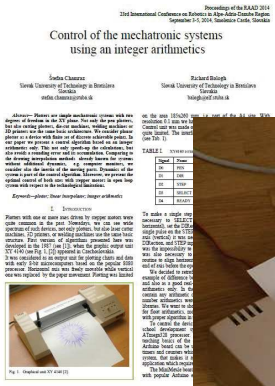
T02: Rezací plotter

Harmonogram

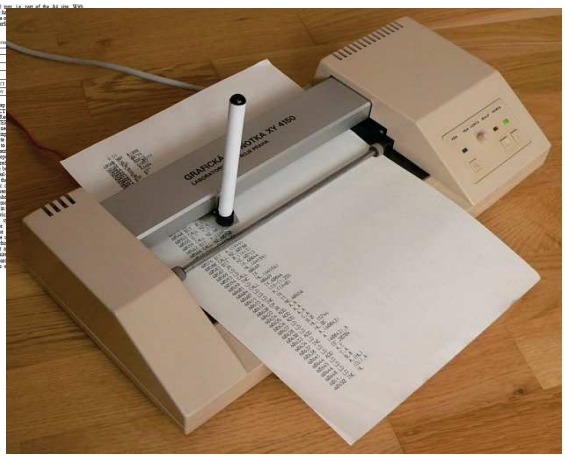
- P1: úvod
  - C1: FabLab: prehliadka a zoznámenie s priestormi
- P2: elektronika I.
  - C2: Schéma zapojenia a návrh plošného spoja
- **P3: bitmapy/vektory, rezanie (notebook)**
  - C3: FabLab: nálepka / tričko (10x10 cm)
- **P4: laser, materiály (notebook)**
  - C4: príprava podkladov na rezanie

