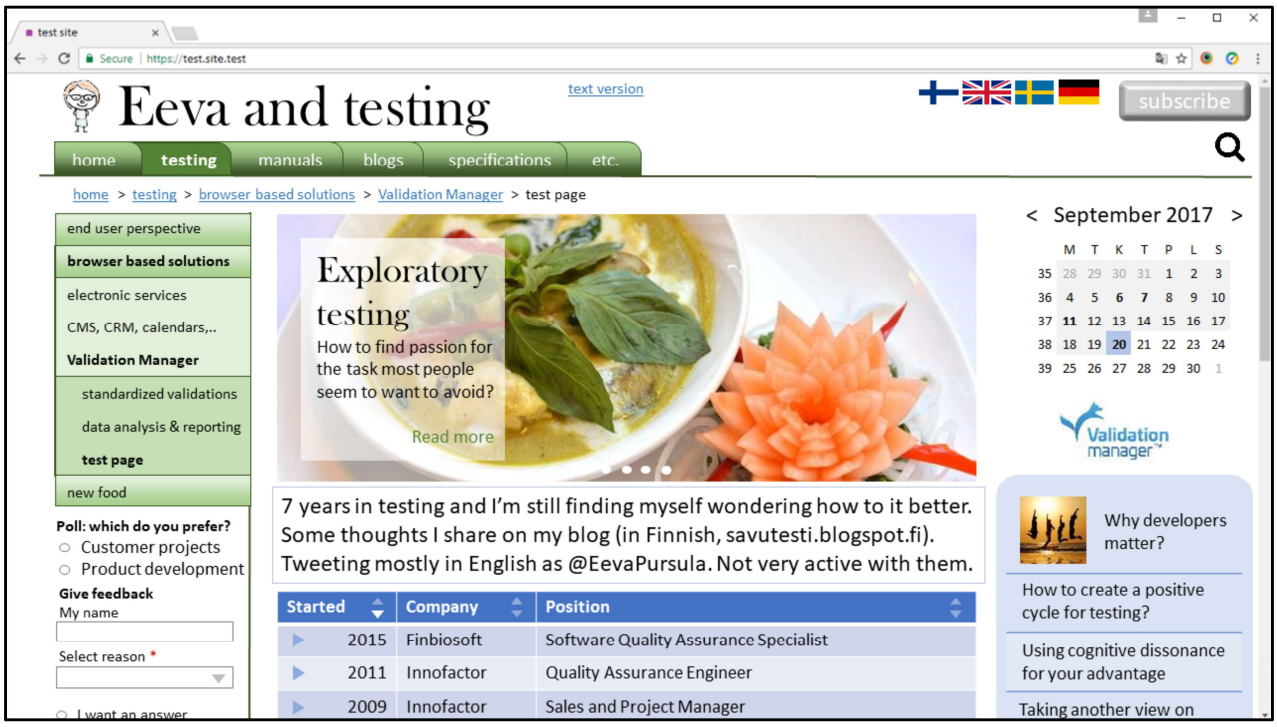
This slide set is about questioning what you see and finding ways to see better. The notes contain links and key words to help you continue exploring the subject.

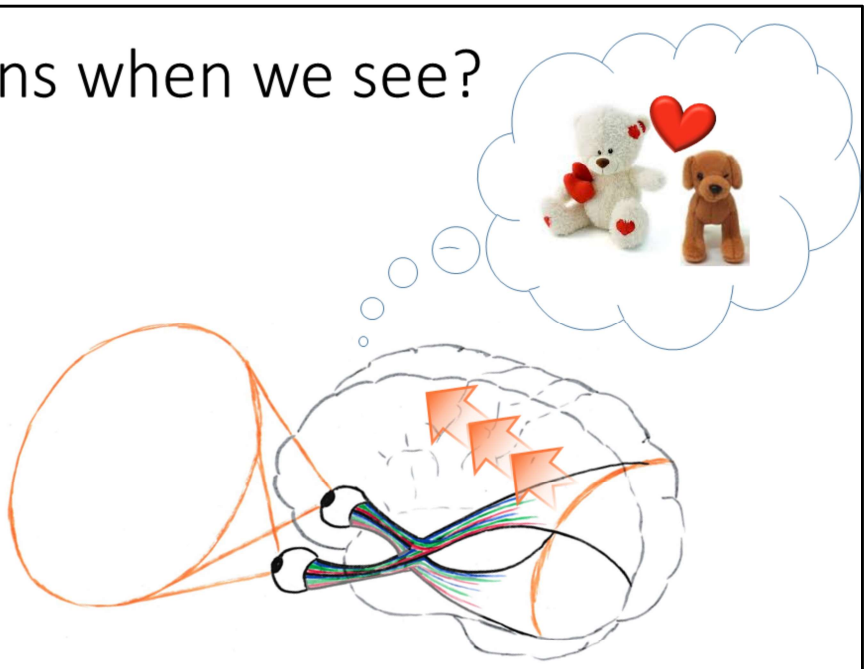


Not seeing accurately enough is very concretely shown when a customer finds layout bugs.

Most things that we'll be going through are applicable to other contexts as well.

What happens when we see?

Youtube / David de Meulles:
Polar bear petting dog



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Eyes detect light in 2D. Visual cortex at the back of your head combines images and does quite a lot of signal processing to make a reasonable 3D interpretation of what is seen. Brains minimize the amount of conscious processing needed for understanding what happens around us

- automatic categorization (label everything that seems familiar)
- automatic prioritization (focus attention on things that seem relevant)
- automatic interpretation about what is the context in which things are happening (scripts, emotions)

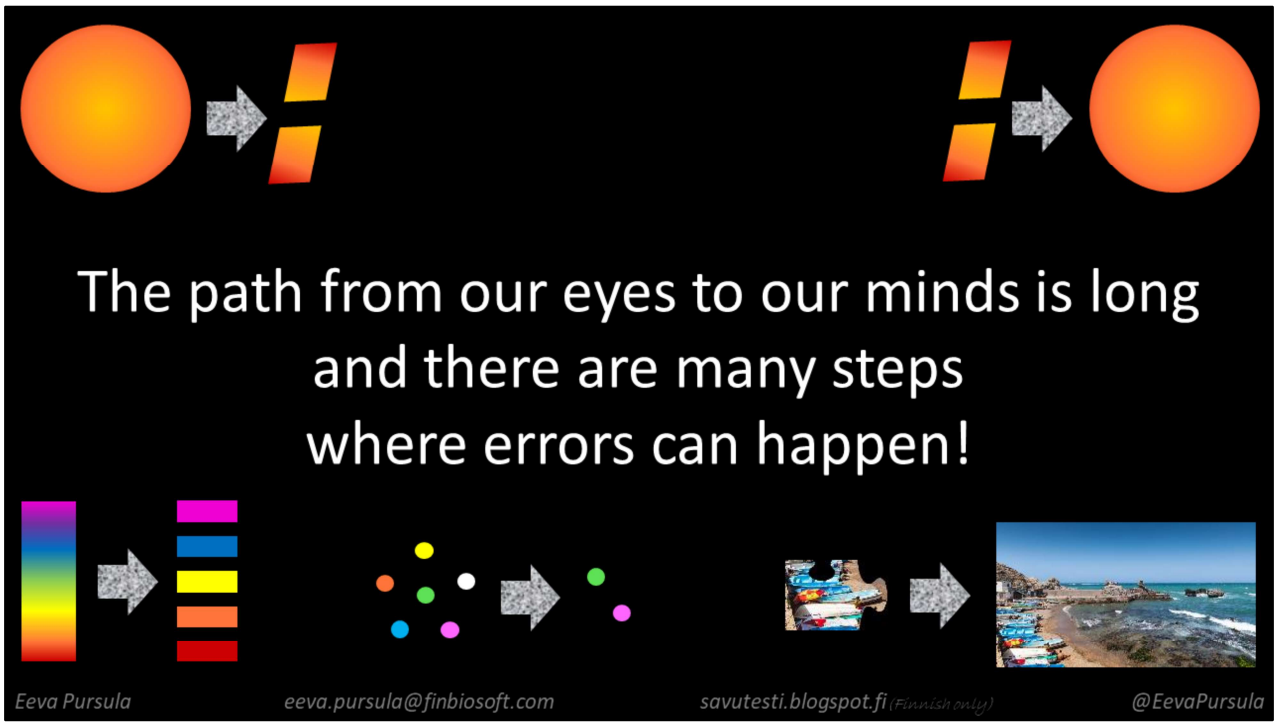
Some further reading: the brain predicts what we are about to see
http://gurneyjourney.blogspot.fi/2011/01/predictive-coding.html

The original polar bear video can be found at https://www.youtube.com/watch?v=oUle-4E1qoQ

