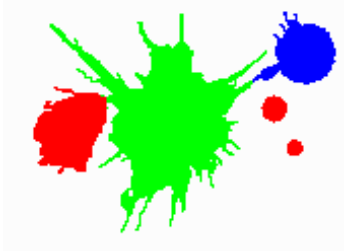
- Se pot selecta calitatea si punctul central al blurarii.
- Calitate: cat de mult zgomot ramane in imagine
- Punctul central e dat in functie de selectia avuta. Daca nu exista selectie se considera ca toata imaginea e selectata



Radial Blur - Spin





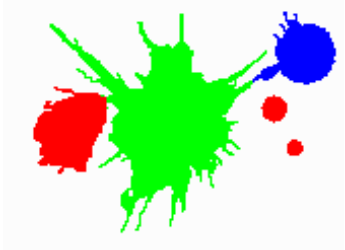


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Radial Blur - Zoom







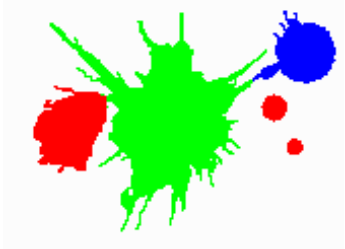
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Radial Blur – Zoom pe Selectie

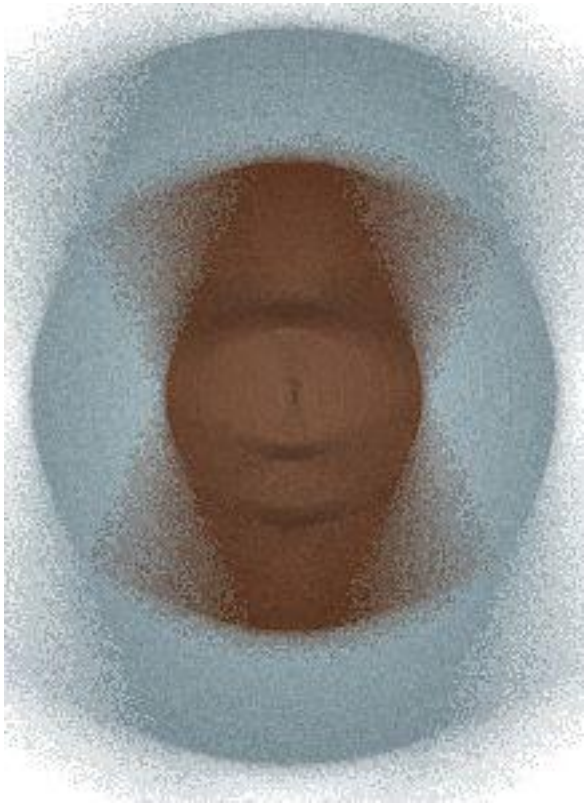




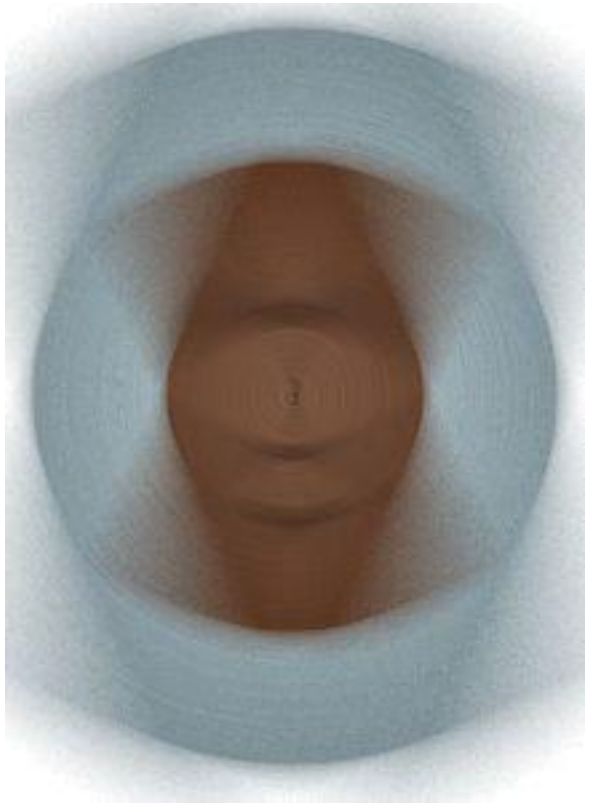


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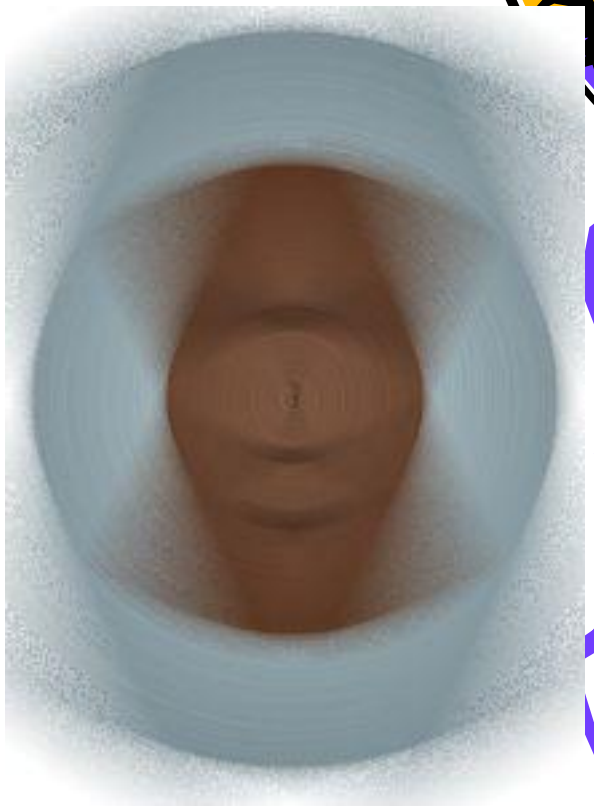
Radial Blur - Quality



