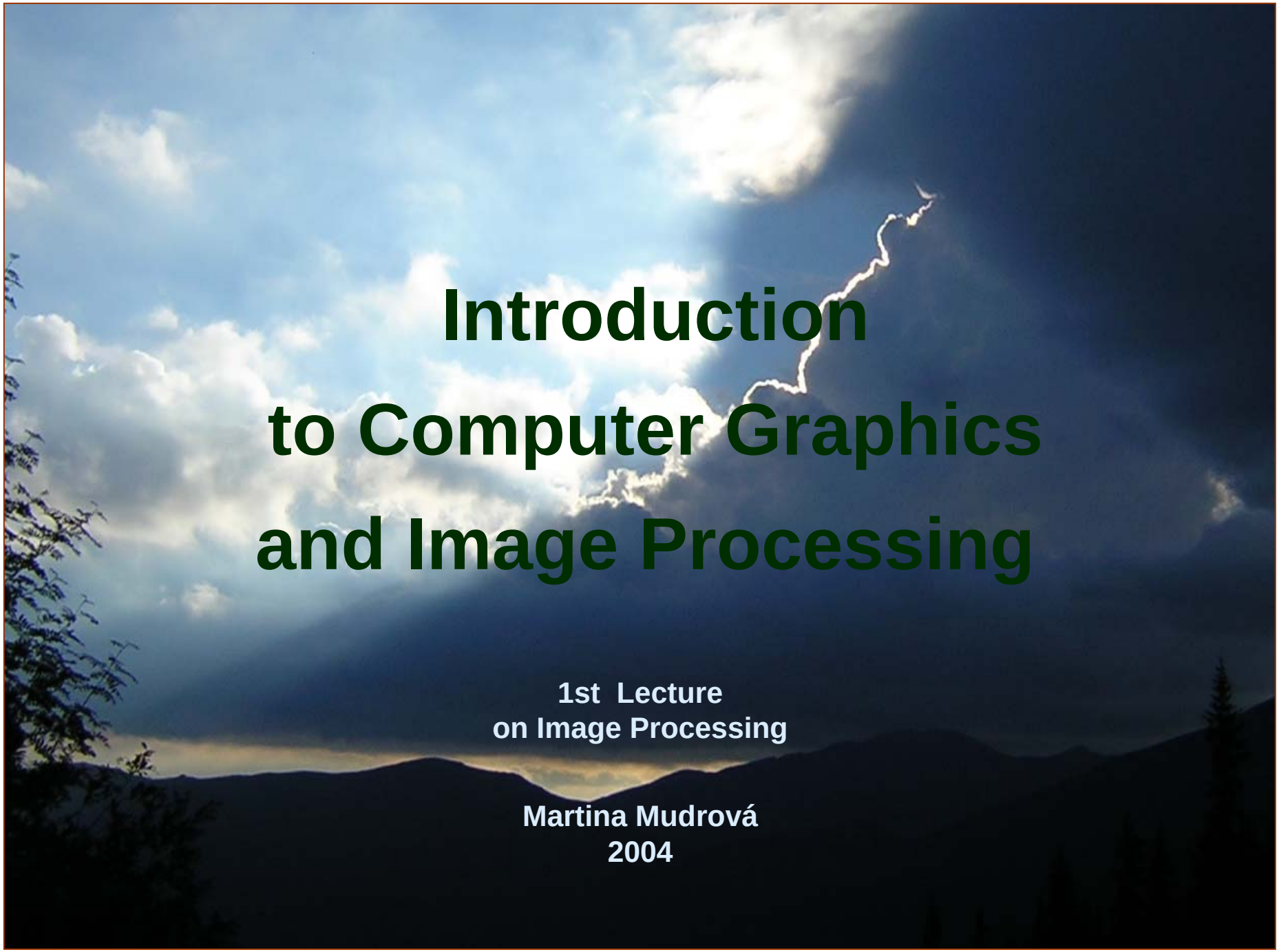

Introduction to Computer Graphics and Image Processing

1st Lecture
on Image Processing

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Basic Terms

What is a relation between computer graphics and image processing?

Computer graphics – more general term at presents involving mainly:
• algorithms for drawing, displaying and storage 2D and 3D vector picture including animated sequences
• graphic materials creation by means of computers
• storage and processing of bitmap graphic information

Image processing – for 2D (3D,…) raster graphic information onlyi,
• methods of storage and processing raster data
• methods of automated extraction of desired information from images
• uses discrete mathematic methods
• is an extension of 1D digital signal processing methods

Draw x Paint

Vector and Raster Pictures

Which principles are used for creating pictures using computer?

	vector drawing	**raster images**
base elements:	objects: line, curve, point,...	point (pixel)
properties of base elements:	mathematical description of objects (starting and ending points,…) and their attributes (line style, colour,…)	pixel's attributes (colour, transparency,…)
advantages:	simple changes of the picture size	possibility of every pixel processing
disadvantages:	necessity of rasterization on displays	problems with the changes of the image size

Vector and Raster File Formats Fast Review

Vector and meta formats
- DWG, EPS, CDR,…
- usually text file containing the description of picture's objects
- size depends on the number of objects