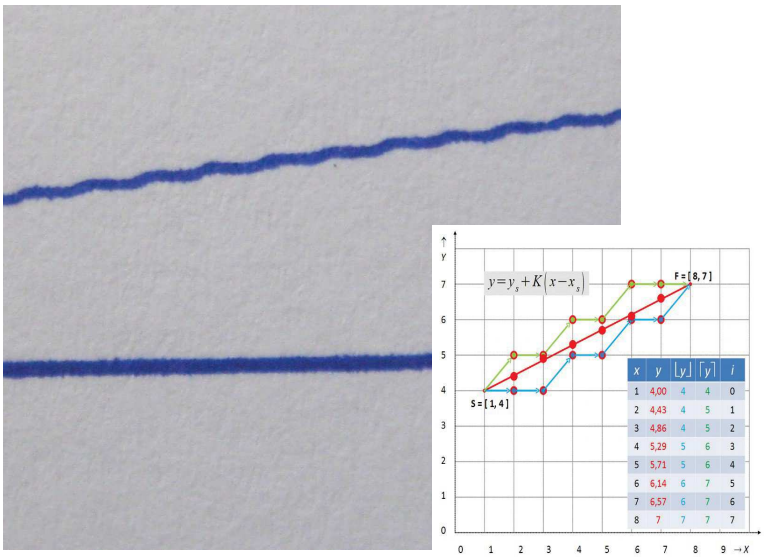
Plotter
Rezací plotter

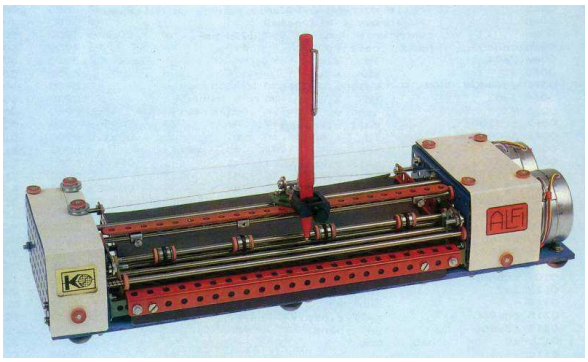
Súradnicový zapisovač
XY zapisovač

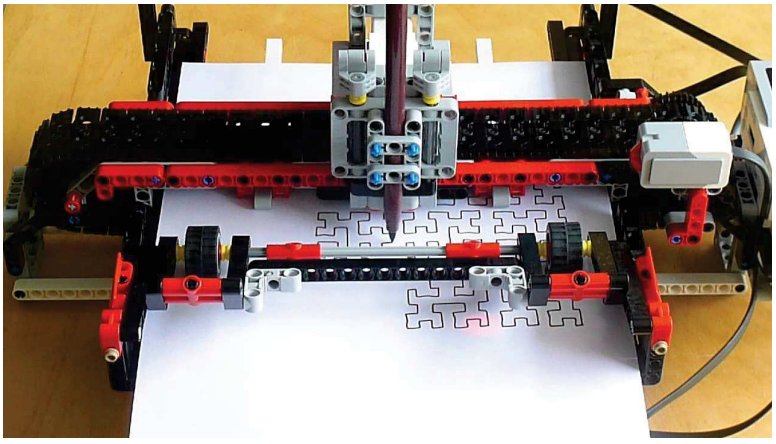


Control of the mechatronic systems
using an integer arithmetics

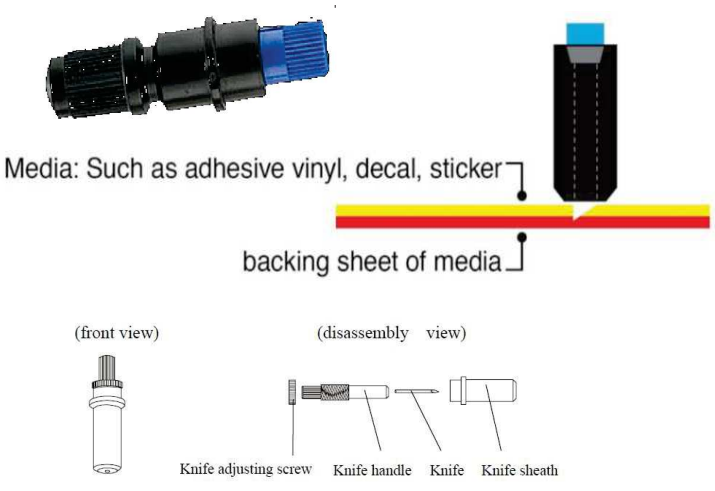


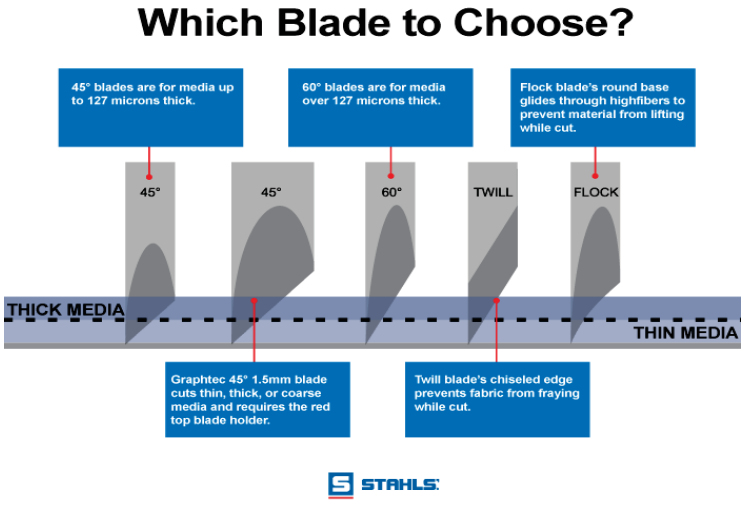


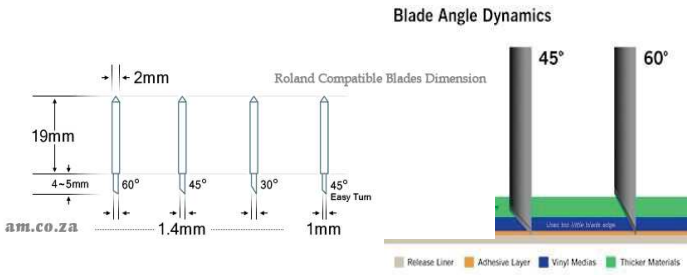


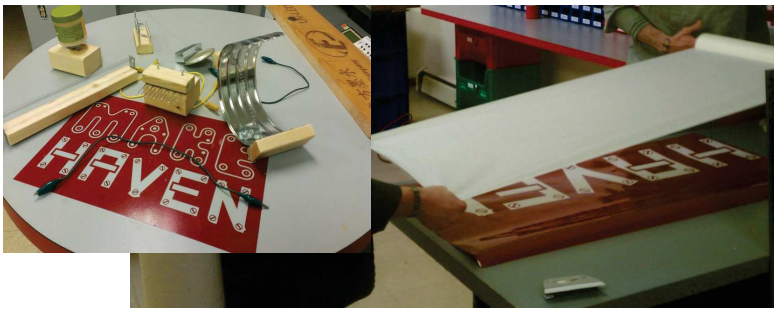


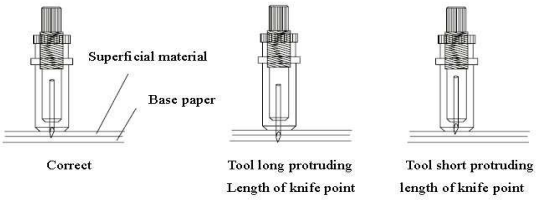
https://www.youtube.com/watch?v=4xXCmw4Y5iA