Draft



Good



Best

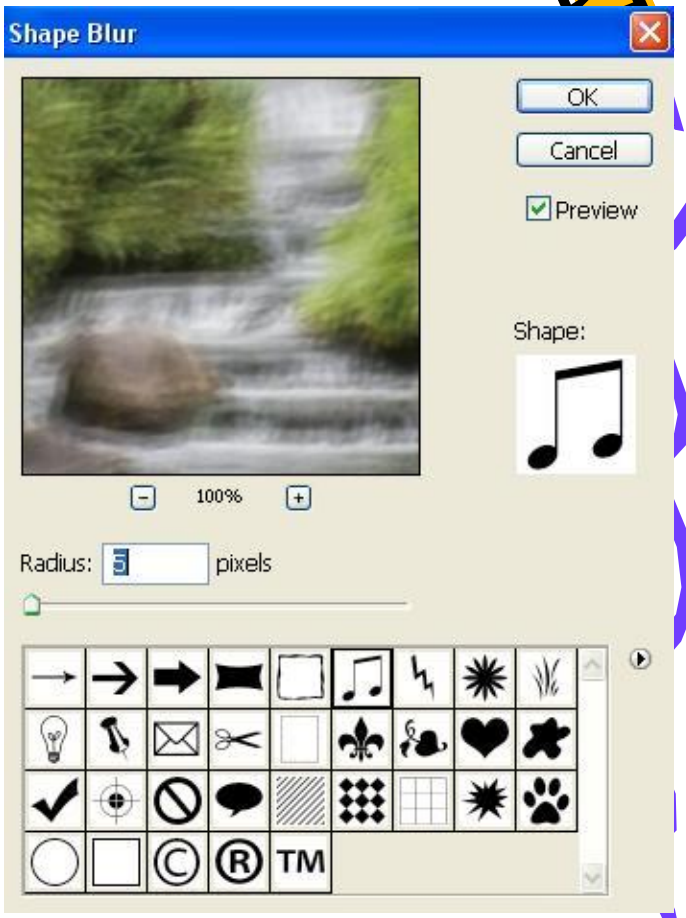


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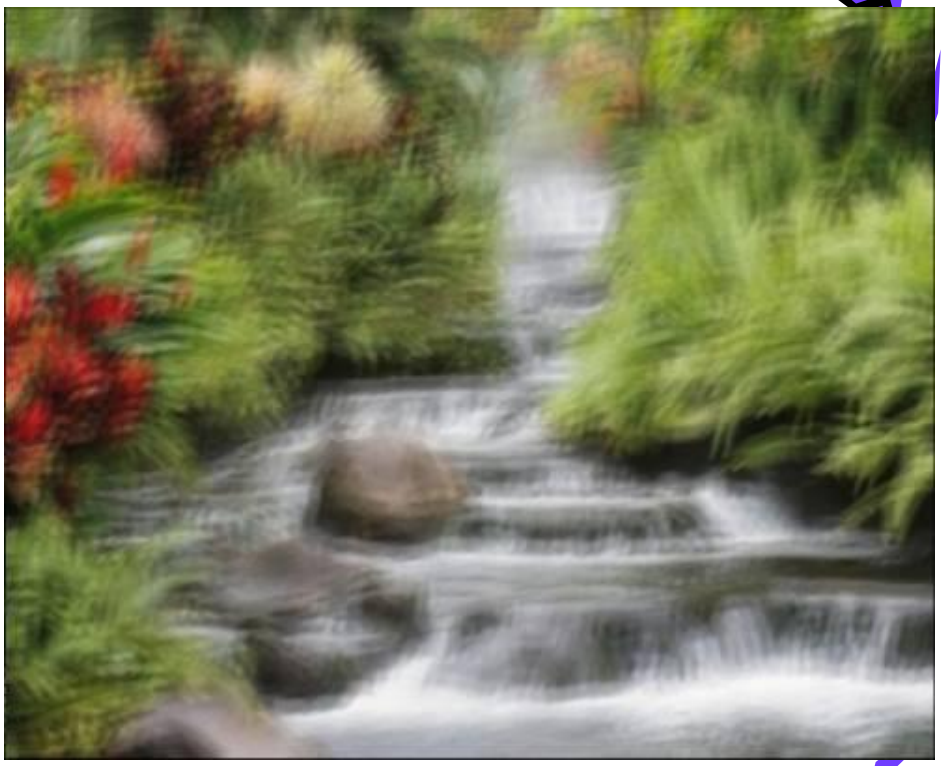
Shape Blur

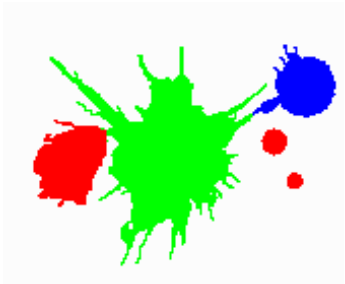
- Foloseste o vecinatate de o forma predefinita
- *Radius*: marimea vecinatatii (intensitatea blurarii)



Shape Blur



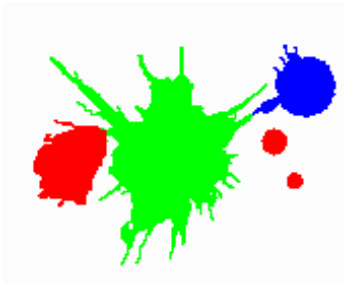




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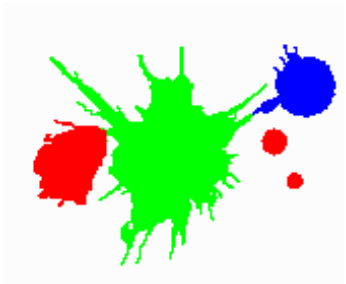
Lens Blur

- Cel mai complex filtru de “blurare”
- Filtru “artistic” folosit pentru a pune in evidenta zone din imagine in contrast cu celelalte
- Blureaza o imagine creand un efect de micsorare (ingustare) al adancimii campului vizual
- Poate fi aplicat pe toata imaginea, pe sectiuni simple din imagine, sau, folosind o harta de adancime a imaginii (*canal alpha, monocrom*) pentru a putea descrie exact cat de mult sa fie “blurate” anumite zone din imagine



Lens Blur – Harta de Adancime

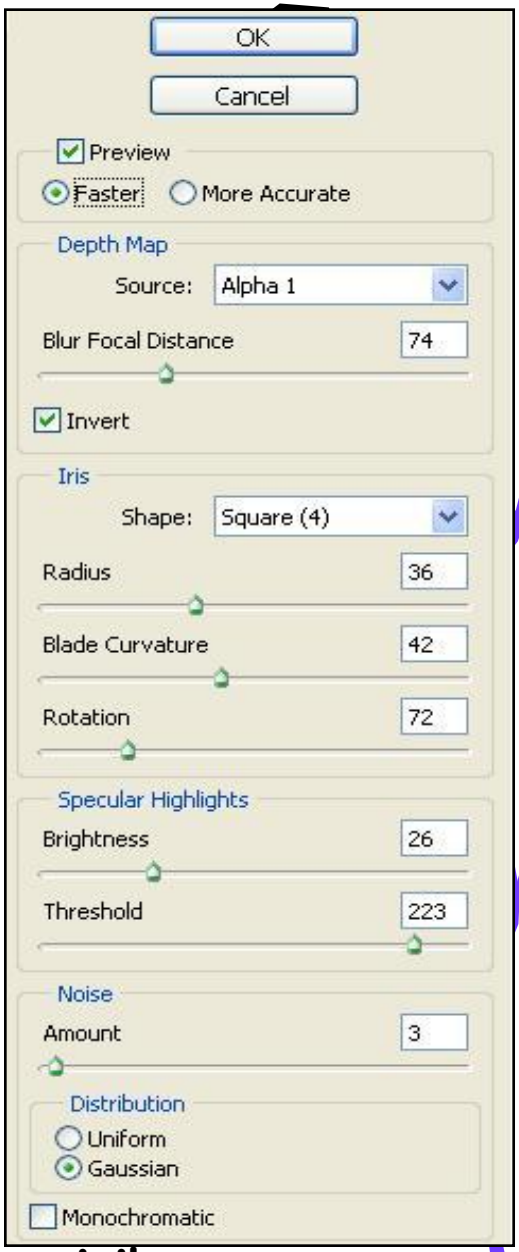
- *Harta de adancime*:
  - Imagine cu nivele de gri
  - Folosita pentru a blura o imagine adaptiv
    - Ex: Zonele negre dintr-un *canal alpha* sunt interpretate ca fiind in focus (blurat foarte putin sau deloc), iar pe masura ce ne departam inspre zonele albe acestea vor fi tratate ca fiind departe de obiectul principal si vor fi blurate semnificativ.

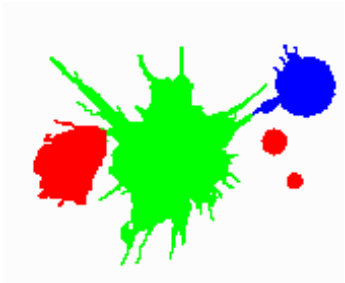




Lens Blur

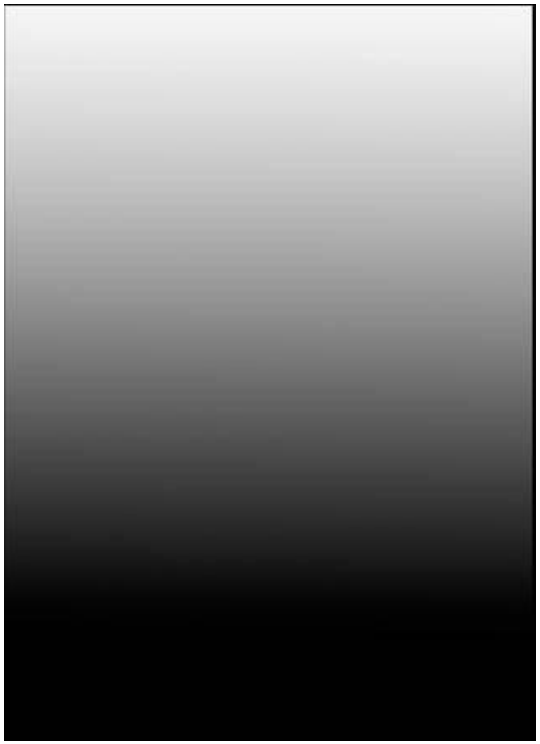
- Modalitatea
  - Rapida Vs. Precisa
- Harta de adancime
  - Selectarea hartii (canale alpha, layere)
  - Distanta focala a zonei blurate
- Detalii de implementare a "blurarii"
  - Forma ferestrei
  - Raza, etc.
- Efecte luminoase ("Specular Highlights")
- Adaugarea de zgomot in imagine
  - Cantitatea
  - Distributia (uniforma/gaussiana)
  - Tipul (monocrom/color)

