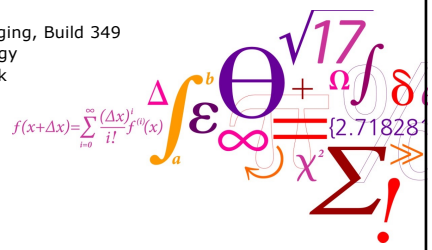
Danmarks Tekniske Universitet

Evaluation, Q&A, and oral exam

Jørgen Arendt Jensen

November 29, 2021

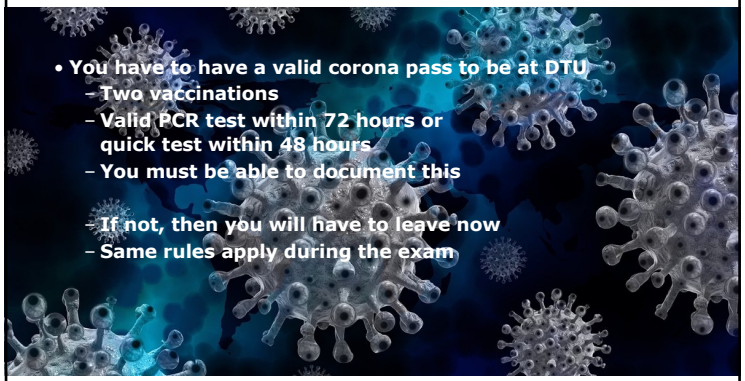
Center for Fast Ultrasound Imaging, Build 349
Department of Health Technology
Technical University of Denmark



Center for Fast Ultrasound Imaging
Department of Health technology

1

Corona Pass



2

Topics for today

- Course evaluation on CampusNet and comments
- Oral exam and time slots:
  - Wednesday 8/12, 2020
  - Thursday 9/12 2020
- Q&A session: Monday 6/12, 2021 at 13.30 in this auditorium
- Help on CT assignments
- MR lecture & exercise

3

DTU Inside evaluation:

Going through it.

4

Oral exam

- 20 min time slots in room 214, building 349
- Take one question, explain on black board
- No books or notes in the room
- Reading list and questions on DTU Learn under Exam
- Time slots are listed on DTU Learn and list is here
- **Q&A session:**
  - **Monday 6/12, 2020 at 13.30 in this auditorium**

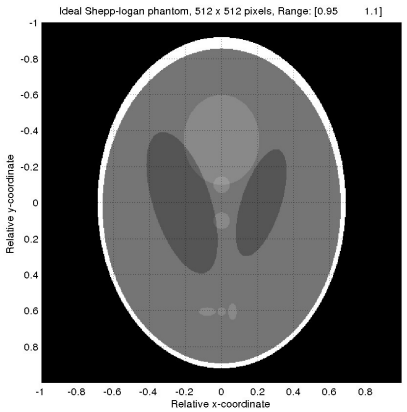
5

CT assignments

- Usual hand-in of reports
- Standard pdf, readable in Urkund
- Remember to include the code
- Grade will be available before the exam

6

Shepp-Logan phantom

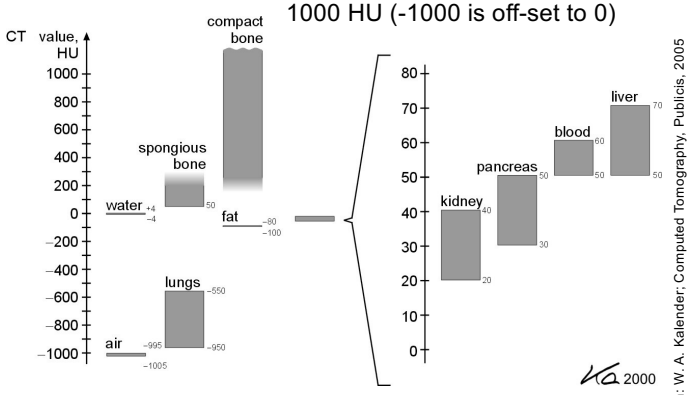


Note that the Shepp-Logan phantom is not in Hounsfield units, but the relative scaling is the same.