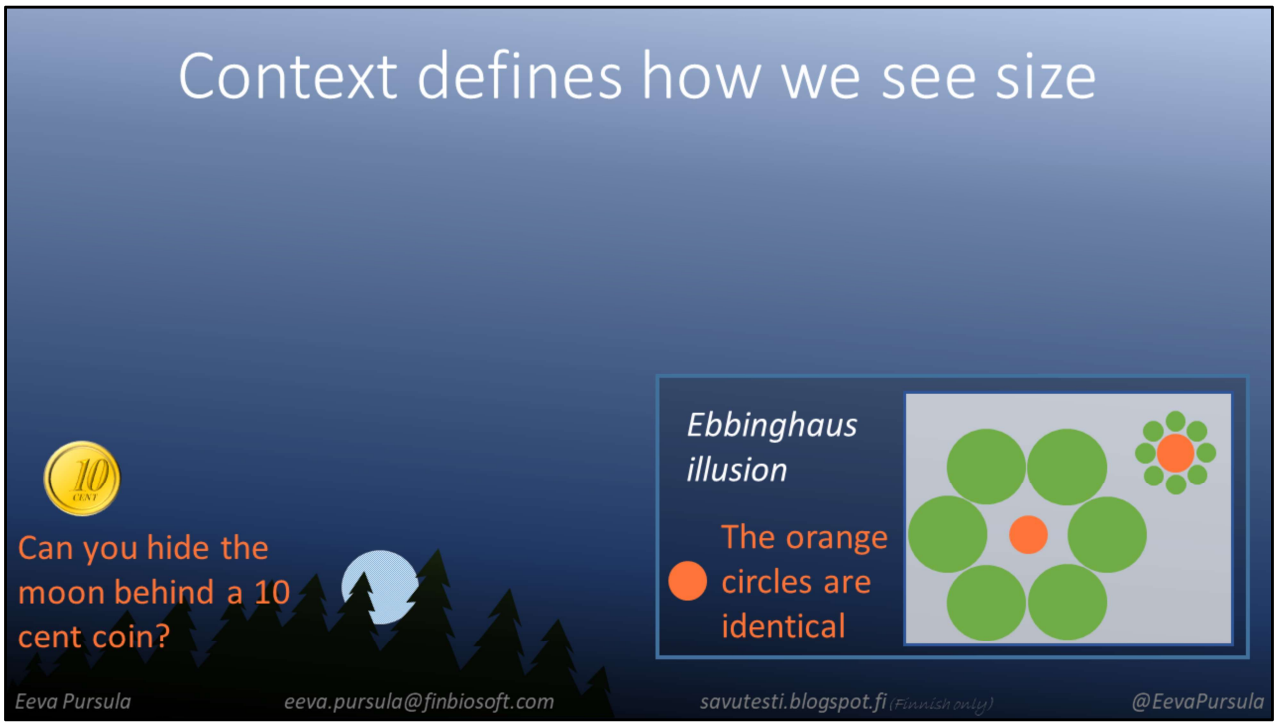
Even the most shares stories may be false interpretations of true events.

The "Disney interpretation" of the story of a friendly polar bear petting a dog lived strong for a couple of days in November 2016 and provoked a lot of positive reactions.

After that, new news articles were published to tell that the polar bear was apparently just playing with his food after all. For example http://www.sciencealert.com/sorry-to-ruin-your-dreams-but-that-dog-petting-polar-bear-just-ate-a-husky-alive



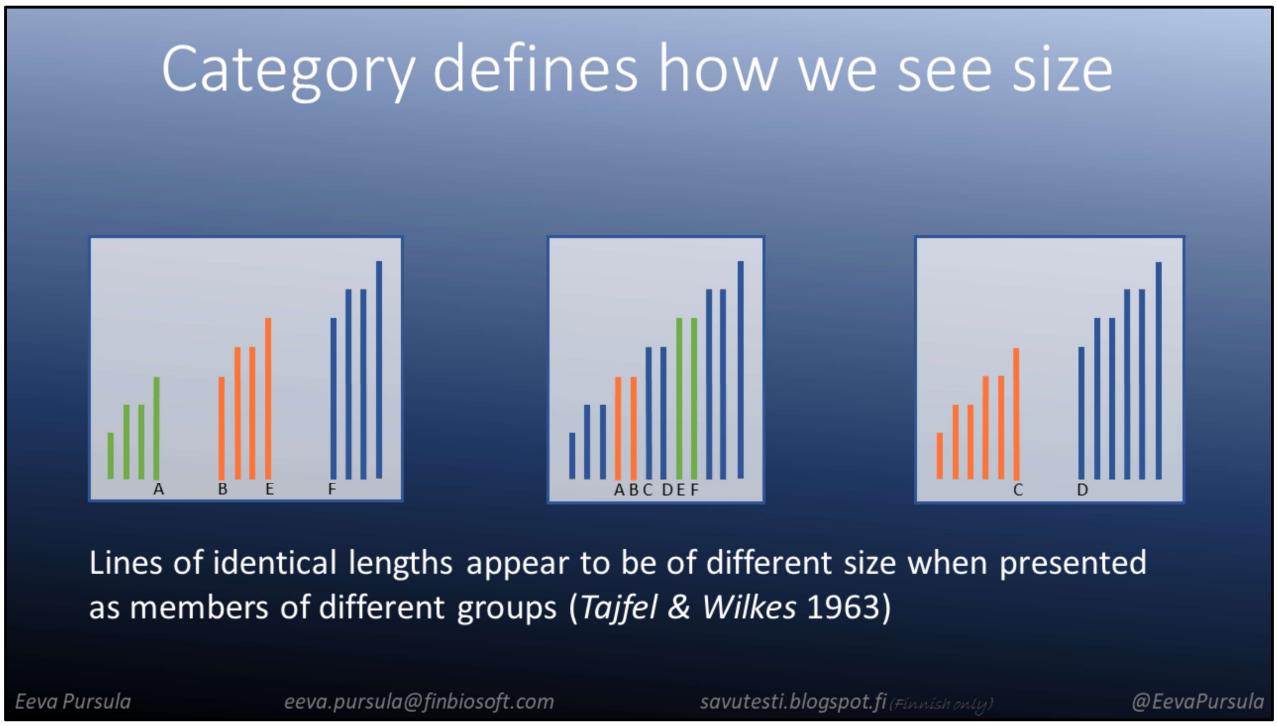
Seeing is a little bit like finding a single piece of a jigsaw puzzle and deducing the whole picture from it by thinking back puzzles you've done before – not noticing what else is in the same toy box.



The moon looks small when it's high, and huge when it's near the horizon where you can compare it to trees or houses. But it's just as big in both cases. Try hiding it behind a small coin that you hold at an arms length to get a standardized reference for estimating the size.

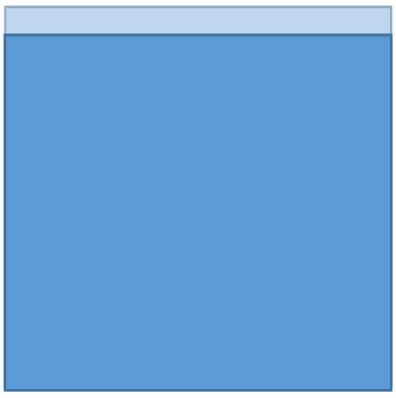
Other examples about how context affects when we estimate sizes:

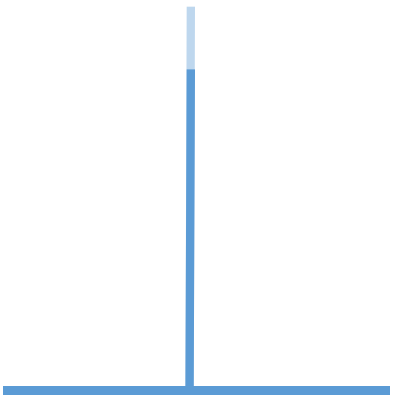
- Delboeuf illusion
- Ebbinghaus illusion
- Müller-Lyer illusion
- Ponzo illusion
- (more information found in Wikipedia)

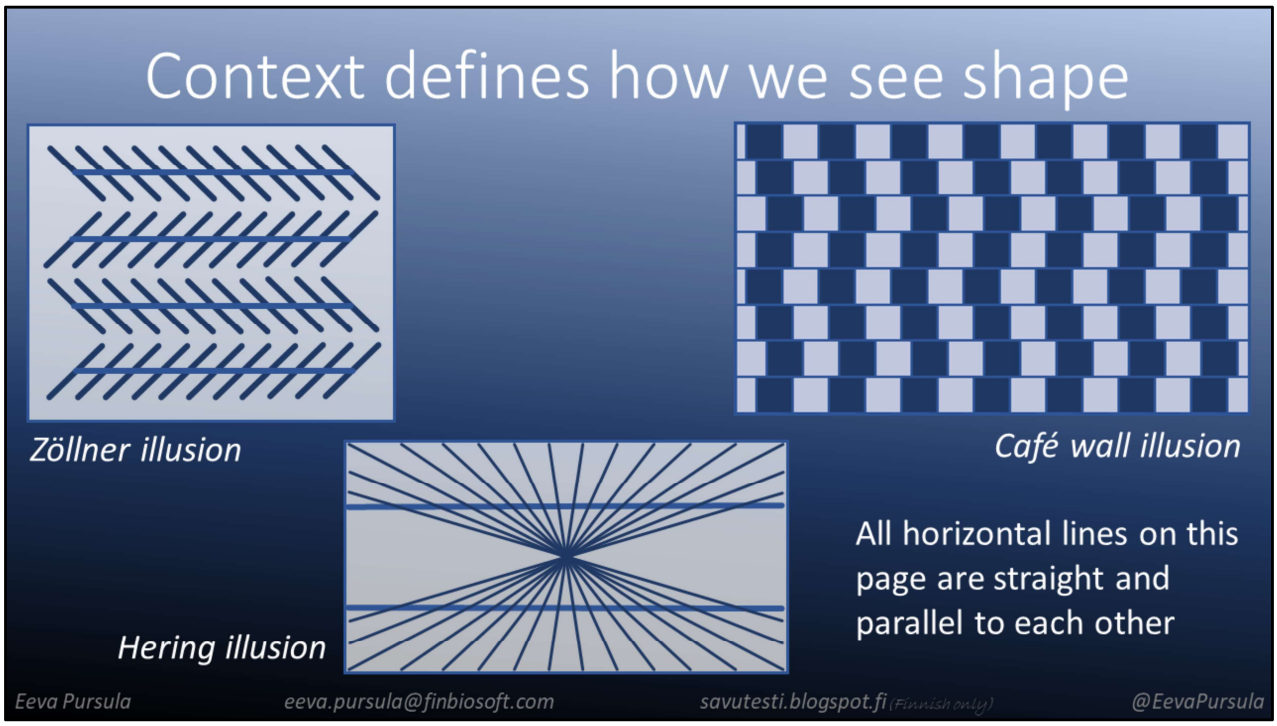


Each category holds many meanings that affect the way we see items we've labelled to be a part of that category. Categorizing things affect even the way we interpret the length of a line.

See also Vertical–horizontal illusion: we tend to see vertical lines longer than horizontal lines of the same length. This effect is strongest if the vertical line "stands" on the horizontal line cutting it in half, but it happens also when trying to draw a square.