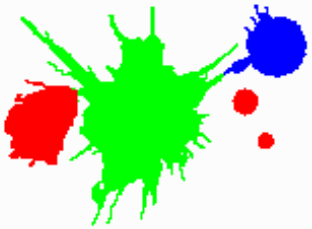




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Lens Blur


+

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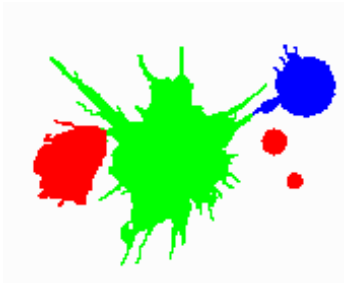
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Lens Blur





Canal Alpha binar – selectie -

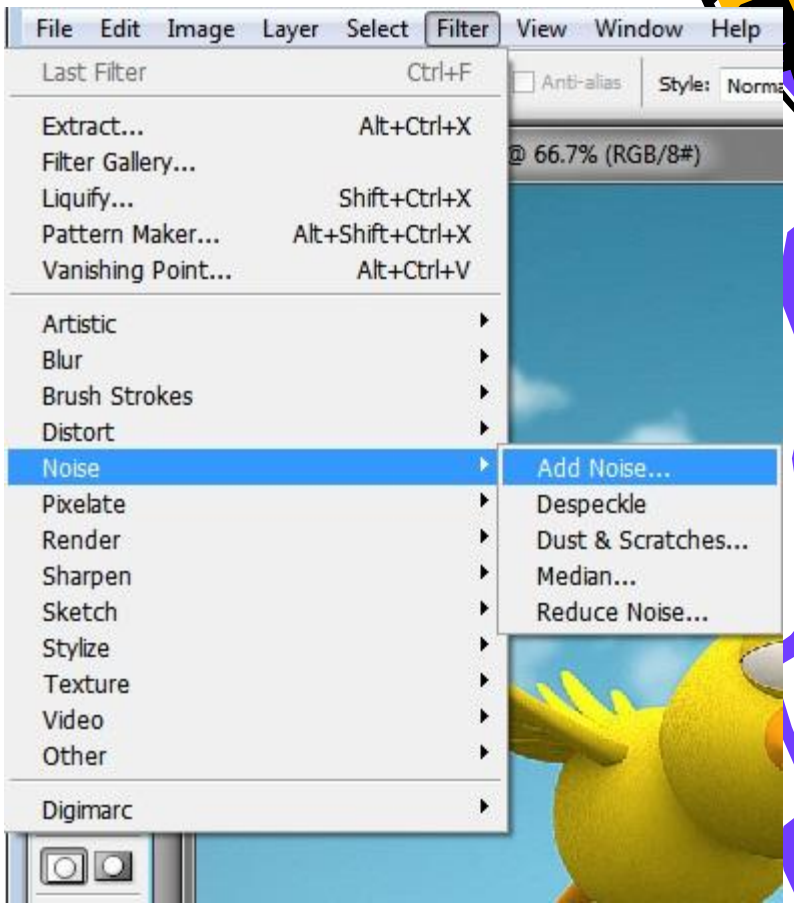


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Filtre de zgomot

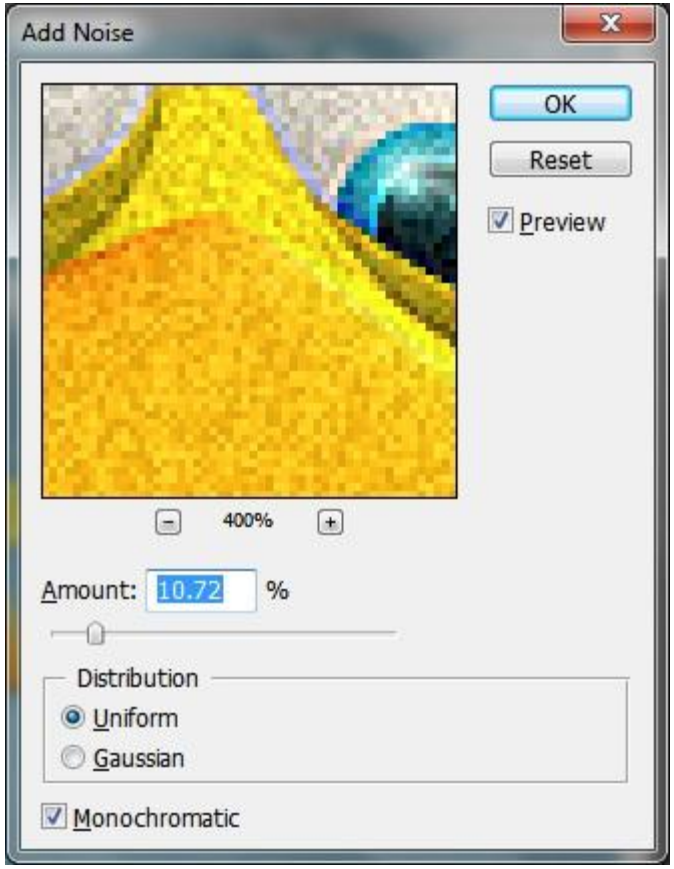
- Adaugă sau elimină *zgomot* sau pixeli cu niveluri de culoare distribuite aleatoriu.



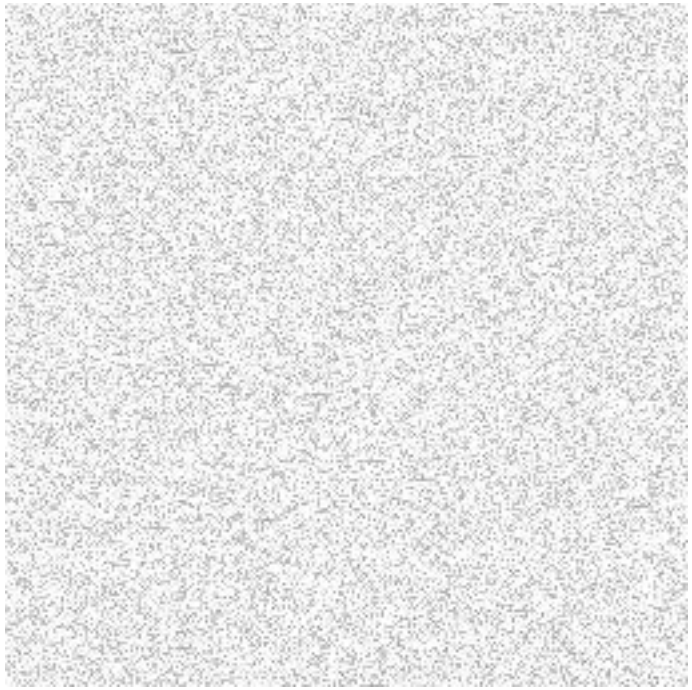
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Add Noise

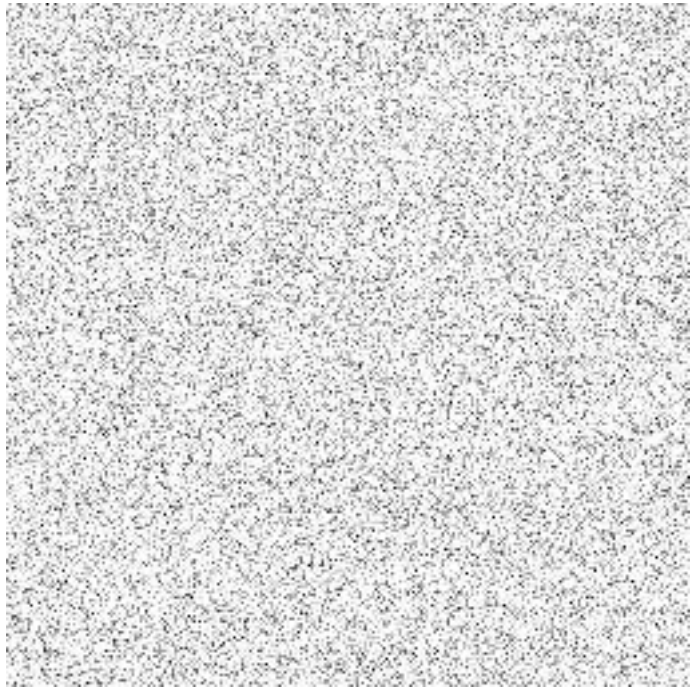
- Se adauga zgomot in imagine
- Se pot selecta:
  - tipul de zgomot,
  - culoarea
  - proportia pixelilor afectati



