FINDING AND FORMULATING A MASTER THESIS TOPIC

Dresden – 12 December 2024

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Cartography M.Sc.

Technical University of Munich

TECHNISCHE UNIVERSITÄT DRESDEN

TECHNISCHE UNIVERSITÄT WIEN
Vienna University of Technology

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Agenda

FIRST: The process

PART 1 : understand & discuss

- *1st idea → Topic → Proposal → Thesis*
  example of the process

PART 2 : do it yourself

- A) Go *Topic → **formulate** Proposal* yourself
- B) Explain *Topic → Proposal* to peers

Q & A (+ personal consultations)

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Start Requirements

- If you have obtained **at least 90 credits** in the first three semesters, you **have permission** to start with thesis research

- If you have between 80 and 89 credits, you *may obtain* permission to start, from the Exam Committee:

  write a special request for starting your thesis – addressed to Juliane Cron as secretary of the Exam Committee; final decision on your request will be made by the Committee.

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Enrolment and scholarship

- For the 4th semester you need to **enrol and pay** the **registration** fees at the partner university that employs the first supervisor, and also at TUM (as administrating university).

  - for EM Scholarship students these fees will be paid by us

  - beware that for UT-ITC registration fees are high (ca. €6.200)

  - during the thesis writing you need to comply with the rules and regulations of the university concerned

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The process

- Students will have to select their topic on 1 January - *well before* the start of the 4th semester

  - Choose 2-3 topics, own or existing...

Existing topics:

- use the list at kartoweb.itc.nl/msc-carto-thesis/topics/

- feel free to contact the proposing people, discuss your ideas with them...

Your own topic:

- contact people early that can help you with developing it

- make sure a partner Uni is *involved (through coordinators)*

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- Stude — *well before*

  - Cho

Cartography M.Sc.

MSc Thesis TOPIC CHOICES

Name student : ....

TUM matriculation nr : ....

First Choice (required)
Topic title : ....
☐ is topic from list
☐ is own topic - possible supervisor(s): ....

Second Choice (required)
Topic title : ....
☐ is topic from list
☐ is own topic - possible supervisor(s): ....

Third Choice (optional)
Topic title : ....
☐ is topic from list
☐ is own topic - possible supervisor(s): ....

Notes or remarks : ....
....

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The process

- Students will have to select their topic on 1 January - *well before* the start of the 4th semester

  - Choose 2-3 topics, own or existing...

- The selected topics will be approved by the Steering Committee, and a TAB (*supervisor*(s) and a *chair*) will be assigned, around half January

- Later that also a *reviewer* (from another Uni) will be appointed

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- Elaborate on your topic in an ERP:
  Extended Research Proposal – deadline 19 April 2025

- Present and defend your ERP
  (5-8 May)

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Extended Research Proposal (ERP)

- You will start with the topic ideas and mould them them into your own <u>Extended Research Proposal (ERP)</u>

- Your **supervisor(s)** will help you write your ERP

  - Your primary supervisor is assigned to you based on your topic choice

  - In most (not all) cases they are the person that proposed the topic

- Depending on the topic, there may be further supervisors, also from other research institutes or companies

- Your supervisor's university is **where** you write your thesis

  - be *available in person*

  - follow *their* programme (intro, workshops, etc.). There might also be joined activities of all partners.

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Primary Supervisor's role

- Your supervisor is your research *coach*
  → *you* are in charge & responsible for the research!

- Consider what the supervisor proposes - Be *teachable*

- Plan your time (e.g., use Gantt charts, etc), and check whether you are on schedule. If not, adjust plans and inform your supervisor when necessary

- Ask for feedback on important decisions

- Discuss (intermediate) results

- Note that your supervisor will not be available 24/7. They have more things on their agenda (unlike you...!)