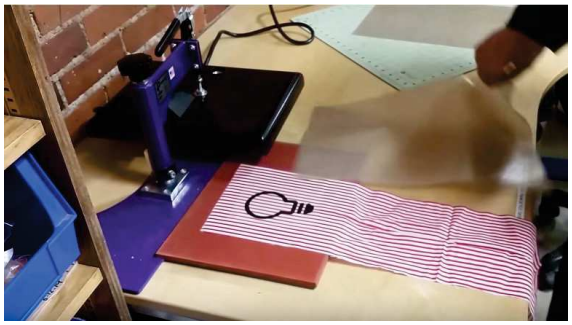


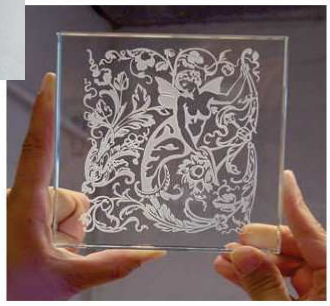










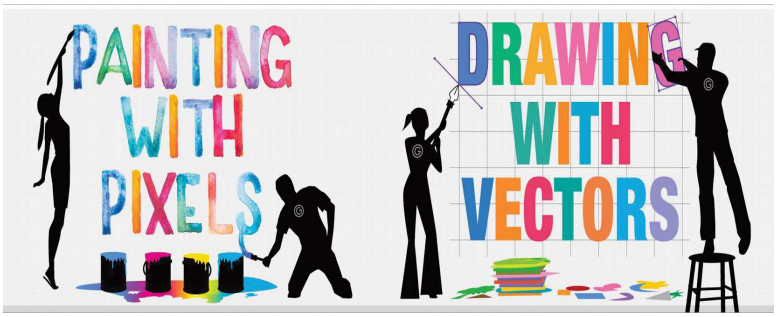


Digitáne technológie výroby

Bitmapy

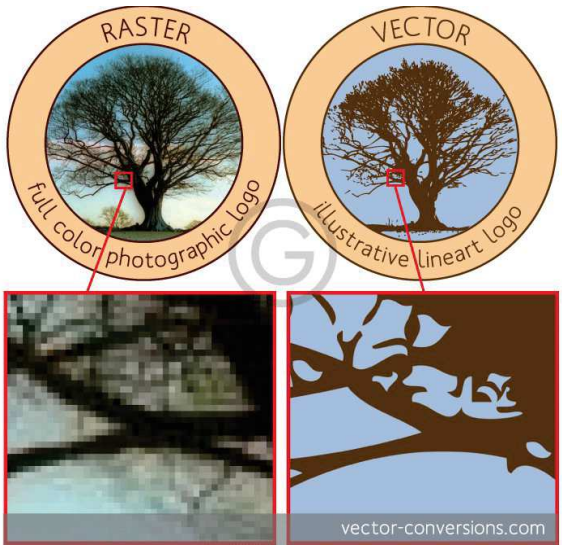
VEKTORY

Richard Balogh

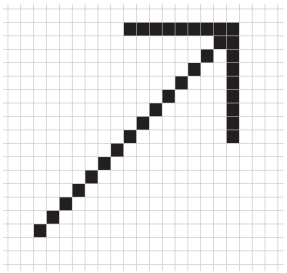


Bitmap Raster **vs** **Vector Curves Lineart**

https://vector-conversions.com/vectorizing/raster_vs_vector.html



Pixel

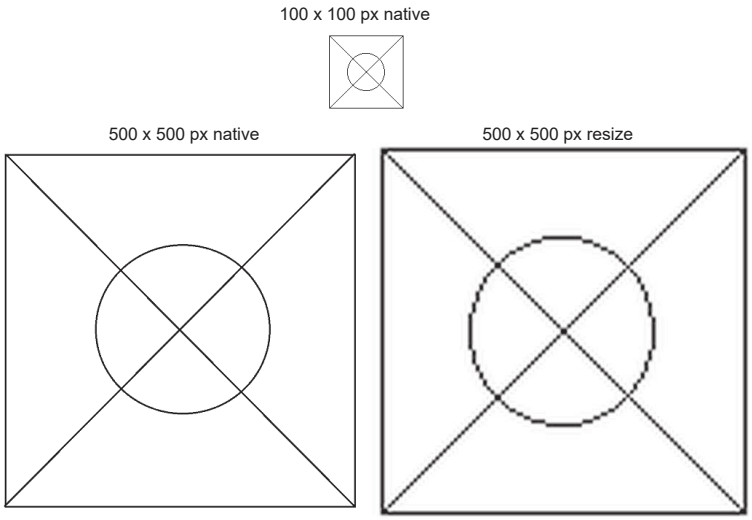


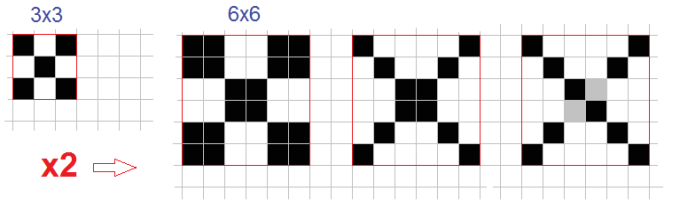
Pixels: individual squares, grid that creates image each square – color

Resolution: identifies the number of pixels.
dots per inch (dpi)
pixels per inch (ppi)
lines per inch (lpi)

web Resolution: 72-96 dpi

print Resolution: 200-300 dpi