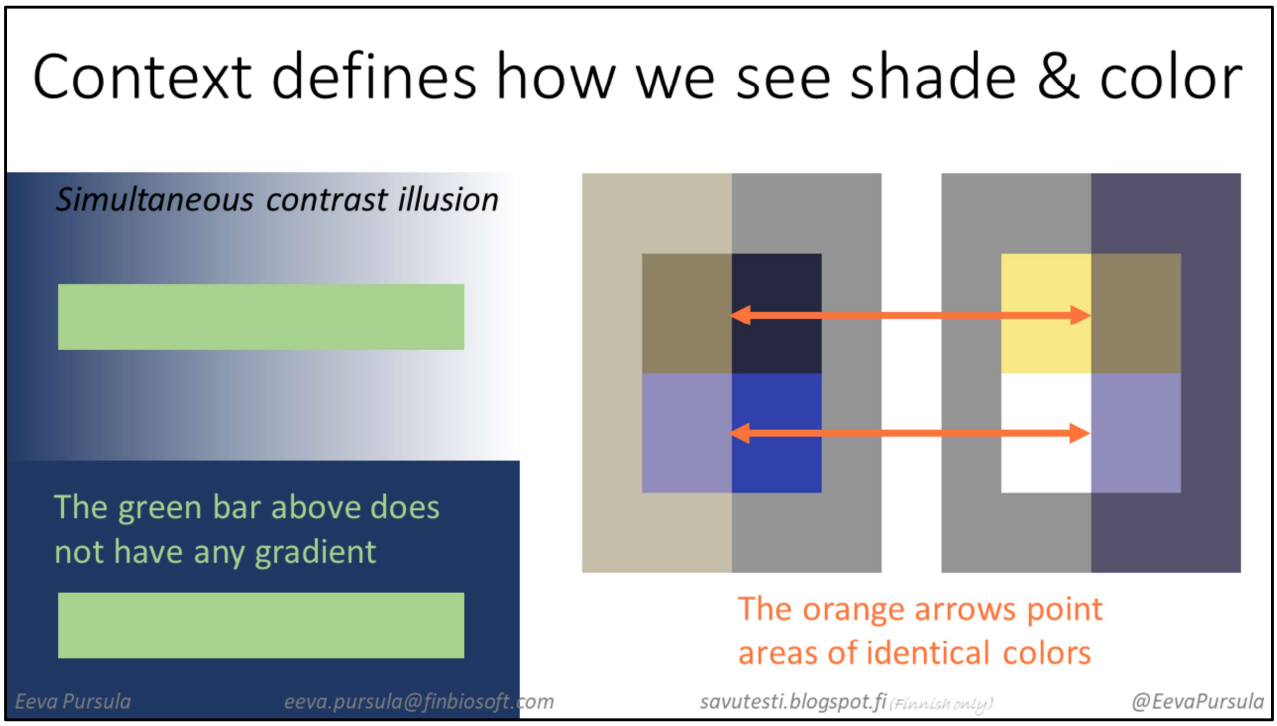






Context can make lines seem sloped, curved or twisted as your brains try to interpret the image as 3D

- Zöllner illusion
- Café wall illusion
- Poggendorff illusion
- Hering illusion
- Wundt illusion
- Orbison illusion



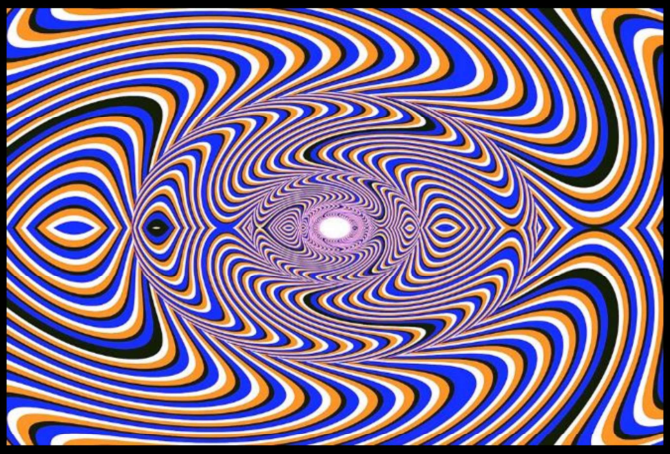
Color only exists inside your head. The wavelength and amount of light that your eyes detect depends not only about the object you are looking at but also about the light in which you see it. When there is less light, the ability of our eyes to detect colors diminishes, but brains are able to correct the signal. Interpretation of shape and light affects how we see colors.

A couple of videos to demonstrate this:

- World Science Festival: How Color Tricks The Eye And Brain
  https://www.youtube.com/watch?v=JHT-VHOFDFY

- TEDxTeddington - Andrew Hanson - Colour is Crazy
  https://www.youtube.com/watch?v=BBWab1K_dzY

Trouble in focusing or interpreting the image can make it look like it moves



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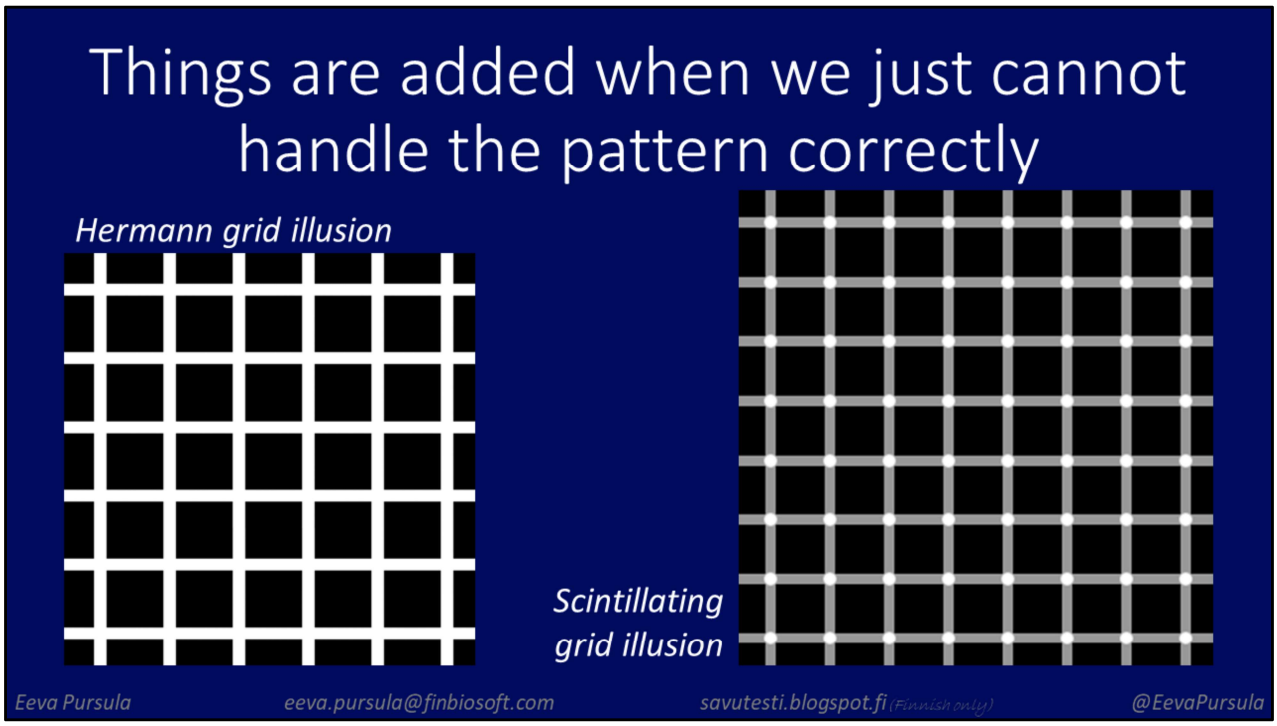
For more moving images

see http://www.psy.ritsumei.ac.jp/~akitaoka/motion27e.html

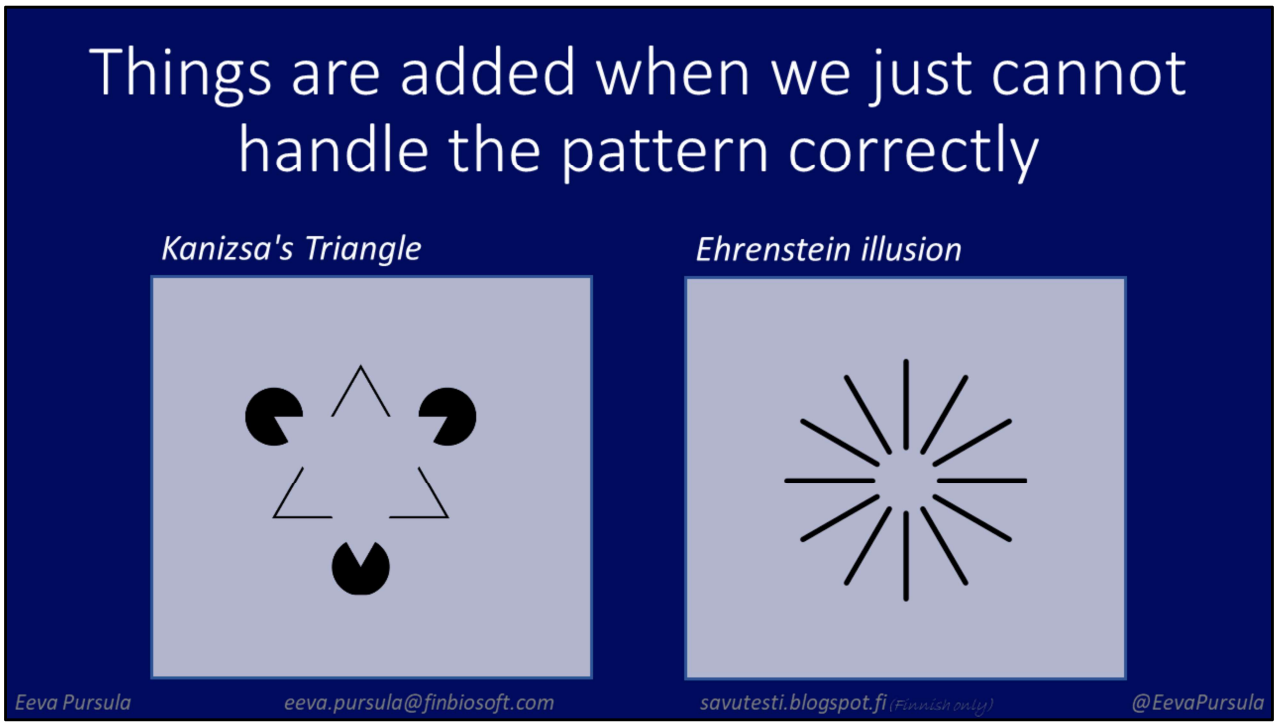
terms for google searches

- anomalous motion illusion
- illusory motion
- Akiyoshi Kitaoka



When looking at grids, dots are added (or hidden) in the intersections. Shape of the grid affects this, with a sine distortion the effect can be made to disappear.