Add Noise

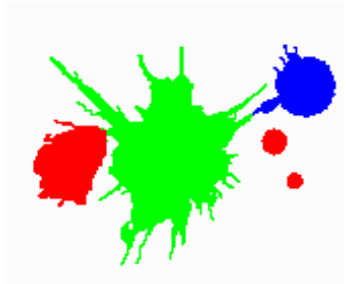


Uniform



Gaussian

(amount=30%, monochromatic)



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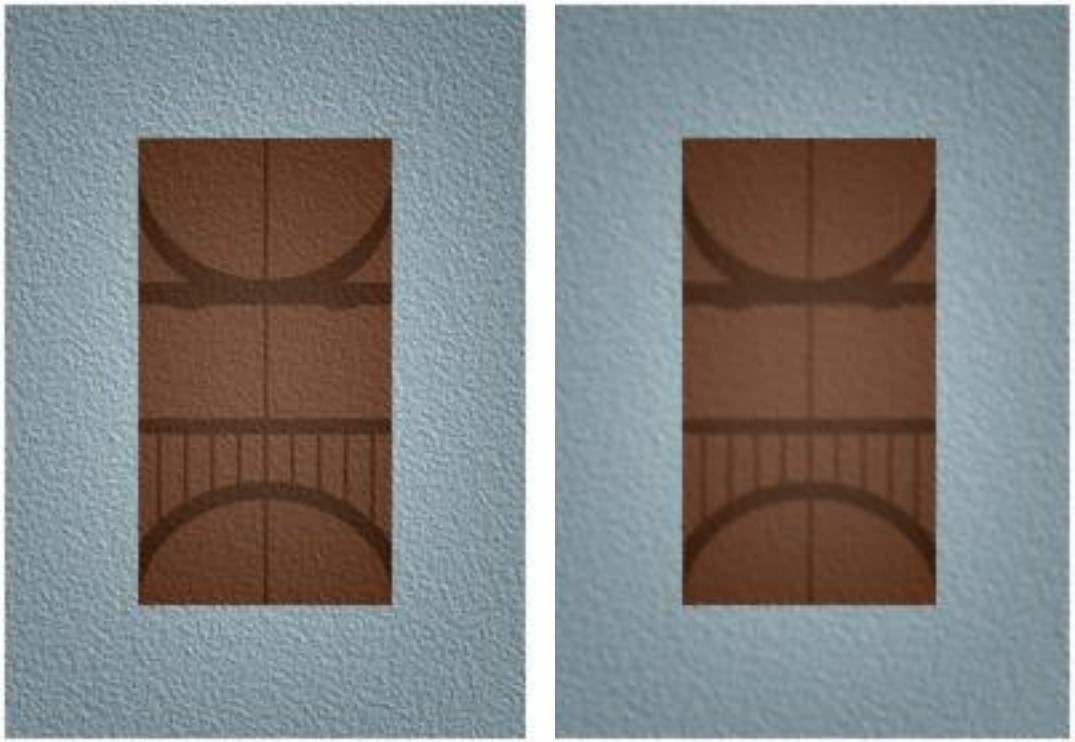
Median





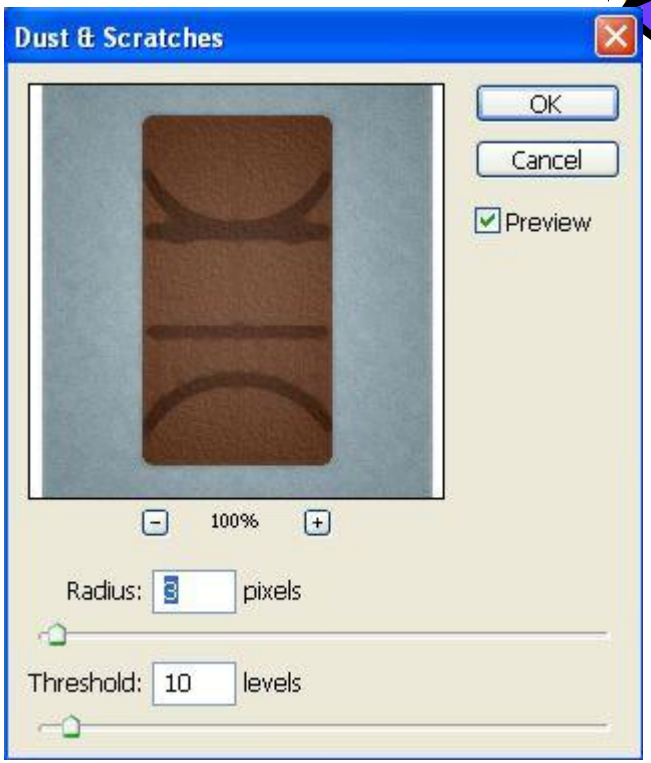
Despeckle

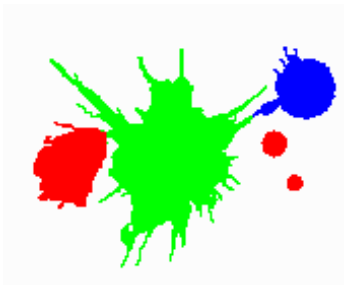
- **Despeckle** detecteaza contururile unei imagini şi face median pe intraga selectie, cu exceptia acelor contururi.



Dust and Scratches

- Face median in zonele de contur
- *Threshold* = cat de diferiti trebuie sa fie pixelii pentru a face filtrarea. (face filtrarea cand pixelii au diferente mai mari decat valoarea *threshold*)
- Cu *Threshold*=0 este chiar filtru median





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Dust and Scratches



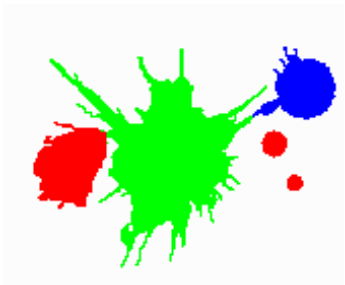
original



Dust and Scratches
Radius=3; Threshold=5



Dust and Scratches
Radius=3; Threshold=10



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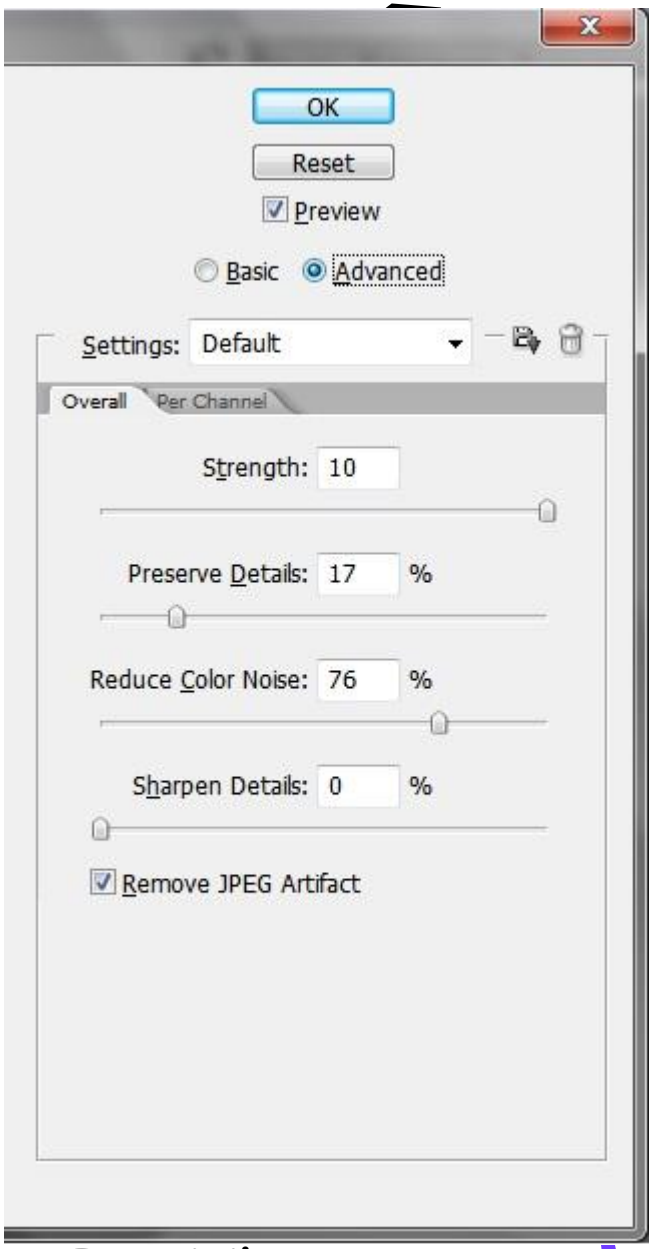