7

Hounsfield units

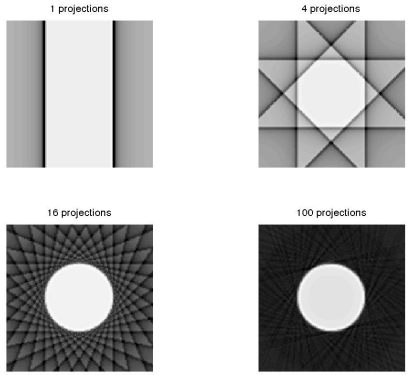
Note that the in-vivo data on the website is off-set by 1000 HU (-1000 is off-set to 0)



From: W. A. Kalender; Computed Tomography, Publicis, 2005

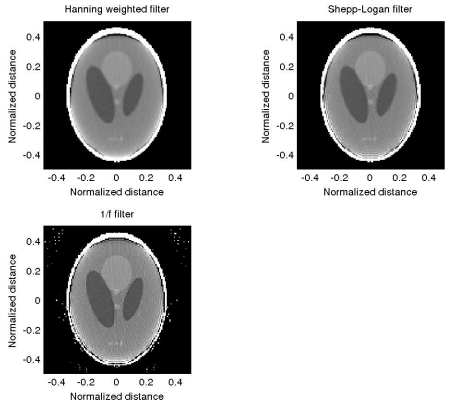
8

Influence from number of projections



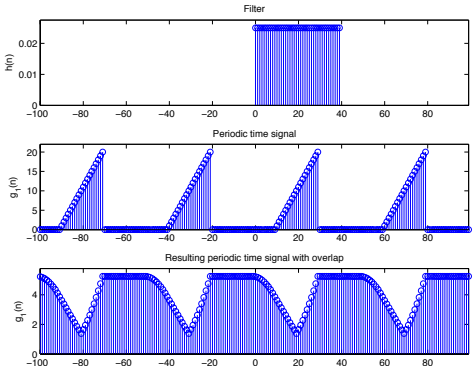
9

Comparison between filters



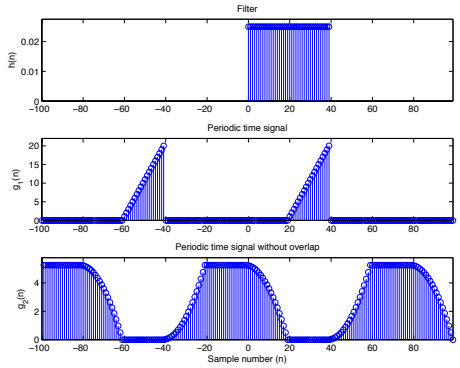
10

Circular convolution



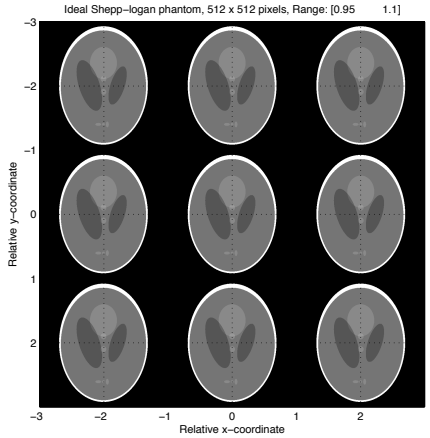
11

Circular convolution



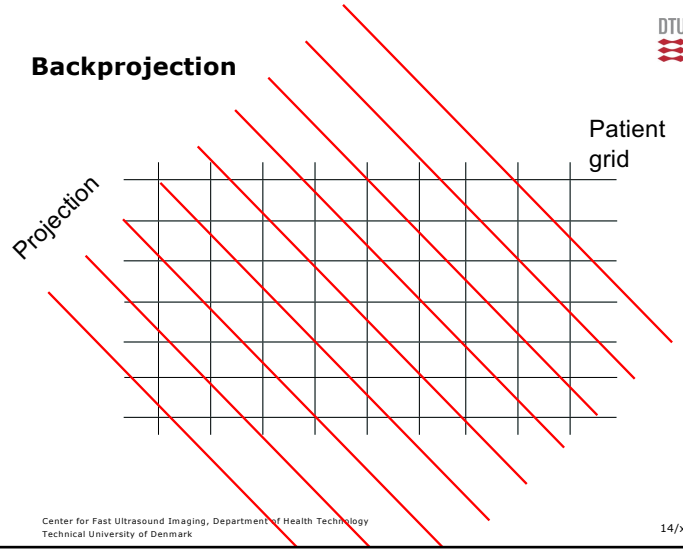
12

Circular convolution – Shepp-Logan



13

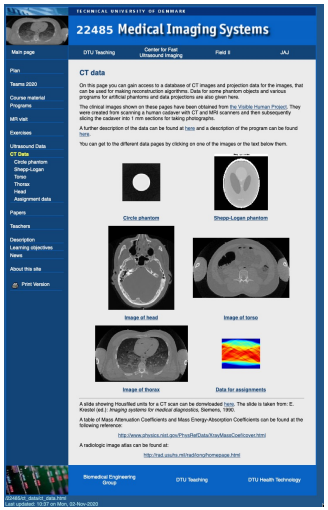
Backprojection



14

Data for testing and validation

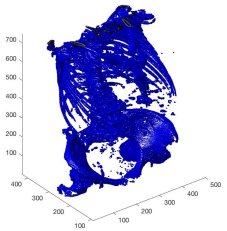
- Use data sets on web site
- Circular phantom for geometry test
- Shepp-Logan for orientation and quantitative data
- In-vivo images for Hounsfield units

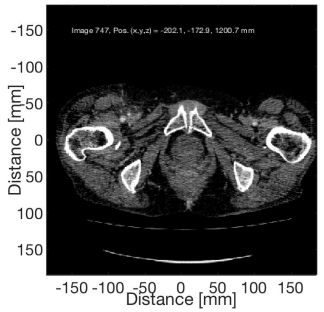


15

Assignment data

- DICOM data from female patient
- All data available on the web
- Task is to find which slice it is





Data and program in:
undervisning/k_22485_31545_billeder/ct_data/dicom_data

16

Reading DICOM data

```
%  Set overall parameters
dir_name='DICOM/ST00001/SE00001/';  %  Directory name
start_image=1;                      %  First image in series
end_image=747;                      %  Last image in series
frame_rate=50;                      %  Frame rate for playing back the movie

%  Set the dynamic range for the display
off_set=100;          %  Offset [Hu]
range=400;            %  Range to display [Hu]