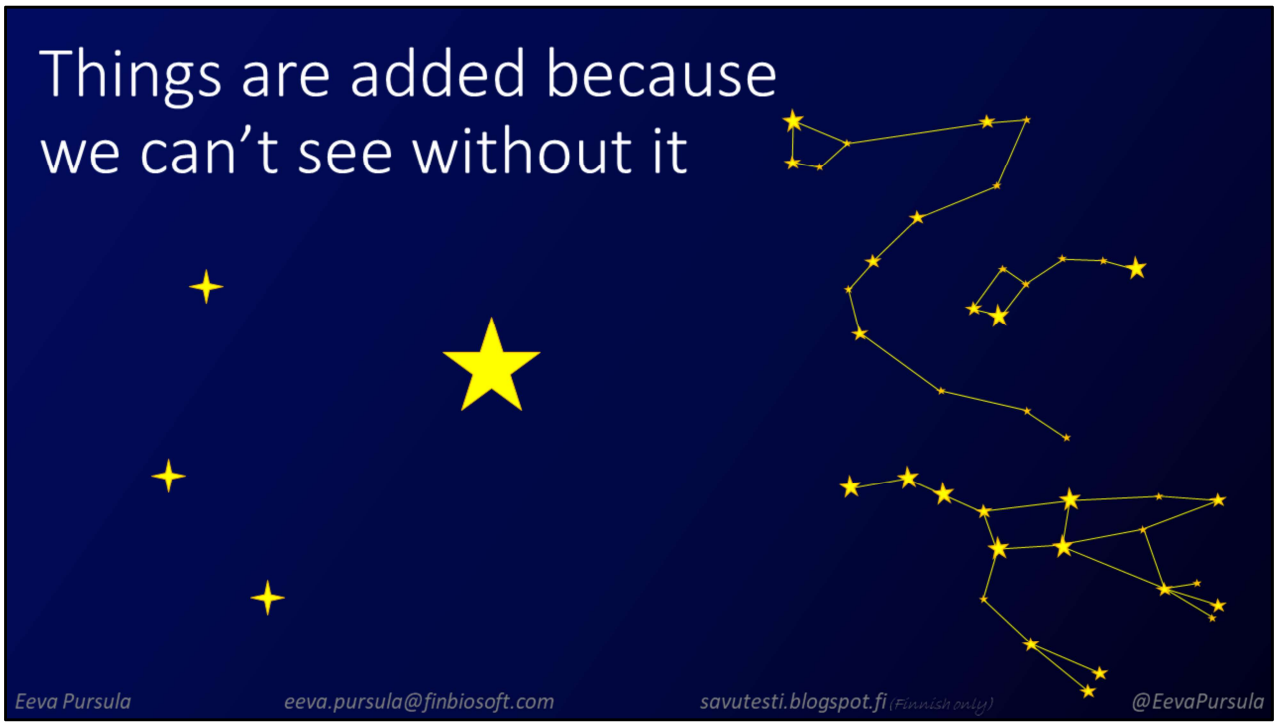
- Hermann grid illusion
- Scintillating grid illusion
- Ninio's extinction illusion
- Stopping the Hermann grid illusion



Illusory contours

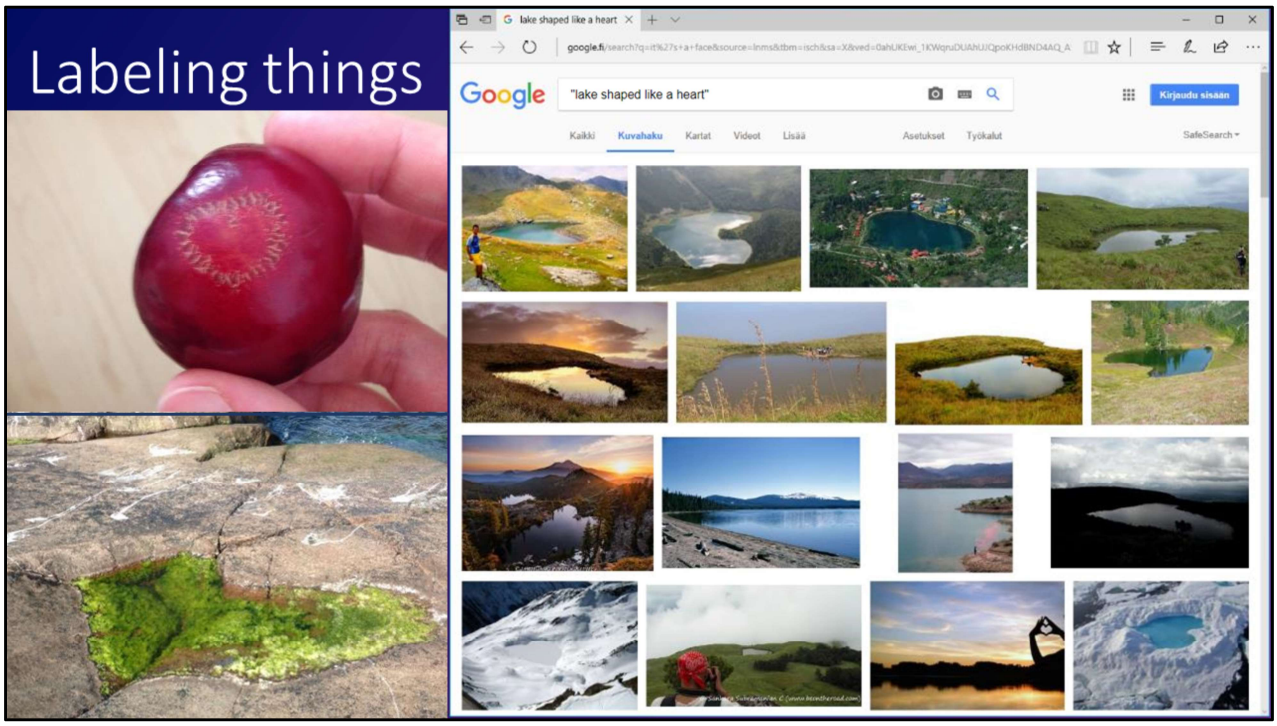
Seeing part of an “edge” of a shape can make us see that shape.
The illusory object often seems brighter and to be closer to the viewer than the background

- Kanizsa’s triangle
- Ehrenstein illusion



Stars are nothing but dots on the sky, but the imperfections of the lenses in our eyes make them look pointy

When brains try to interpret an image, trying to make us notice the most relevant things, they may also add things that don't really exist



We tend to see familiar patterns in places where they really do not exist.

Some search terms for finding amusing images

- alive vegetables
- funny shaped fruits
- oddly shaped fruits
- bizarrely shaped lakes
- cloud shaped like

We are especially good in seeing human faces in places where they do not exist.

some examples of pareidolia can be found behind these links:

- http://www.sadanduseless.com/2017/04/funny-pareidolia/
- http://www.quillhammer.com/hey-its-a-face
- http://www.huffingtonpost.com/2014/02/07/wave-face-patrick-swayze_n_4740363.html
- http://www.dailymail.co.uk/news/article-2022006/Is-face-clouds-Footage-shows-spooky-shape-shifting-display-formed-Canadian-storm.html

A few examples of paintings to study seeing:

Octavio Ocampo: *The General's Family* shows 9 faces in one portrait

Oleg Shuplyak has painted many cool potraits of famous people as landscapes, for example paintings

- *Charles Darwin*
- *Sigmund Freud*
- *Double take*

Giuseppe Arcimboldo: many paintings, for example *The Jurist* (1566) and *The Waiter* (1574)

Pavel Tchelitchew: *Hide-and-Seek* (1942)

William Ely Hill: *My Wife and My Mother-in-Law* (1915)

Old Couple and Musician has three levels of interpretation (claimed to be painted by Salvador Dalí in 1930?)

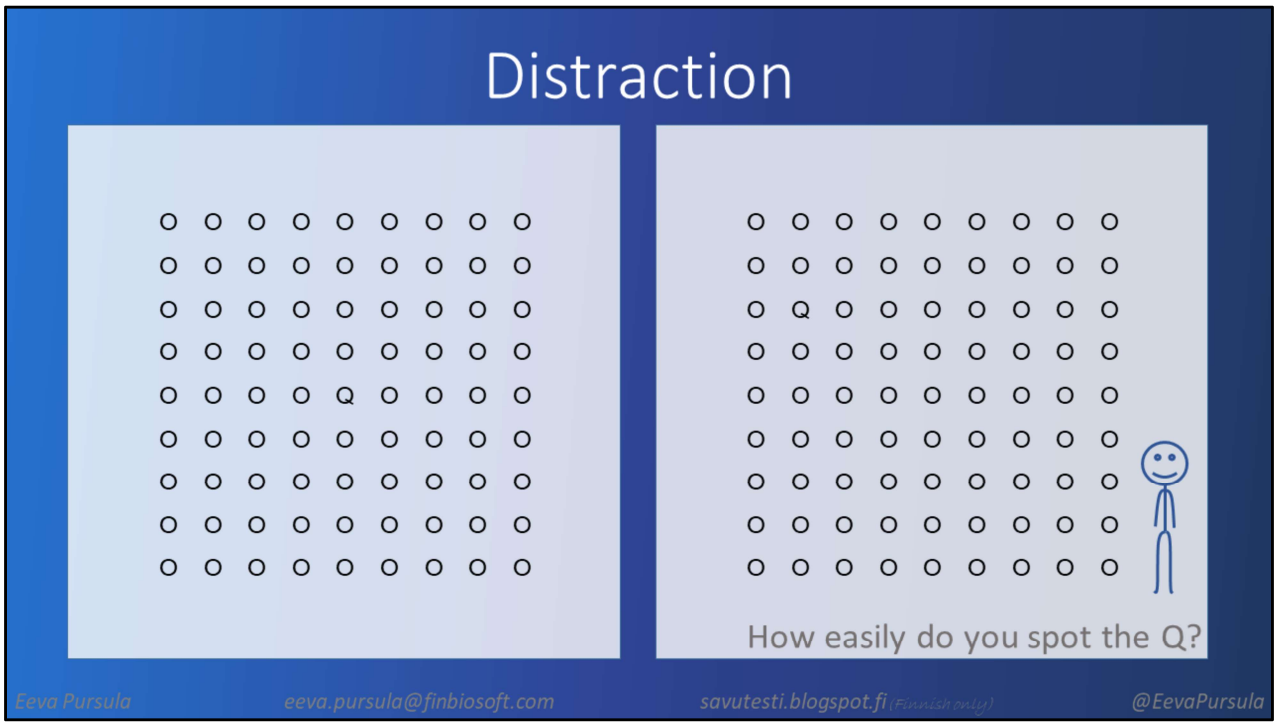
Some interesting paintings by **Salvador Dalí**:

Hidden faces

- *Endless Enigma* (1938) can be seen on 6 different ways
- *Spain* (1938)
- *Mae West's Face which May be Used as a Surrealist Apartment* (1934-35)
- *Apparition of Face and Fruit Dish on a Beach* (1938)
- *Slave Market with the Disappearing Bust of Voltaire* (1940)
- *Galatea of the Spheres* (1952)

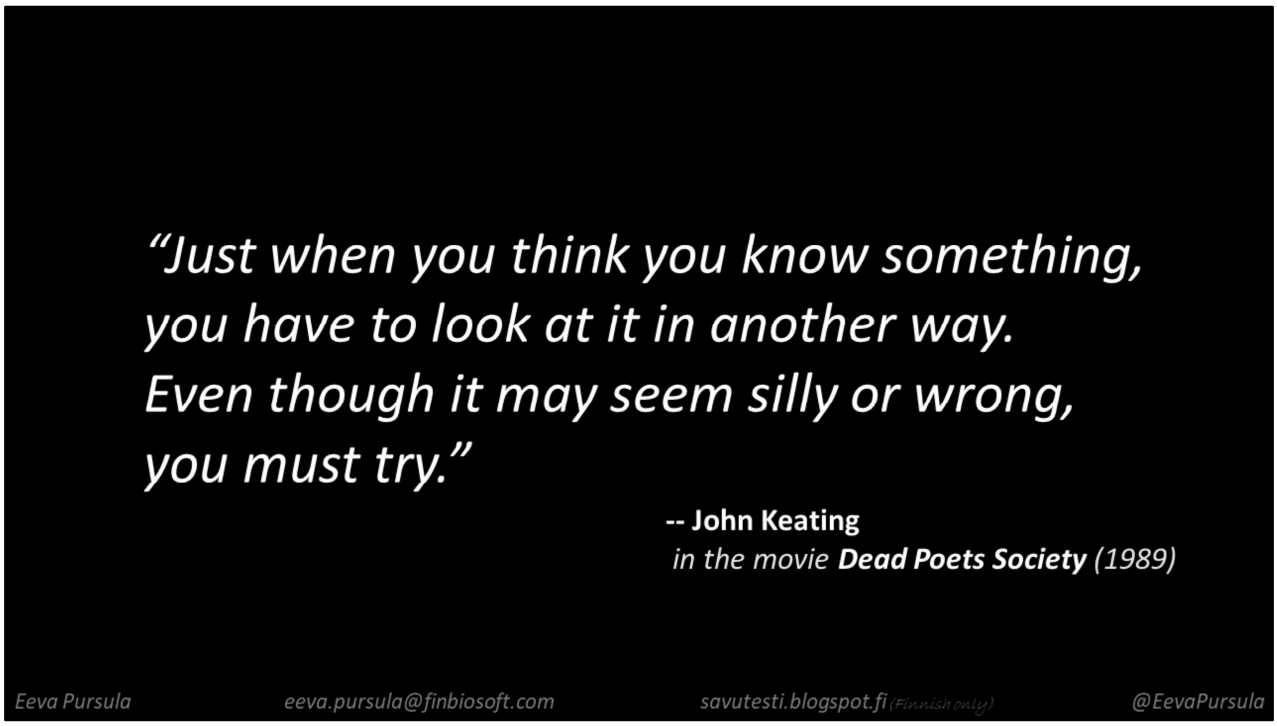
Other images playing with multiple interpretations

- *Metamorphosis of Narcissus* (1937)
- *Swans Reflecting Elephants* (1937)
- *The Sistine Madonna* (1958)
- *Gala Contemplating the Mediterranean Sea which at Twenty Meters Becomes the Portrait of Abraham Lincoln-Homage to Rothko* (1976)



On the left it is easy to spot the Q because your eyes naturally focus on the center of the image.

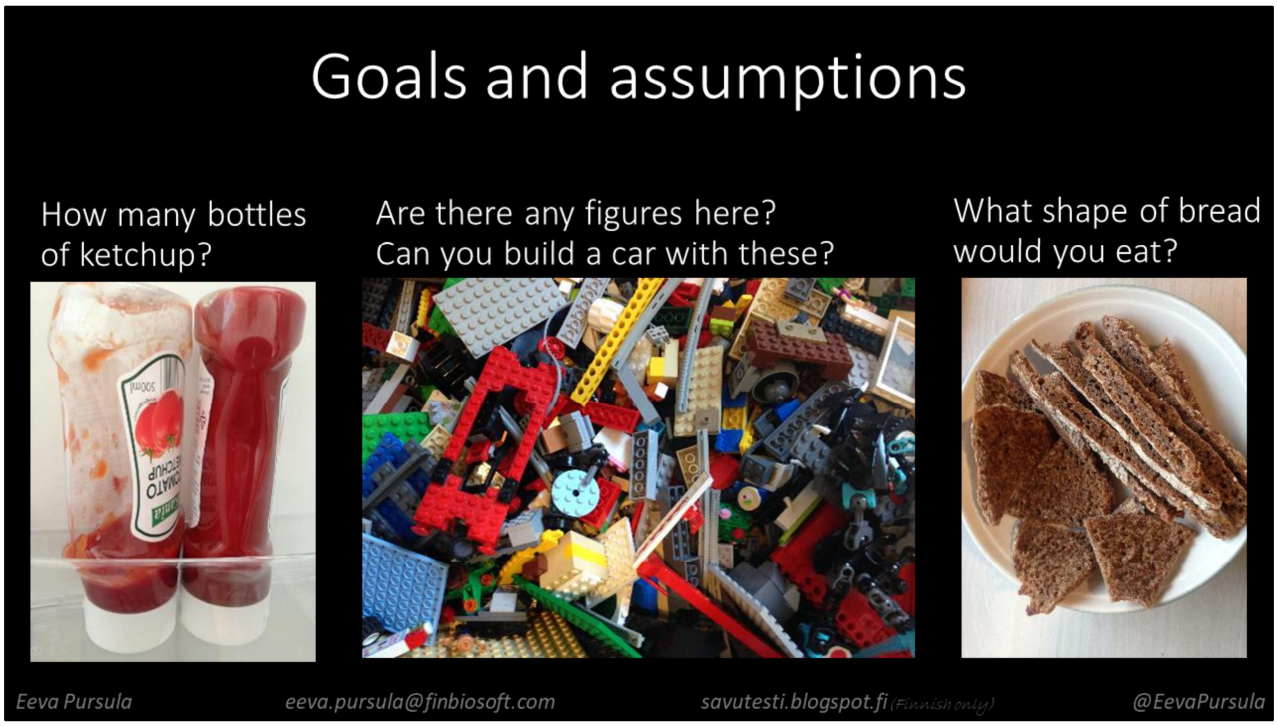
On the right it is tempting to look at the human like figure next to the grid, which makes it hard to find the Q



How to see better?

- Try another role
- Switch a project
- Discuss with someone who views things from a different angle
- Do something else

Try to be aware of your interpretations and assumptions and question them



It's easier to spot a full bottle of ketchup than a nearly empty one, because when looking for ketchup we look for something red http://hellofatester.blogspot.fi/2013/06/all-ketchup-bottles-are-not-red.html

When looking at a toy box full of Legos, you cannot know whether something is missing, but you can have many kinds of tasks for exploring the pile. Your goals determine what you will find out about the pile.

The way a bread is cut affects how it tastes and feels. Fixed assumptions on how to cut bread may make it impossible to get kids eat rye bread.

The answer you get depends on what you ask.