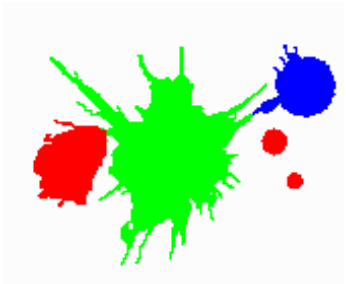
Reduce Noise

- Cel mai complex filtru de reducere a zgomotului

- *Strength*: reduce zgomotul pe planul de luminozitate
- *Preserve Details*: pastreaza contururi (micsoreaza efectul de la *Strength*)

- *Reduce Color Noise*: reduce zgomotul pe planele de crominanta
- *Sharpen Details*: aplica o masca de contrastare (micsoreaza efectul de la *Strength*/*Reduce Color Noise*)

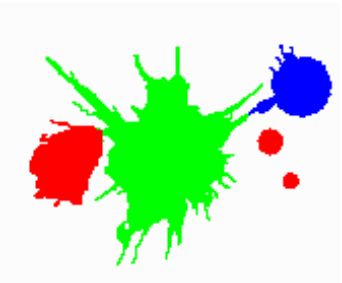




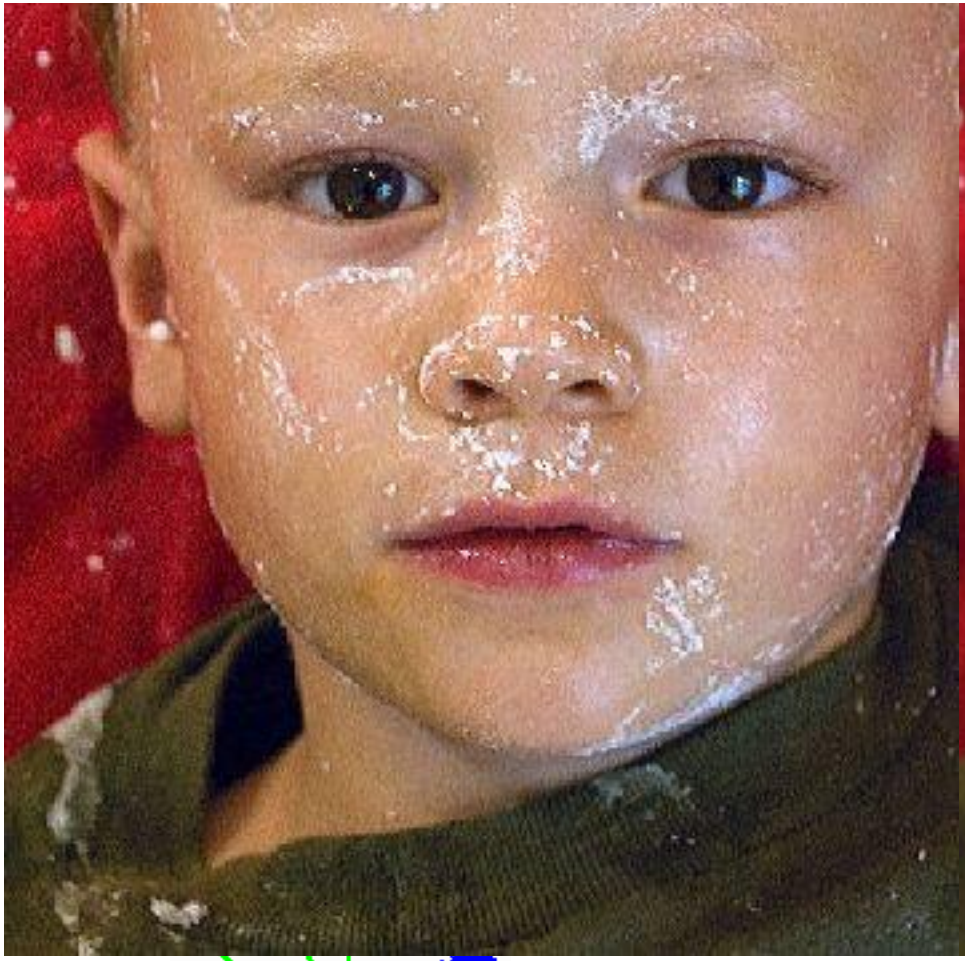
Reduce Noise

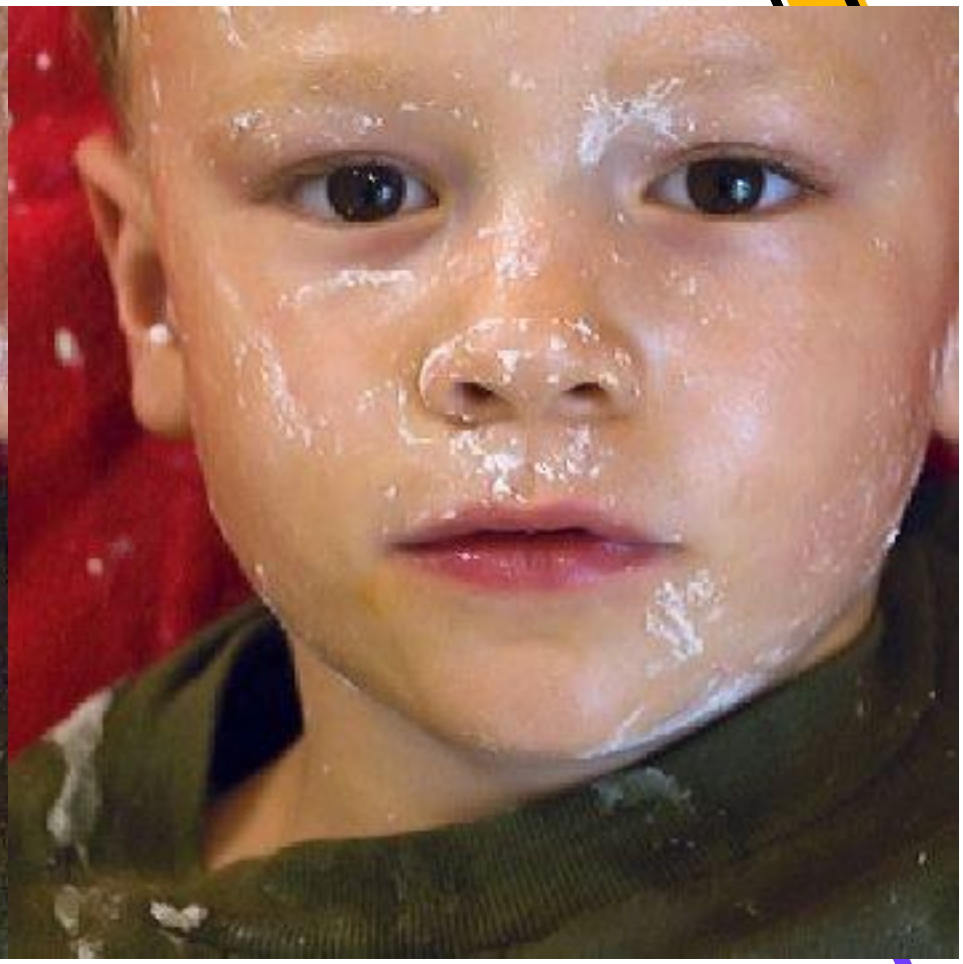
- Se poate face reducere de zgomot si pe fiecare canal in parte (tab-ul *Per Channel*) in cazul in care filtrarea normala distruge detaliile fine