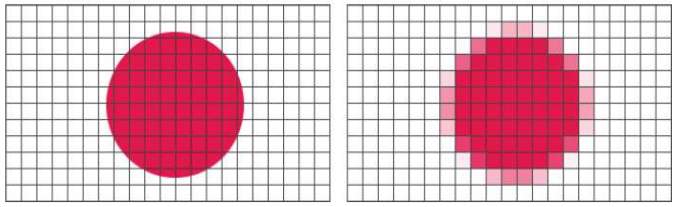


Image courtesy of Phrood on Wikimedia Commons. License: CC-BY-SA.This content is excluded from our Creative Commons license. For moreinformation, see http://ocw.mit.edu/help/faq-fair-use/.

Bitmap

Common File Formats

.bmp	**Bitmap** (Windows)
.png	**Portable Network Graphics**
.jpg	**Joint Photographers Expert Group**
.gif	**Graphic Interchange Format**

Raster Editing Programs

Adobe Photoshop

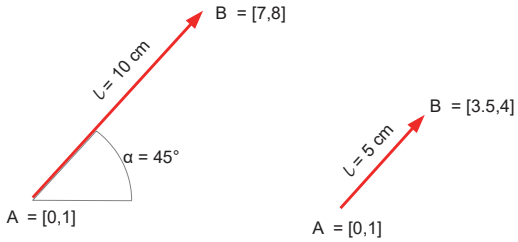
Microsoft paint (malování)

Paint.NET

Gimp (open source)

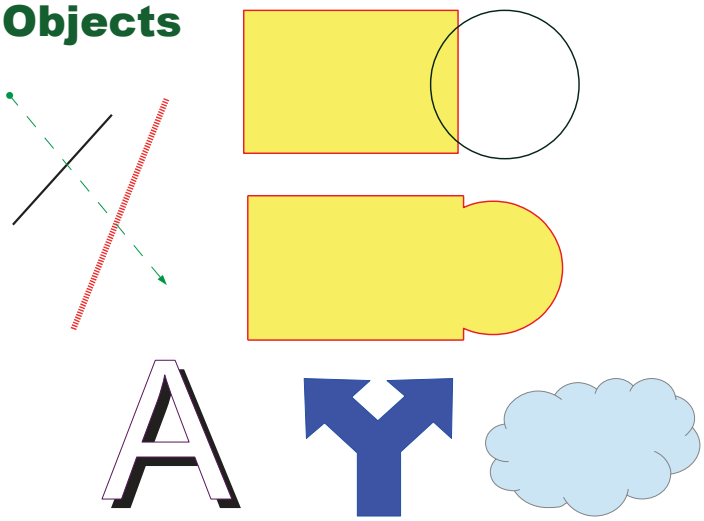
Vector

- Vector: mathematical description of the line/curve

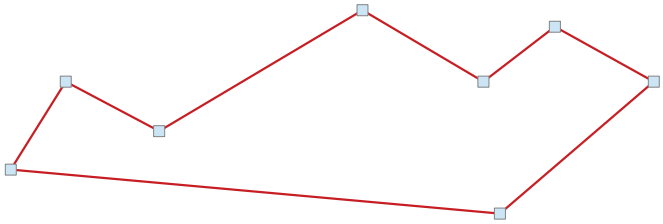


Note: rasterization on OUTPUT device!