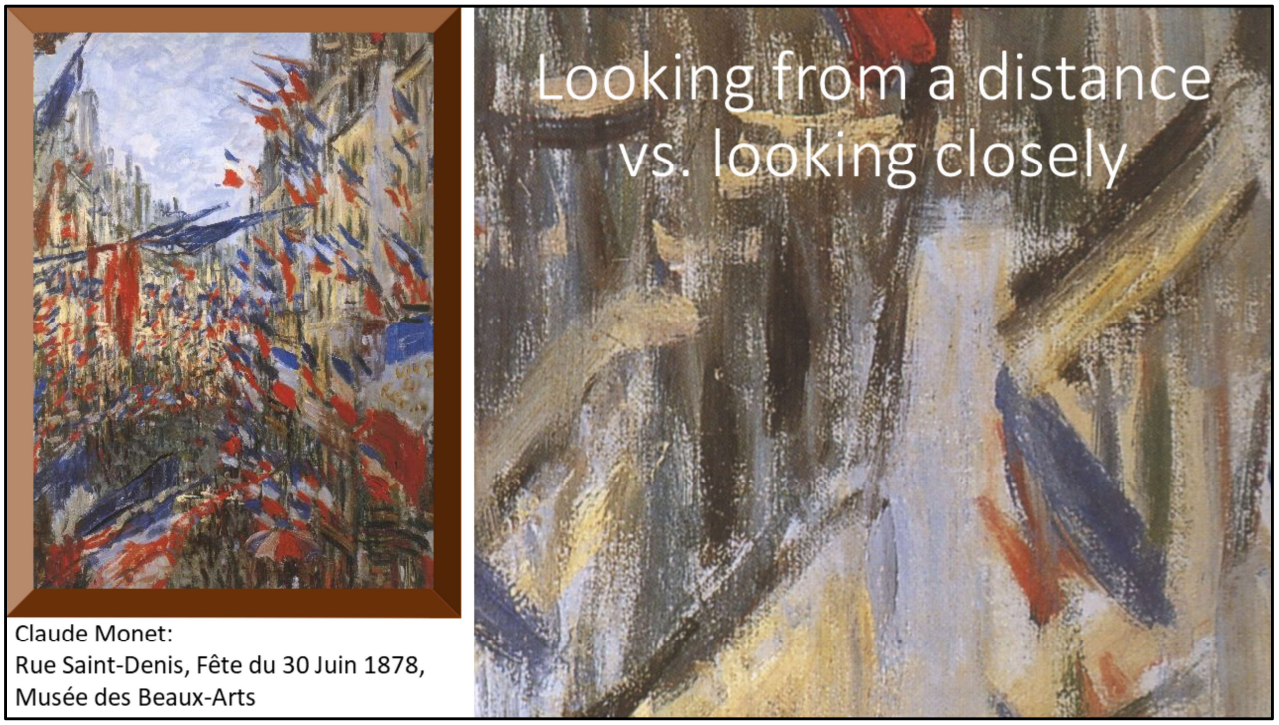
We are not always aware what we are asking.

We need to be able to see resemblance (being part of the same category) in things that are not identical:

- being able to learn new things by making comparisons to already learned things
- learning easily how to use different items of the same category (e.g. navigate on a new web site)
- coming up with use cases (and types of misuse) to create test cases

We need to be able to see discrepancies (uniqueness of an item in the category):

- how the implementation differs from what it was planned to be
- how the implementation differs from other similar products
- how the implementation differs from similar features within the same product



Claude Monet:
Rue Saint-Denis, Fête du 30 Juin 1878,
Musée des Beaux-Arts

A few examples of paintings to study seeing:

Claude Monet:
- *Regatta at Argenteuil* (1872)
- *Impression: Sunrise* (1873)
- *Rue Saint-Denis, 30 June* (1878)
- *The Houses of Parliament, Sunset* (1903)
- *Blue Waterlilies* (1916-19)

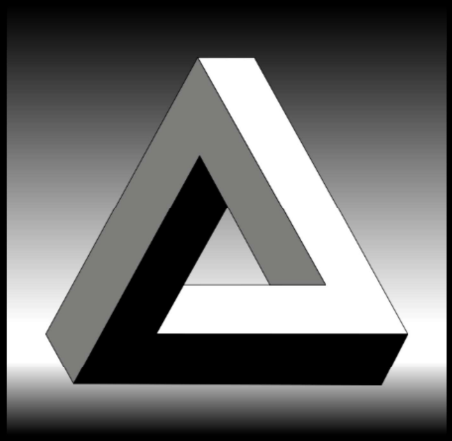
Paul Cézanne painted many paintings of following themes, some of them particularly interesting:
- *The Gardener Vallier* (1902-1906)
- *Forest* (1902-1904)
- *Mount Sainte-Victoire seen from Les Lauves* (1904-1906)

It's quite common that oil paintings look better when seen from a distance, but it's particularly distinctive in impressionism and expressionism.

Similar effects are still used in more modern contexts, e.g. **Yuri Bondar** (images available in the internet depend on what's on sale)

The developer who builds the product doesn't necessarily see the big picture but only his own small part, and sometimes it's hard to make sense of that part alone.

Looking from a distance vs. looking closely



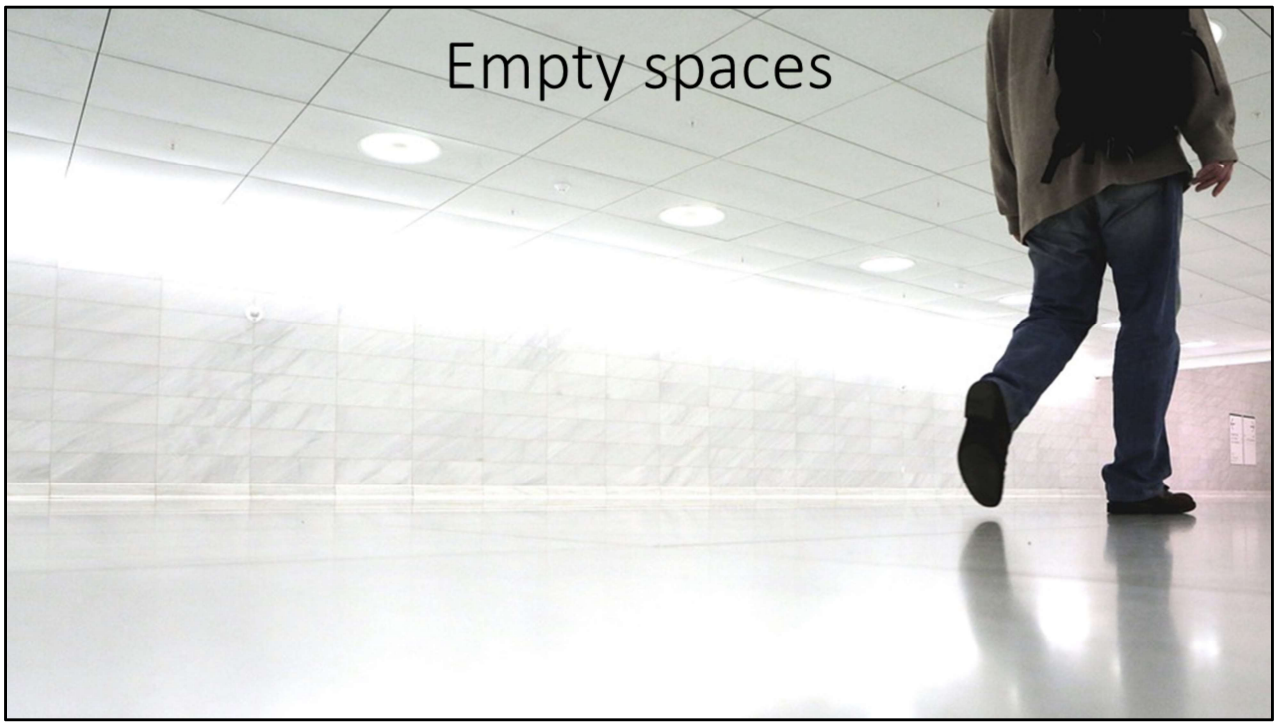
The Penrose triangle

Sometimes details can seem reasonable, but looking from a distance shows otherwise.

Examples of paintings by **M.C.Escher**:

- *Relativity* (1953)
- *Cube with magic ribbons* (1957)
- *High and low* (1947)
- *Concave and convex* (1955)
- *Waterfall* (1961)
- *Belvedere* (1958)

Test also workflows, not just features



Background is also something!

Empty spaces are important!

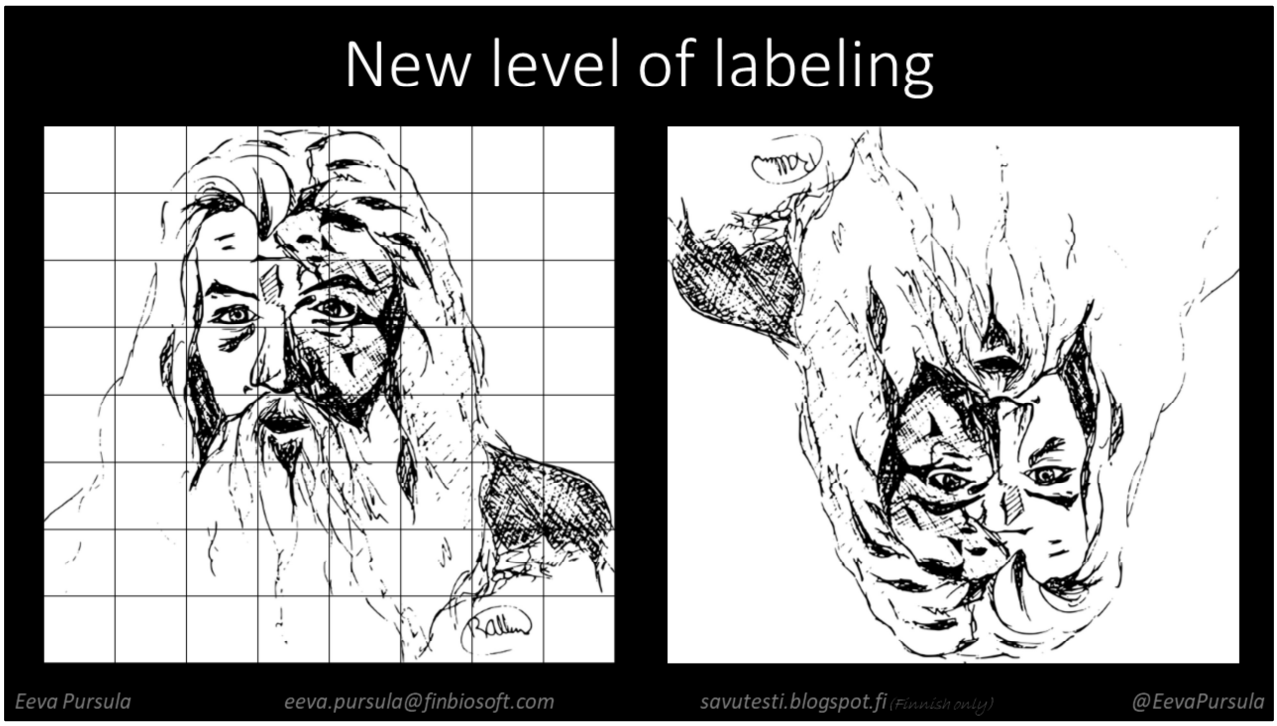
One way of learning to see better is learning to categorize things you've never looked at.