- Pentru imagini cu mult zgomot se poate face intai o transformare in *Lab (Image->Mode->Lab)* si apoi o filtrare separata a cromintantelor si luminantei (eventual o blurare a crominantei cu blur Gaussian)



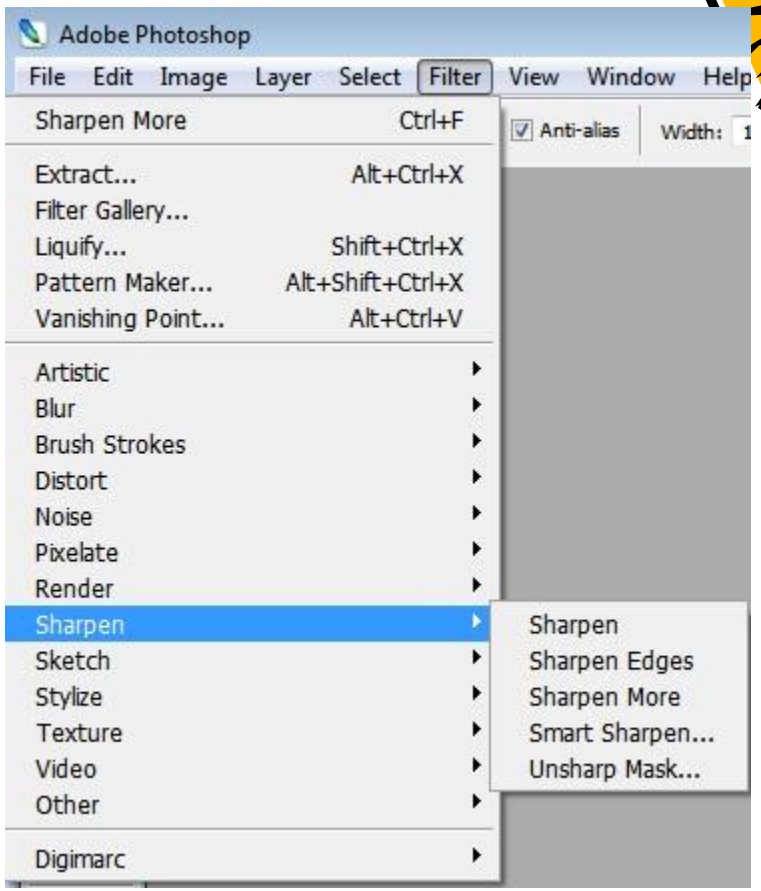
Reduce Noise





Filtre de "Sharpen"

- Filtrele de "sharpen" accentueaza contururile, marind contrastul dintre pixelii adiacenti
- Zona mai deschisa a conturului va deveni si mai luminoasa, zona mai inchisa se va intuneca si mai mult.



Sharpen

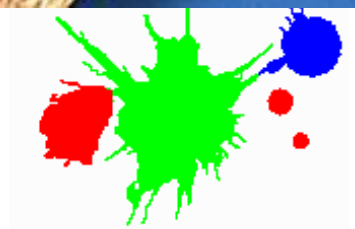




Sharpen More







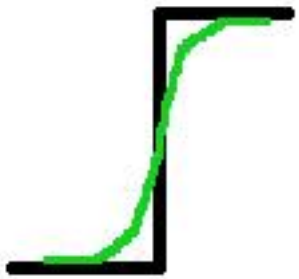
Sharpen Edges

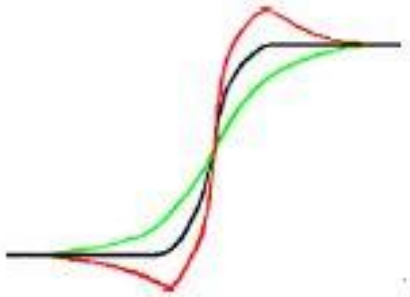


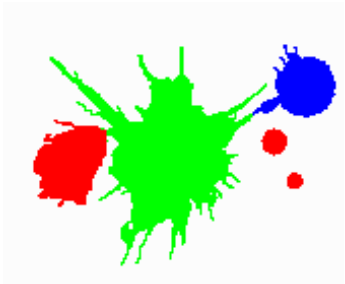


Unsharp Mask

- Filtru de accentuare a contururilor
- Numele vine de la tehnica similara folosita in fotografia pe film
- Blureaza contururile cu filtrul *Gaussian* si apoi scade rezultatul din imaginea initiala

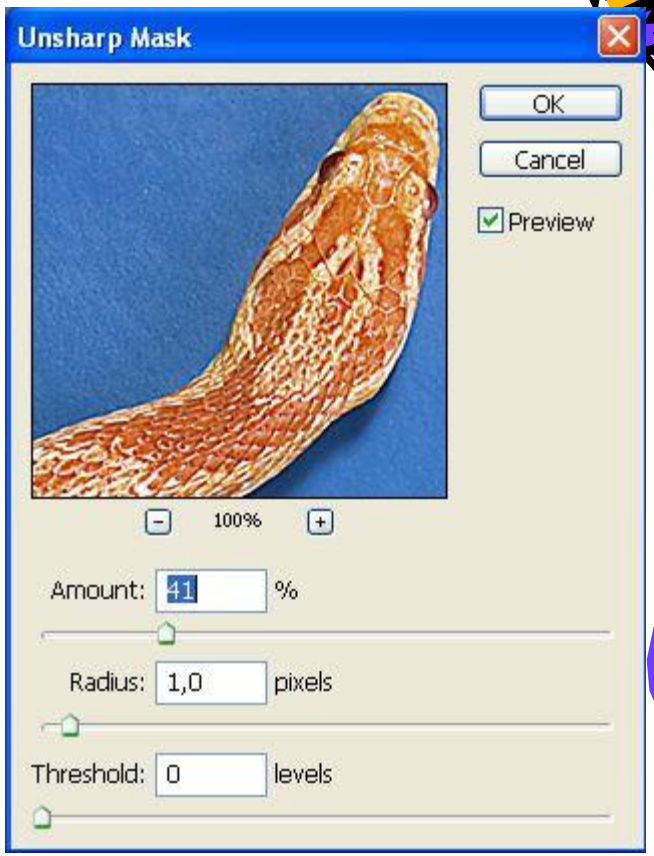


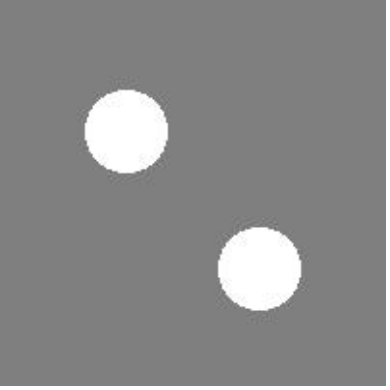




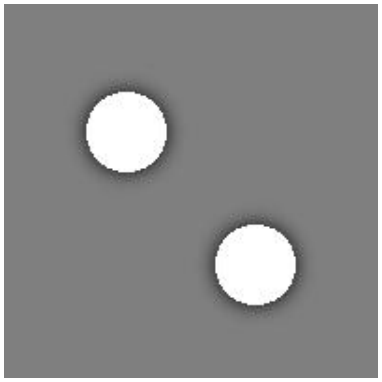
Unsharp Mask

- *Amount*: gradul de amplificare a contrastului
- *Radius*: cat de gros este conturul (cat de mare e halo-ul)
- *Threshold*: cat de mare sa fie diferenta dintre pixeli ca sa fie considerati pixeli de contur