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Timing in a Nutshell

12 Dec	*topic choice & definition workshop*
1 January	Topic selection by students
during Jan	Approval of thesis topic & supervisor
…	*…work on proposal…*
1 April	Official start of semester 4
25 Apr	Extended Research Proposal (ERP)
5-8 May	ERP defense
…	*….working….*
23-27 June	Midterm presentation
…	*….working….*
5 Sep	Deadline for submitting
22-26 Sep	Thesis defense

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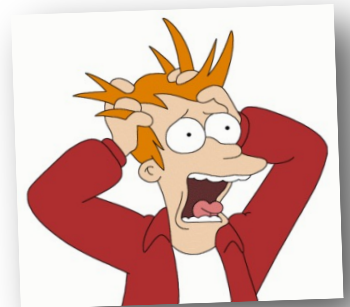
PART 1

1st idea ⟶ Topic ⟶ Proposal ⟶ Thesis

Let's see how this process worked for a 2020 thesis...

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EXAMPLE: 1ST IDEA

Experimental Atlas of the Netherlands

https://kartoweb.itc.nl/NatAtlas/
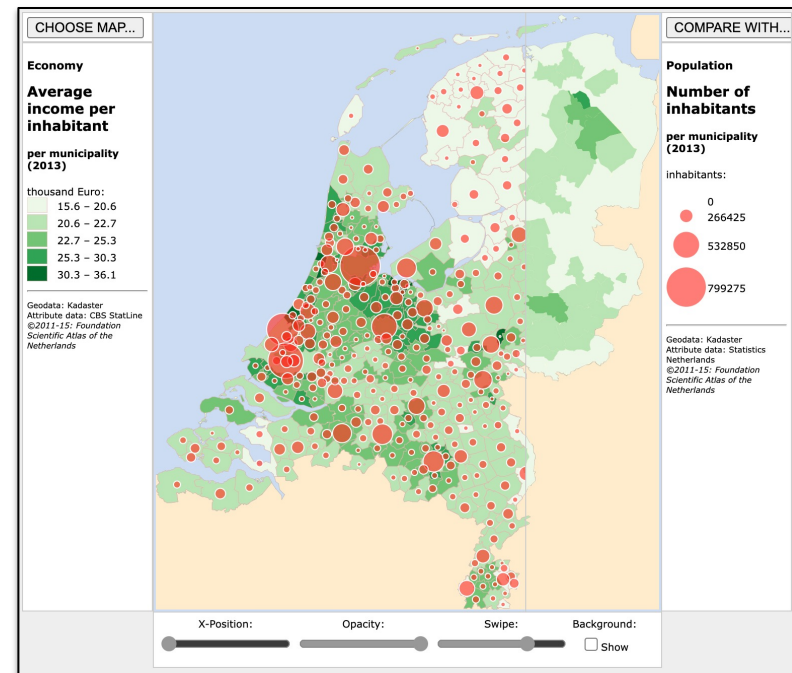
Animated Transitions in Statistical Data Graphics

Jeffrey Heer, George G. Robertson

Abstract—In this paper we investigate the effectiveness of animated transitions between common statistical data graphics such as bar charts, pie charts, and scatter plots. We extend theoretical models of data graphics to include such transitions, introducing a taxonomy of transition types. We then propose design principles for creating effective transitions and illustrate the application of these principles in *DynaVis*, a visualization system featuring animated data graphics. Two controlled experiments were conducted to assess the efficacy of various transition types, finding that animated transitions can significantly improve graphical perception.

Index Terms—Statistical data graphics, animation, transitions, information visualization, design, experiment

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EXAMPLE: TOPIC

https://gip.itc.utwente.nl/default/node/668

Animated Transitions in Statistical Maps

Figure 1: animated transitions

Objective:
Find out how animated transitions in thematic mapping work, and if they are helping or hindering user perception.

Keywords: Statistical Mapping, animation, User perception, MSc Cartography

Figure 2: National Atlas on the web

Description:
In 2007, Heer & Robertson in their paper "Animated transitions in statistical data graphics" [ref1], concluded that animated transitions can significantly improve graphical perception of users. Their experiment was limited to statistical graphs (bar graphs, scatter plots, donut graphs), and we are interested to see if animated transitions in statistical maps would work in a similar fashion.

You will research the possibility of animated transitions in the National Atlas of the Netherlands [ref2], an experimental web mapping system that consumes data from the Dutch National GeoData Infrastructure and maps these in an interactive web client based on the D3 Javascript library [ref3]. You should look into transitions between various between various thematic map types and/or between maps and graphs, and determine how these help or hinder the user perception.