Objects

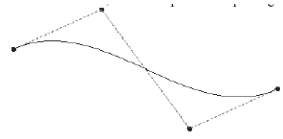


Polynomial

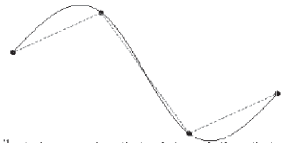


Interpolation vs. approximation

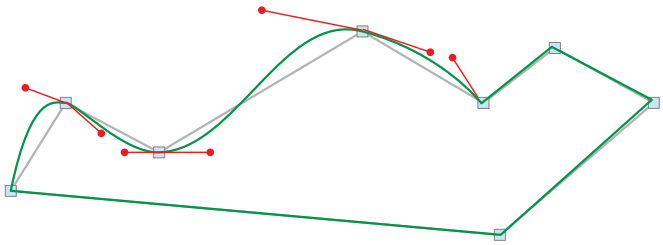
- Bezier curves are **approximating**. The curve does not (necessarily) pass through all the control points. Each point pulls the curve toward it, but other points are pulling as well.



- We'd like to have a spline that is **interpolating**, that is, it always passes through every control point.



Parametrické krivky (Beziér)



Parametrické krivky

Priamka

$$\mathbf{X} = \mathbf{A} + t \cdot \mathbf{u}$$

$$x = x_0 + t \cdot u_x$$
$$y = y_0 + t \cdot u_y$$

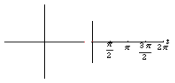
Parametrické krivky

Priamka

$$\mathbf{X} = \mathbf{A} + t \cdot \mathbf{u}$$

$$x = x_0 + t \cdot u_x$$
$$y = y_0 + t \cdot u_y$$

Kružnica



$$x = x_0 + r \cdot \cos(\tau)$$
$$y = y_0 + r \cdot \sin(\tau)$$

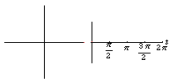
Parametrické krivky

Priamka

$$\mathbf{X} = \mathbf{A} + t \cdot \mathbf{u}$$

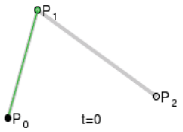
$$x = x_0 + t \cdot u_x$$
$$y = y_0 + t \cdot u_y$$

Kružnica



$$x = x_0 + r \cdot \cos(\tau)$$
$$y = y_0 + r \cdot \sin(\tau)$$

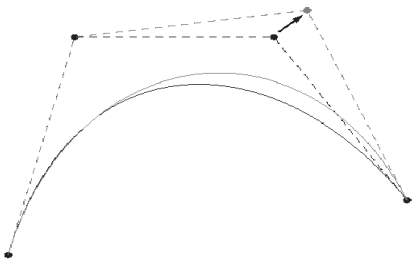
Bézierova krivka



$$C(t) = (1-t)^2 P_0 + 2t(1-t) P_1 + t^2 P_2, \quad t \in \langle 0,1 \rangle$$

Local control

One problem with Bezier curves is that every control point affects every point on the curve (except the endpoints)
Moving a single control point affects the whole curve!



We'd like our spline to have local control, that is, each control point affects a certain well-defined neighborhood around that point.

Vector

Common File Formats

.ai	Adobe Illustrator
.ps	PostScript (.PS)*
.eps	Encapsulated PostScript
.svg	Scalable Vector Graphics
.dwg	Autodesk DraWinG

Vector Editing Programs

Adobe Illustrator

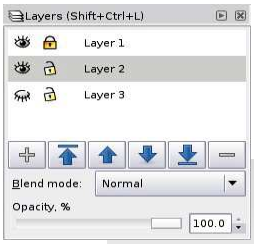
AutoCAD, IntelliCAD,…

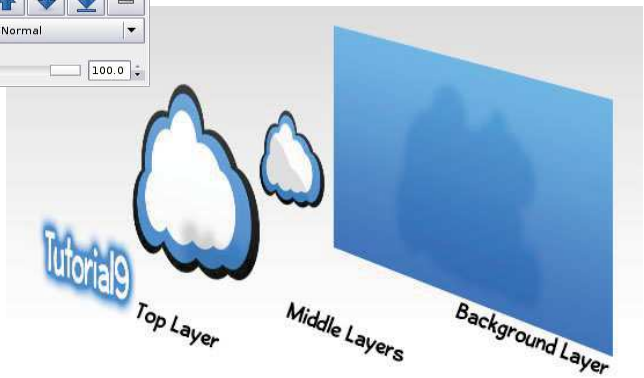
Corel Draw

Inkscape (open source)