Raster formats
- BMP, JPG, GIF, PNG, …
- file containing information about every pixel's colour
- file size depends on the picture resolution and bit-depth of colour

picture resolution: number of points painted in the unit of length

-dpi (dots per inch)

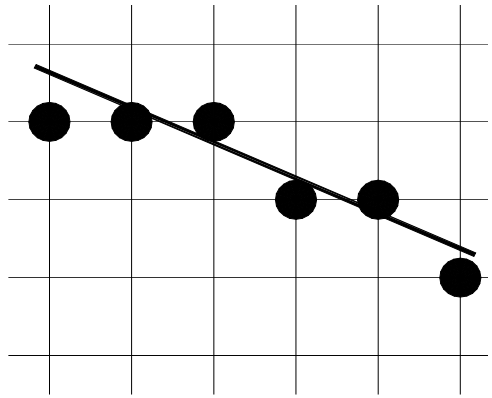
1inch = 2.54cm

1 typography dot = 1/72 inch

Rasterization

How the vector objects are displayed on the raster device?

General problem: display of a smooth curve on the device with a given resolution



Reqiurements:

- algorithm must be fast enough
- the line width must not to depend on the lone slope
- the line shoul be smooth (visually)
- the drawing must start and end in the given points

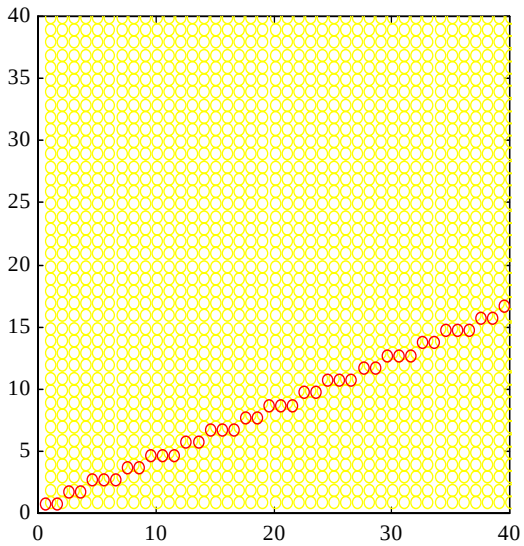
Solution:

Linear interpolators:
- DDA algorithm (*Digital Differential Analyzer)*
- Bresenham's algorithm

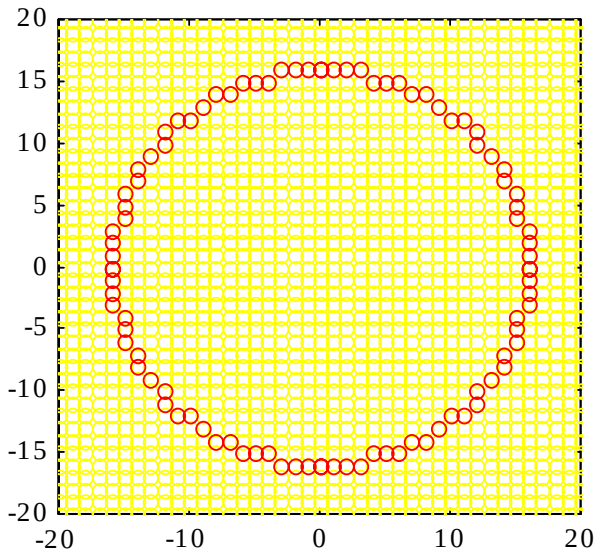
Examples

Results of application of the Bresenham algorithm to various objects

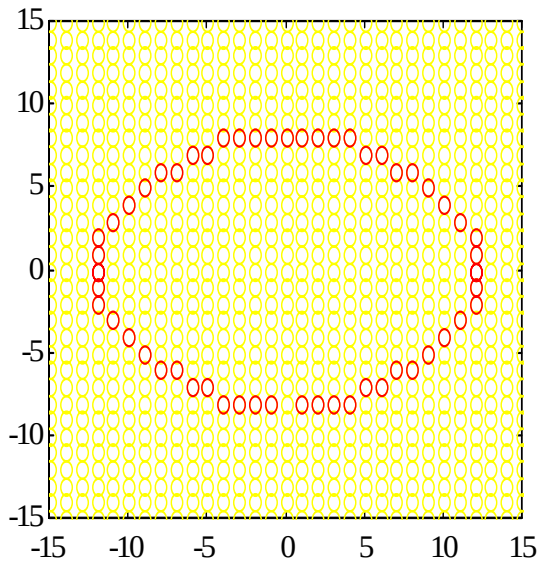
Line



Circle



Ellipse



The Most Important Image Processing Areas

What are the main aims in image processing?

- Storage and compression of image data
- Colour processing and modification
- Image geometric transformations
- Frequency image analysis
- Statistic image data analysis and description
- Morphological operations
- Image segmentation and objects detection
- Texture classification
- Image reconstruction
- …

Related areas:

- Digital photography and microscopy
- Animation and video processing
- Computer vision …