Examples of paintings by **M.C.Escher**

- *Day and night* (1939)
- *Sky and water* (1938)
- *Encounter* (1944)
- *Three worlds* (1955)
- *Metamorphose* (1939-1940)

Examples of paintings by **Robert Gonsalves**:

- *Ladies of the Lake*
- *Fall Floating*
- *The Phenomenon of Floating* (2012)
- *The Sun Sets Sail*
- *Water Dancing*
- *Big Air*
- *Aspiring Acrobats* (2009)
- *When the Lights were Out*

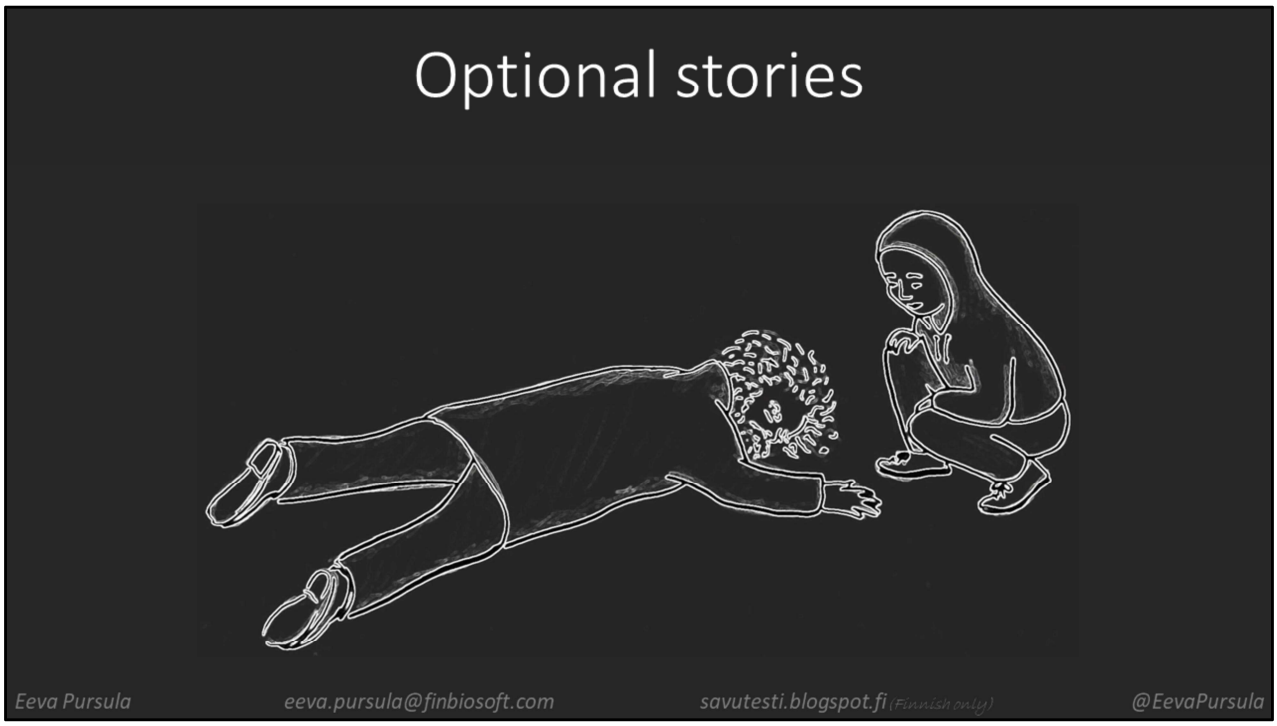


Seeing the model as lines and areas instead of seeing it as a face is essential for being able to draw it well. Otherwise you will just draw a generic face.

https://www.slideshare.net/mardev/whyupsidedowndrawing

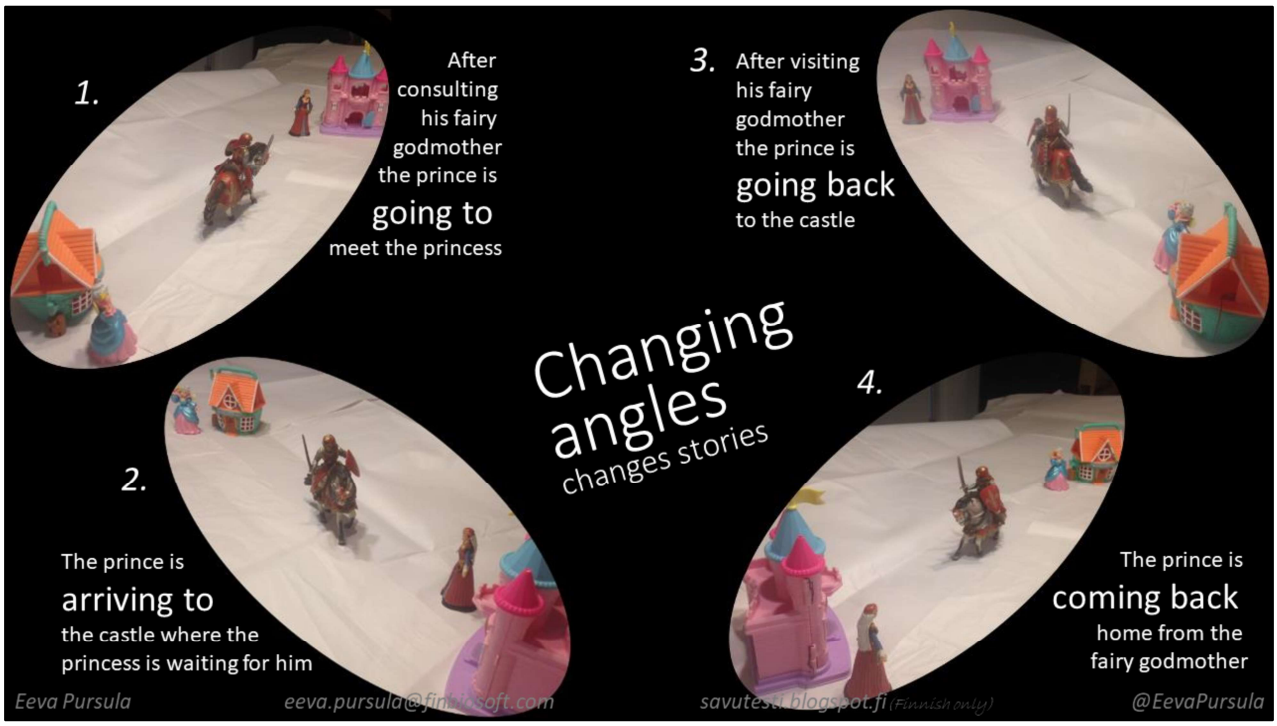
Testing is not just about doing things (or actively breaking things), sometimes you need to stand still and observe and let the software run into the bug by itself.

- what happens when it's time for timeout?
- what happens when a view is automatically refreshed?
- are there notifications that are linked to some background processes and do they disappear when that process is finished?



When looking at the picture, what do you think has happened and what will happen? What optional stories you can come up with? What details affect which story first came to your mind?

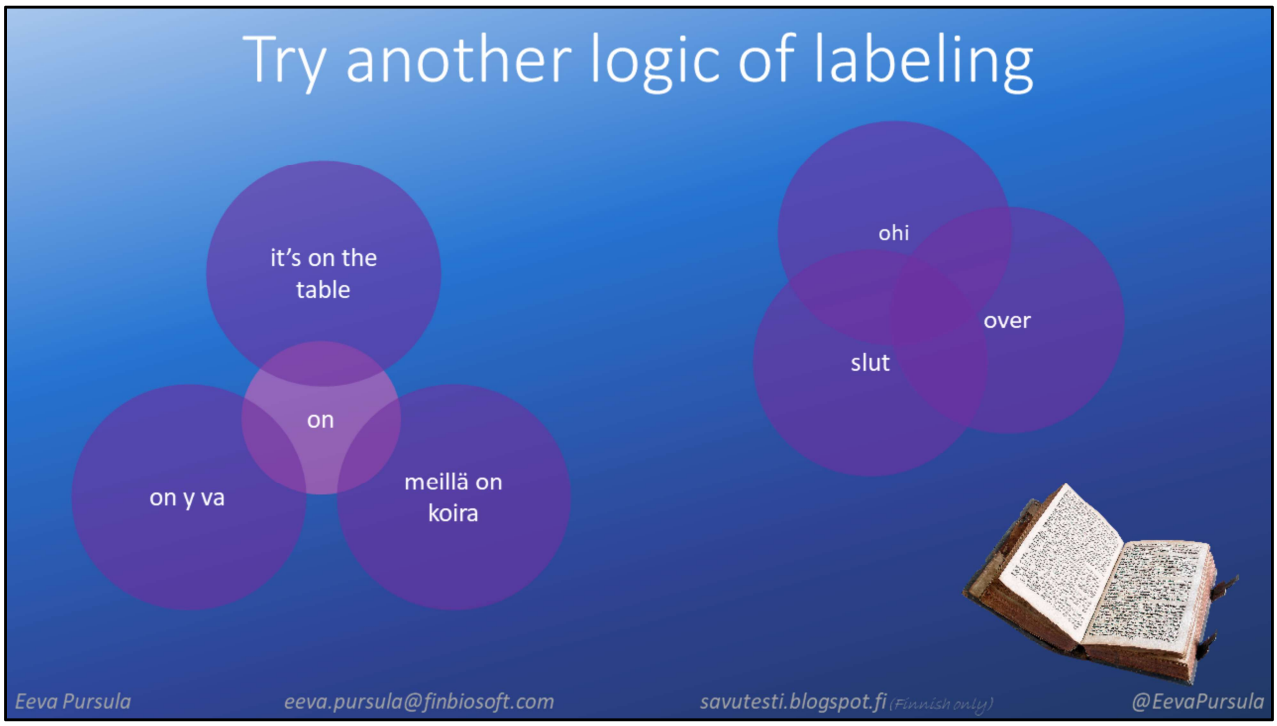
- helps you in creating test cases
- helps you in seeing what has not been defined well enough
- helps you in finding your role as a tester



We've been trained to read images in a certain way before we learned to read. You can build a story using images taken from different angles presenting the same situation.