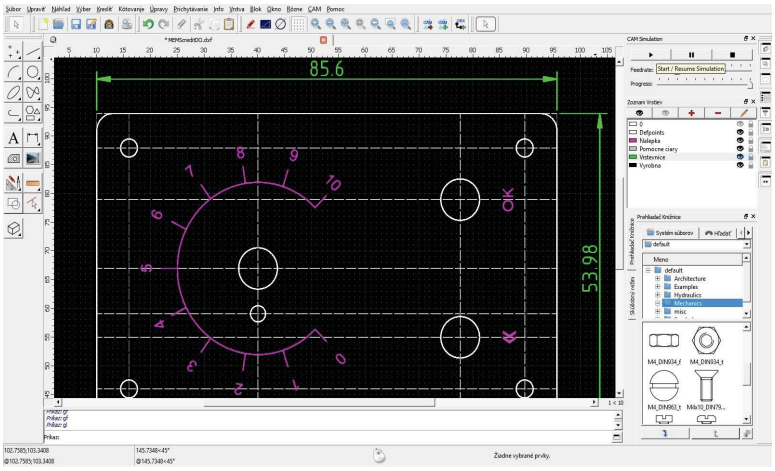
Both Illustrator AI and EPS formats allow users to place raster images within a vector file. The raster image is not converted to vector format; rather it is simply embedded in the vector file, and is rendered in raster format.

Layers (vrstvy)



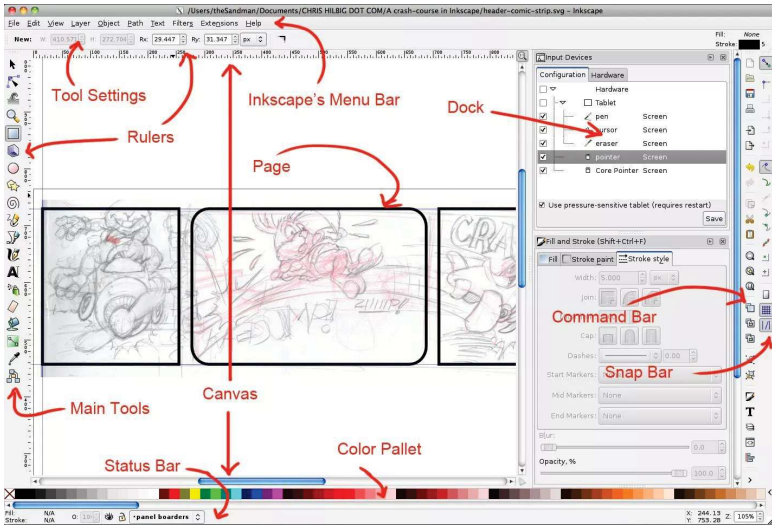


Layers (vrstvy)



Comparision of bitmap and vector graphics

	Bitmap graphics	Vector graphics
What are they made up of?	Pixels of different colours	Objects
What can be edited?	Individual pixels	Individual objects
What is the file size?	Large, as the computer stores details of every pixel	Small, as the computer stores details of objects, which do not require much memory
What happens when they are resized?	They lose quality	They do not lose quality
How real do they look?	Real	Not real (many of them look like cartoon images)
Native formats that the software can read	.bmp	.svg
Common file formats	.bmp, .dib, jpeg, gif, tiff, .png	.cgm, .svg, .odg, .eps, .xml



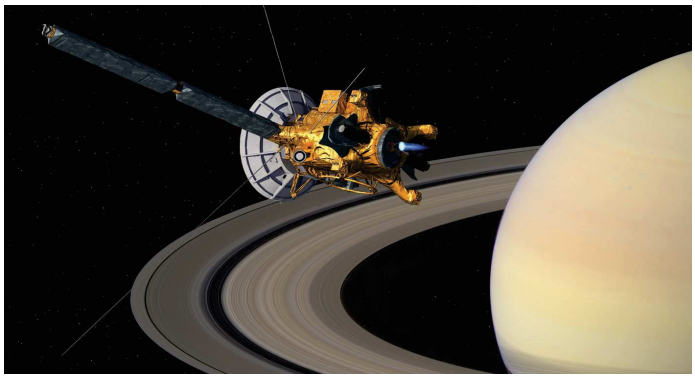
HACKADAY

FAIL

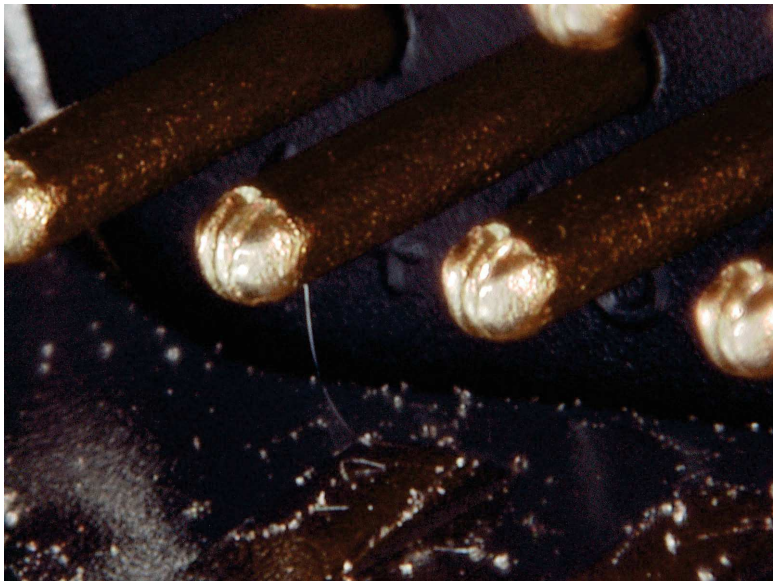
Fail of the Week is a Hackaday column which celebrates failure as a learning tool.