map_values=128;       %  Number of gray level values
bone_off_set= -250;   %  Offset for showing the bones
bone_range=100;       %  Range for showing the bones

%  Initialize figure
colormap(gray(map_values));
dicom_movie(end_image+1-start_image) = struct('cdata',[],'colormap',[]);

%  Read information for the first images
file_name='IM00001';
info=dicominfo([dir_name, file_name]);
dx=info.PixelSpacing(1);
dy=info.PixelSpacing(2);
Y = dicomread(info);
[Nx,Ny]=size(Y);

%  Make space for all the images
Y=zeros(Nx,Ny,end_image+1-start_image);
z_positions=zeros(end_image+1-start_image,1);
```



```
%  Loop through the images and read and display them

for i=start_image:end_image
    file_name=['IM00',num2str(floor(i/100)),num2str(floor(rem(i,100)/10)),num2str(rem(i,10))];
    info=dicominfo([dir_name, file_name]);
    Y(:,:,i) = dicomread(info);
    image(((1:Nx)-Nx/2)*dx,((1:Ny)-Ny/2)*dy,(double(Y(:,:,i))+off_set)/range*map_values)
    xlabel('Distance [mm]')
    ylabel('Distance [mm]')
    pos=sprintf('%5.1f, %5.1f, %5.1f', info.ImagePositionPatient(1), …
         info.ImagePositionPatient(2), info.ImagePositionPatient(3));
    z_positions(i)= info.ImagePositionPatient(3);
    text(-150, -150, ['Image ', num2str(i),', Pos. (x,y,z) = ', pos,' mm'], 'Color', [1 1 1])
    axis('image')
    drawnow
    dicom_movie(i)=getframe;
end

%  Display the movie

movie(dicom_movie, 5, frame_rate);
```

Full script can be found at:

courses.healthtech.dtu.dk/22485/files/ct_data/dicom_data/display_dicom_images.m

on the page for the CT data: courses.healthtech.dtu.dk/22485/?ct_data/assign_data.html