Sometimes it's good to physically change the way you view things.

Sometimes it's good to try to imagine yourself in someone else's position. (Though you can never thoroughly understand the experience of another person.)

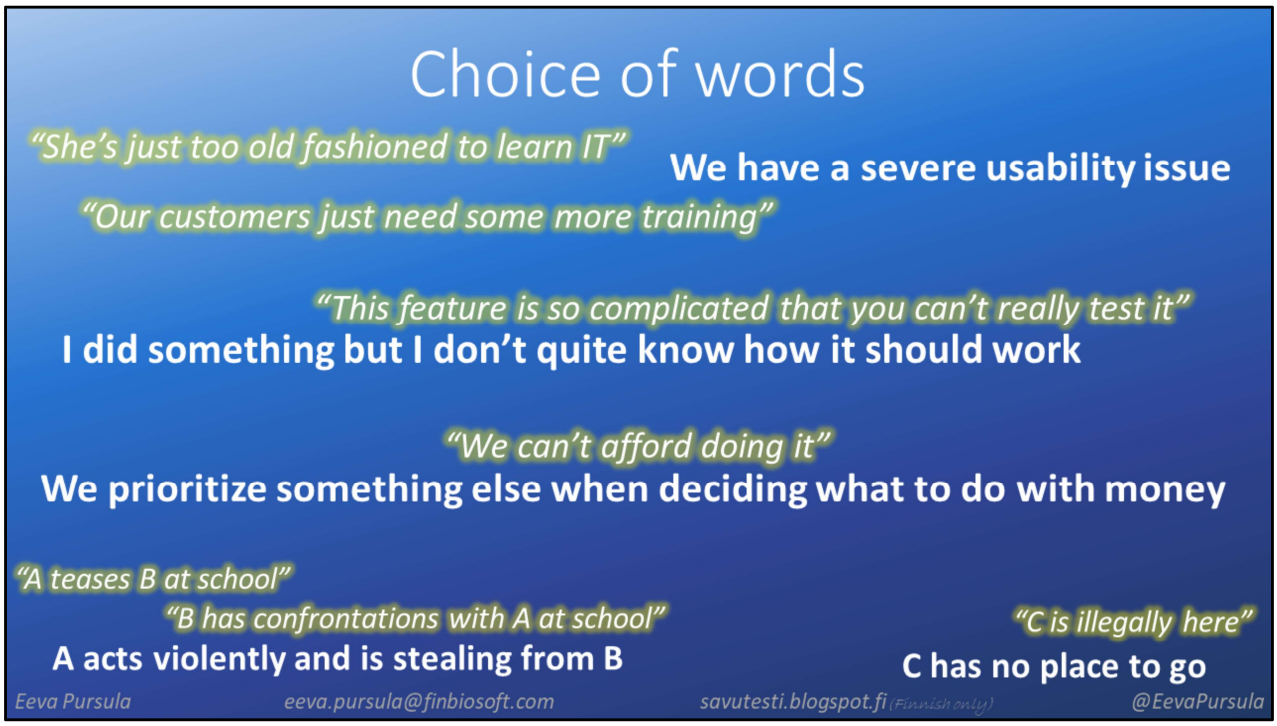


Find sequences of letters that have a different meaning in different languages

Find words that don't have direct matches on other languages. For example you can play with Google translator, trying how long chains of new translations you can get by simply switching languages. (e.g. Finnish-English starting with "realisoitua" or "luovia")

Read books from authors from different cultures.

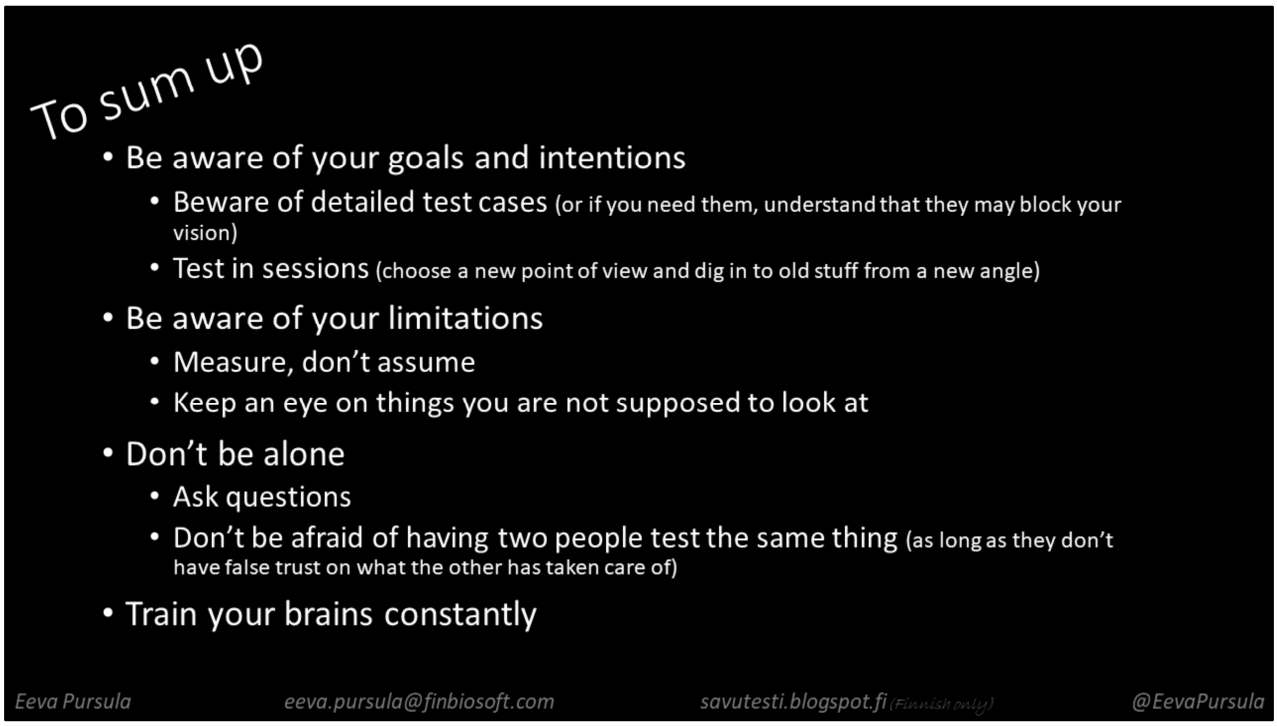
Talk with people from different cultures / with different native languages, and people of different kinds of backgrounds.



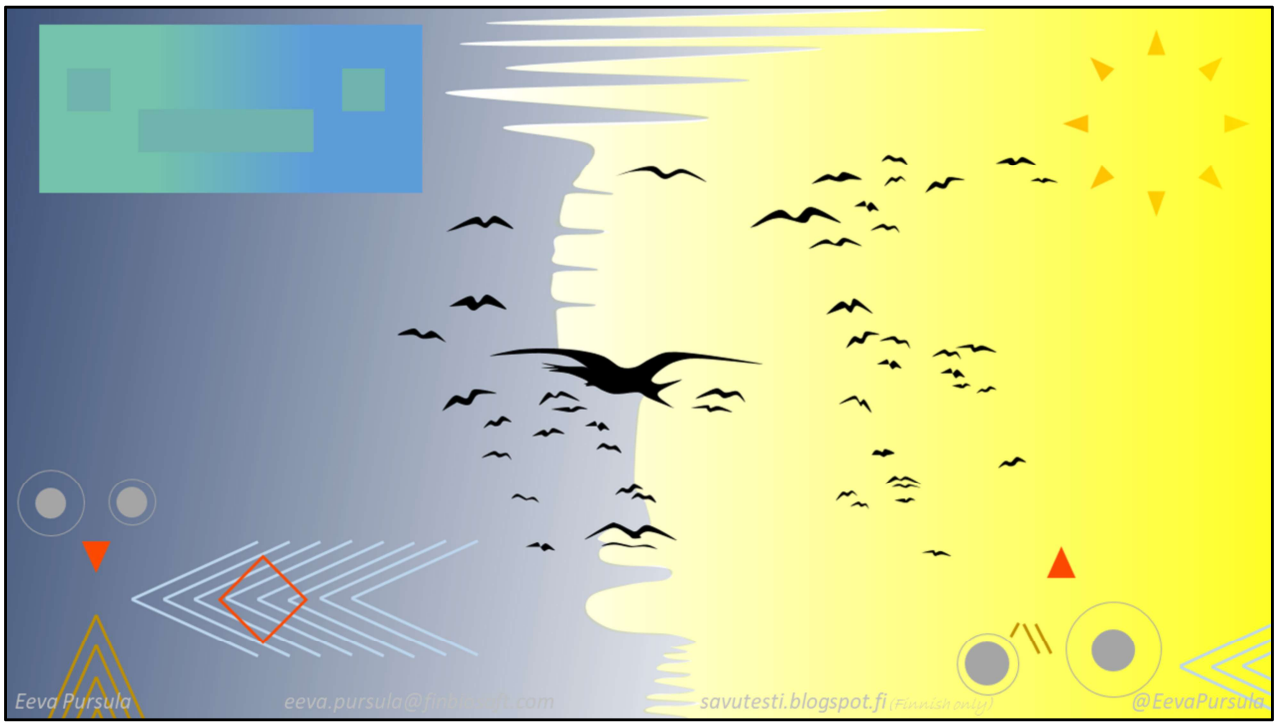
Be aware (and careful) about whose words you use, because the words define what is taken for granted, what is seen as problems, how severe these problems are seen, and what options are seen. What things are investments and what are expenses, what are threats and what are risks worth taking.

Sometimes getting to real problems and finding ways to solve them requires you to refuse using the accustomed language.

A magician (and a user interface) guides you through the show following a certain path. Looking to directions you are not supposed to look at may reveal bugs and tricks.



You may have tested enough, but you have never tested everything.



What do you see here?


Thank you!
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Questions?
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