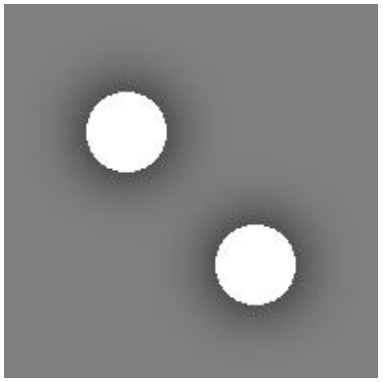




Amount vs Radius Black eye effect

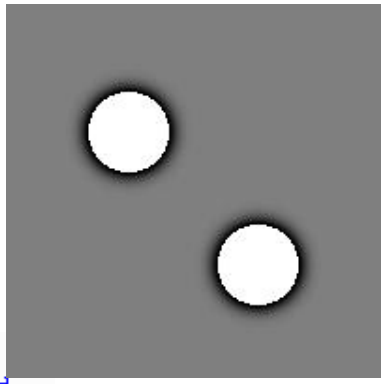


Amount = 100

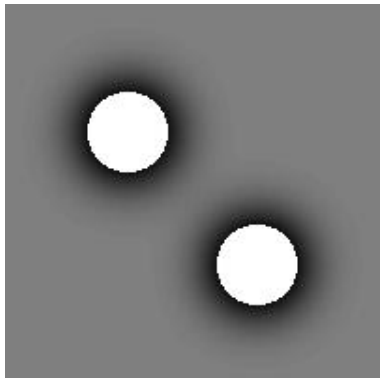


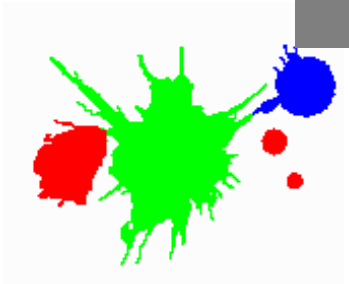
Radius = 5

Radius = 15



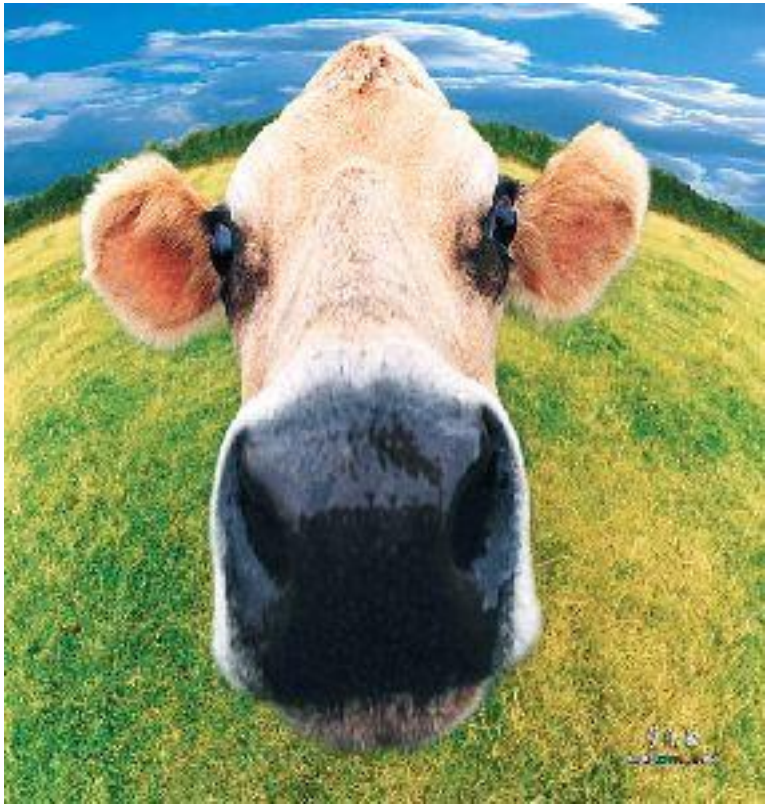
Amount = 250

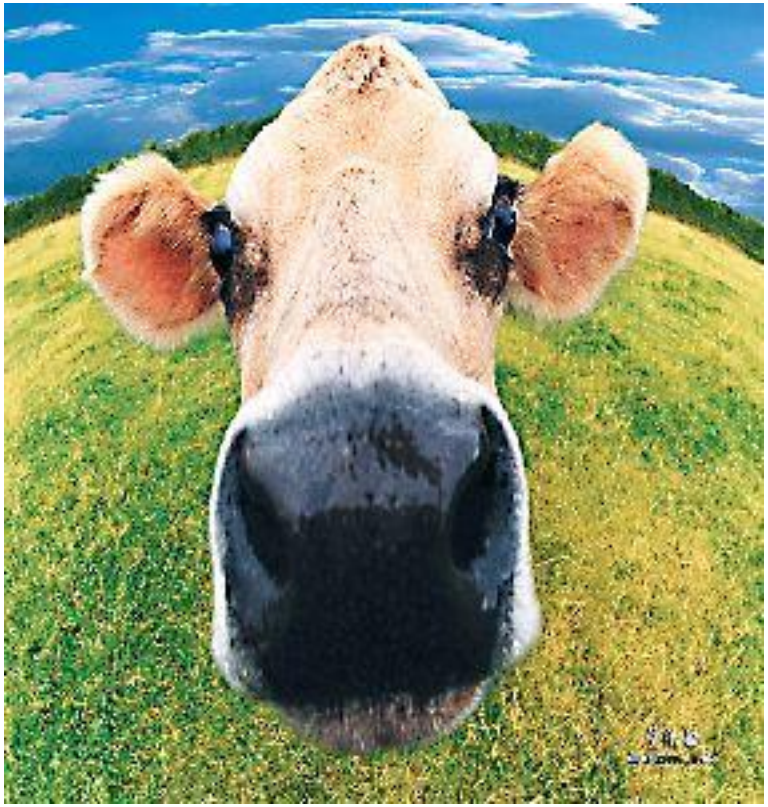


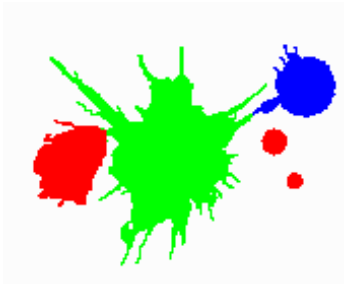


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Unsharp Mask







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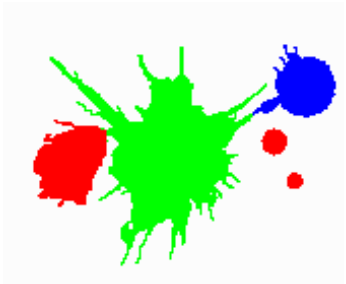


Unsharp Mask



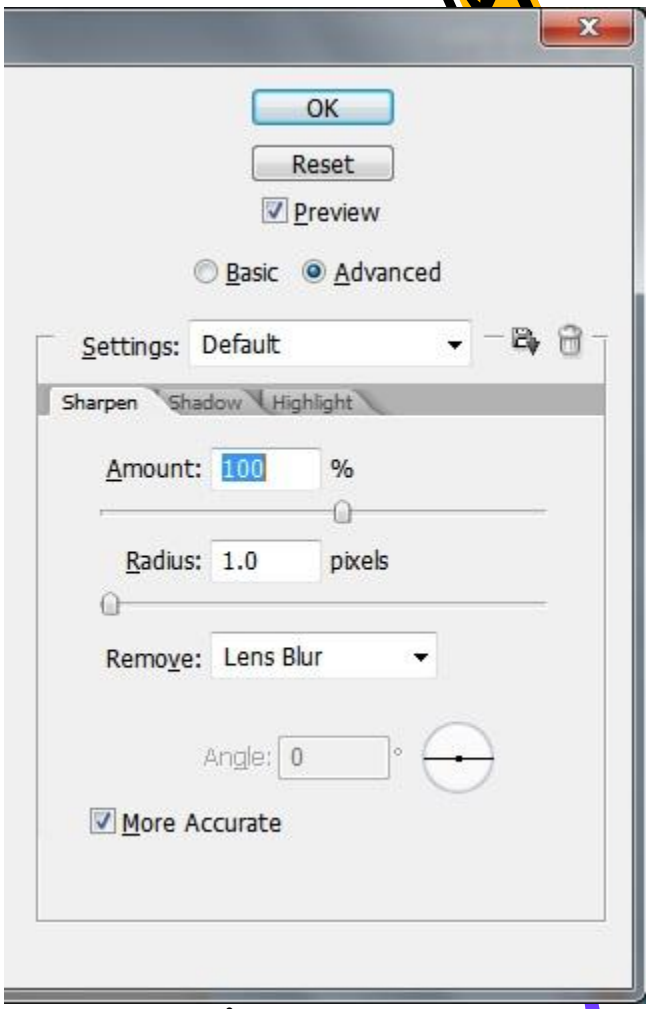
- In cazul in care *Unsharp Mask* produce distorsiuni de culoare (pentru imagini cu contraste puternice de culoare), se poate incerca transformarea imaginii intr-un spatiu de culoare care contine luminanta separat (*Lab*) si aplicarea filtrului numai pe planul de luminanta. Se face apoi trecerea inapoi la *RGB*.