NASA Lessons Learned

Office of the Chief Engineer



https://www.nasa.gov/offices/oce/functions/lessons/index.html



NASA Lessons Learned

Office of the Chief Engineer

SUBJECT: Tin Whiskers	NA-044	PAGE NO.: 2	NO. OF PAGES: 5
PART NO.: Various		PARTS ADVISORY OFFICIAL BUSINESS U.S. GOVERNMENT	
REFERENCE: Numerous GIDEP Alerts and Technical Papers			

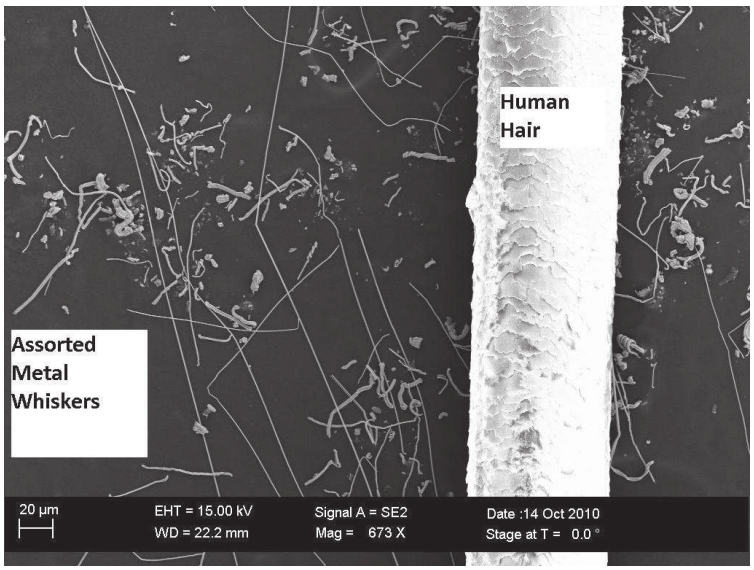
MESSAGE TO BE TRANSMITTED

Potential Risks of Tin Whiskers:

Tin whiskers pose a serious reliability risk to electronic assemblies. Several instances have been reported where tin whiskers have caused system failures. The general risks fall into four categories:

4. ***In space vacuum*** however, a much more destructive phenomenon can occur. If currents of above a few amps are available, the whisker will fuse open but ***the vaporized tin may initiate a plasma that can conduct over 200 amps!*** An adequate supply of tin from the plated surface is necessary to sustain the arc.

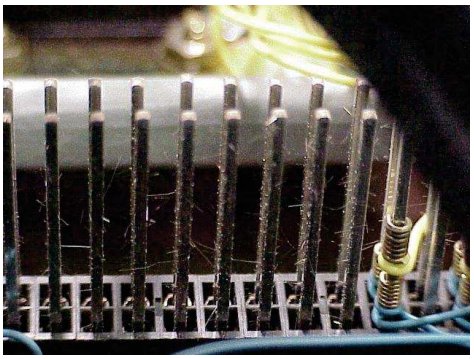
https://www.nasa.gov/offices/oce/functions/lessons/index.html

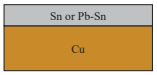


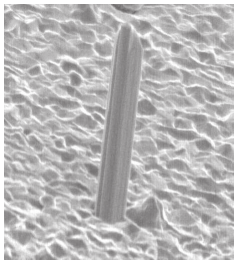
NASA Lessons Learned

Office of the Chief Engineer

Problem: Pure Sn forms whiskers on Cu
Failures in satellites, pacemakers, missiles







Source: https://nepp.nasa.gov/whisker/

Engineering Design Process

Keep in Mind:
- Address the problem
- Satisfy constraints
- Meet the criteria
- Think Trade-offs
- Be creative
- Consider everyone's ideas
- Failure is an important part of the process

Engineering Design is an adaptable and open process.

ASK
What is the problem?
What are the constraints?
What are the criteria?