- Atentie la efectul de amplificare a zgomotului!



Smart Sharpen

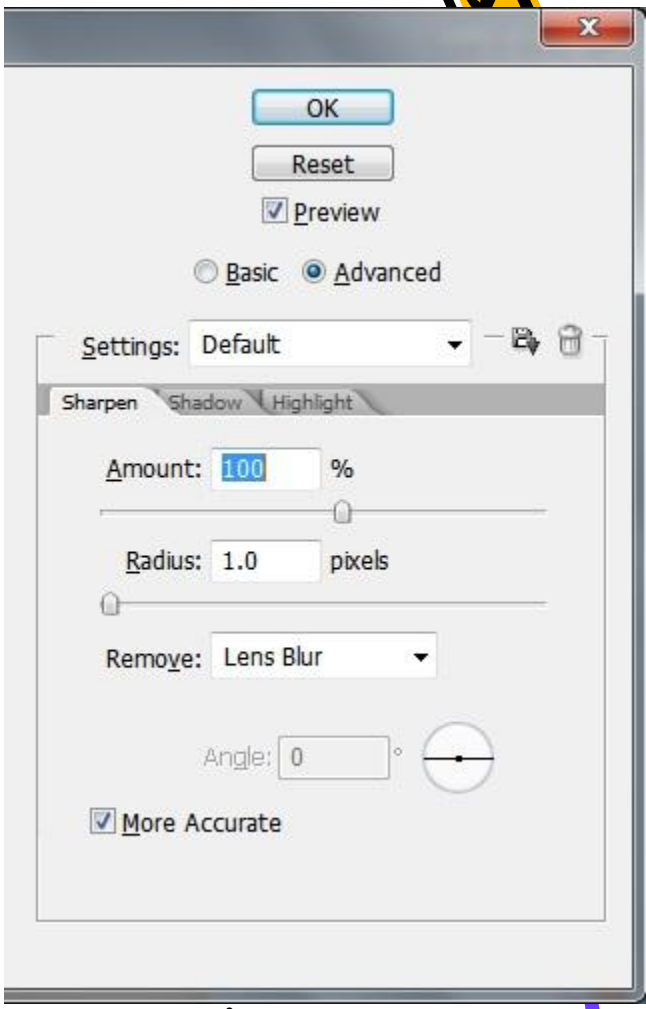
- *Amount*: seteaza cantitatea de sharpen
- *Radius*: determina numarul de pixeli afectati de sharpen
- *Remove*: seteaza algoritmul de blurare folosit la sharpening
  - *Gaussian Blur*: este folosit de USM. Folosit la imagini scanate (daca s-a blurat datorita scanarii)
  - *Lens Blur*: folosit la imagini capturate cu camere digitale care nu au fost procesate
  - *Motion Blur* incerarca sa reduca efectele de blurare datorate miscarii camerei sau a subiectului. Se poate selecta unghiul miscarii.



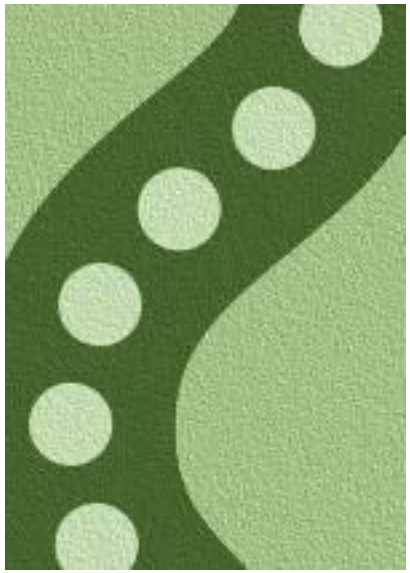
Smart Sharpen

- *More Accurate*: aplica un nou pas de sharpening. Nu se aplica la portrete. Se poate aplica la imagini cu texturi fine.

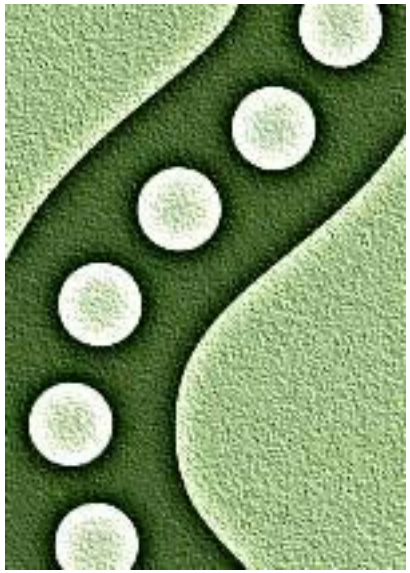
- *Advanced*: Pentru a ajusta sharpen-ul ariilor mai luminoase sau mai intunecate se folosesc optiunile Shadows/Highlight. Se foloseste daca in imagine exista deja cliping pe alb sau negru.



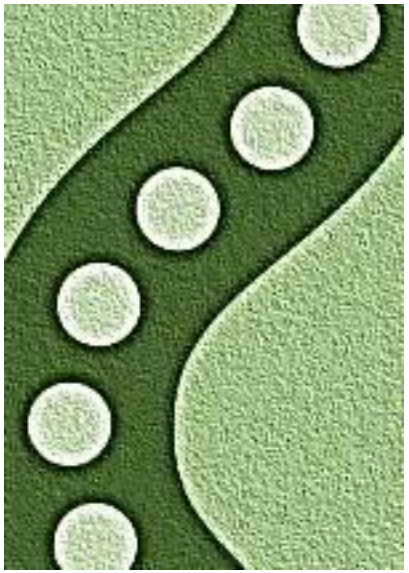
Smart Sharpen



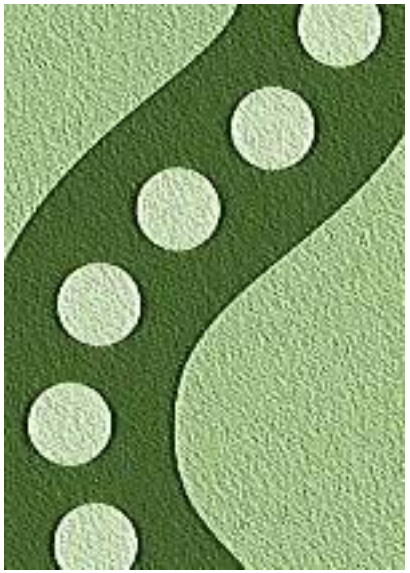
Original



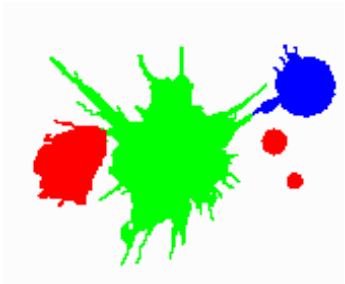
Gaussian blur



Lens Blur

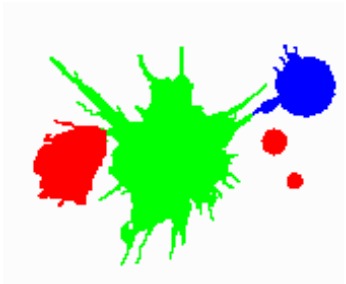


Motion blur
(Angle=0)



Smart Sharpen

- Cu *Remove Gaussian Blur* si cu *More Accurate* deselectat este identic cu USM cu *Threshold*=0
- *Smart Sharpen* se foloseste in general pentru imaginii cu frecvente mari
- Pentru imagini cu frecvente mici (portrete) e mai bine de folosit *High Pass Filter*.



High Pass + Edit->Fade





High Pass + Edit->Fade





Bibliografie

- www.lynda.com
- http://graphicssoft.about.com
- Adobe Photoshop - Classroom in a Book, Adobe Press
- http://www.photoshopsupport.com
- http://www.foto-magazin.ro/tutorial_open.php?art=ftm20/archives/2007/04/utilizarea_filt_1.html

- Multumesc pentru ajutor masteranzilor Oana Miu si Liviu Dutu (TAID 2010)!