EXPLORE
What have others done?
Explore options
Explore materials

PLAN
Brainstorm
Choose the best idea
Make a plan

CREATE
Follow your plan and start building

TEST
Try it out!
Collect data
Record observations

IMPROVE
Analyze your data
How can you make it better?
Redesign

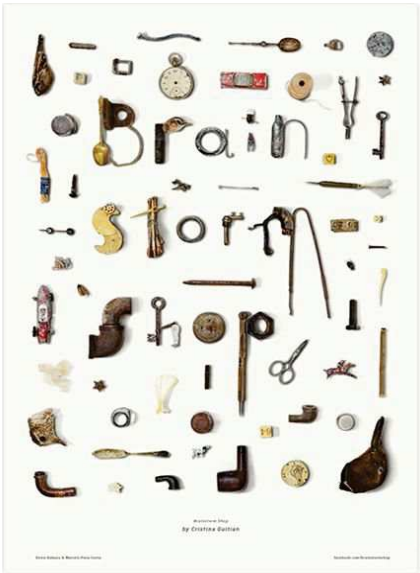
PRODUCTION
Design satisfies the goal
Present your design
Reflect

Adapted from University of Arizona College of Engineering

Alphabet by **Roman Milert**

Alphabet formed from young people wearing industrial uniforms and helmets posing with various tools and accessories
Source: Alamy Stock Photo
http://www.alamy.com/stock-photo-alphabet-formed-from-young-people-wearing-industrial-uniforms-and-80293665.html

Fold Yard: Cubicles' bad rap is, for the most part, well-deserved. Which is why Fold Yard by Benoit Challand, a typeface made entirely out of modular desk pieces, appears extra whimsical by comparison. Each desk still has its main storage spaces, partitions, and shelf space, all while fulfilling your typographical needs
https://www.gizmodo.com.au/2014/06/nine-crazy-3d-typefaces-made-from-everyday-objects/



Brainstormshop
by **Cristina Guitan**,
represented by Meiklejohn Illustration, has been awarded a Slice D&AD award for the poster she created for the BrainstormShop.

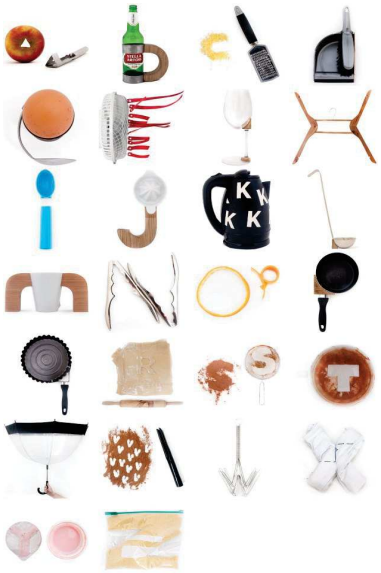
The Brainstormshop is a workshop run by Marcelo Pena Costa & Denis Kakazu, in Sau Paulo. Cristina was art directed by the creative duo and worked with photographer Manuel Vázquez to create the artwork.
12 Jun 2012

http://www.creativematch.com/news/cristitna-guitan-wins-d-ad/101464/

Cvičenie 1

- Napíšte **svoje meno** tak, aby jeho **iniciála** (t.j. prvé písmeno) bolo tvorené nejakými elektro- objektmi.

- Zvyšok stačí obyčajným písmom, ktoré sa k nemu hodí. Ceruzka + papier, ale môžete aj počítač.
- **Objekty:** elektronické súčiastky, motív plošného spoja, schematické značky, skrutky, vodiče, blesky, rovnice, matematické symboly...
- Iniciála môže byť z jedného objektu ktorý sa na písmeno podobá alebo vyskladať alebo vyplniť z drobnejších objektov.
- Koho by to bavilo, môže spraviť celú abecedu.



March 6, 2014
The ABC of IMO
"IF AN OPPORTUNITY DOESN'T KNOCK, BUILD A DOOR" – MILTON BERLE
AN ALPHABET Project created BY ADAPTING EVERYDAY HOUSEHOLD ITEMS, altering the feature OR FUNCTION of each object to create every letter of the alphabet. Each object corresponds to its starting letter (a is for apple corer) and I found this rule as a good starting point, allowing the relevant object to respond to its material, shape, and intended use, to create each letter. I wanted my letters to each have their own individual charm, but as a whole an alphabet which I have tried to inject fun, wit, simplicity, and playfulness into objects which can be seen as every day and mundane.

https://rayclarke12.wordpress.com/2014/03/06/the-abc-of-imo/

Richard Balogh

Ústav automobilovej mechatroniky
FEI STU v Bratislave

balogh@elf.stuba.sk

http://www.robotika.sk