References:
- J. Heer and G. Robertson. Animated transitions in statistical data graphics. IEEE Transactions on Visualization and Computer Graphics, 13(6):1240–1247, 2007. ISSN 1077-2626. doi: 10.1109/TVCG.2007.70539.

- B. Köbben. Towards a National Atlas of the Netherlands as part of the National Spatial Data Infrastructure. The Cartographic Journal, 50(3):225–231, 2013. doi: 10.1179/1743277413Y.0000000056.

- M. Bostock, V. Ogievetsky, and J. Heer. D3: Data-Driven Documents. IEEE Transactions in Visualization & Computer Graphics (Proc. InfoVis), 2011.

Domain(s):
Data Organization | GeoVisualization

Researchers working on this field:
Barend Köbben
Corné van Elzakker
Menno-Jan Kraak

BJ Köb

EXAMPLE: EXTENDED RESEARCH PROPOSAL (ERP)

2.1 Research Objectives

The main objective of the current study is **to determine how animated transitions from statistical maps to graphs and vice versa change user perception**. Particularly, the study has the following sub-objectives:

1. To describe possible animated transitions between statistical maps and graphs;
2. To develop working examples of the suggested transition types;
3. To test and analyze if and how the animated transitions affect user perception.

The results of the suggested research can contribute to the area of data visualization, specifically quantitative thematic cartography and data graphics. This study will be valuable to cartographers, data graphics and user interface designers, statisticians, storytellers and journalists to find more efficient ways to explore, analyze and design representations of statistical data.

https://kartoweb.itc.nl/msc-carto-thesis/files/topic_workshop/ERP_AnimatedTransitions.pdf

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EXAMPLE: ERP

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2.2 Research Questions

To meet the afore-mentioned objectives, the following research questions need to be addressed:

Q1 What are the possible ways to transition between dimensions of statistical maps and graphs?

Q2 How do animated transitions affect the map reader's perception?

Q3 Does the change in perception improve the understanding of patterns, trends or relationships in statistical data?

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3.1 Methods Adopted

The primary research method for this work is a literature overview to find existing types, classifications and methods of animated transitions in data graphics, user interface design and other related studies. Identification and description of feasible transitions between different combinations of statistical maps and data graphics are the very first steps towards understanding of when and how they influence map reader's perception.

In the second stage, the vast majority of time will be dedicated to the development of experiments for measuring perception change. The test tasks will be prepared, and selected types of transitions from the first step will be designed using the D3 JavaScript library.

Finally, the testing will be conducted. After the results are analyzed, the study will discuss how different types of transitions affect user perception and which of them are the most and least helpful for perception.

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WHAT CHANGED...?

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"A mind is like a parachute. It doesn't work if it is not open."

Frank Zappa

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EXAMPLE: THESIS

1.2 Research objectives and questions

The current study's main objective is **to determine how animated transitions from statistical maps to charts and vice versa change user perception**. To accomplish this, the study has the following sub-objectives:

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https://kartoweb.itc.nl/msc-carto-thesis/files/topic_workshop/Thesis_AnimatedTransitions.pdf

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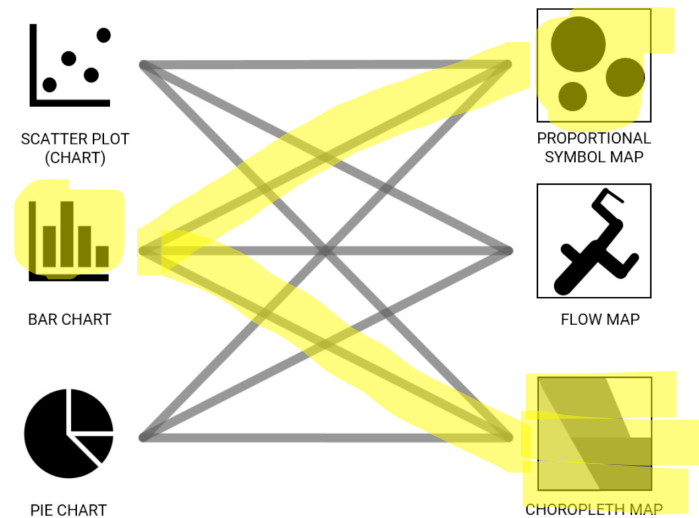
In the end: selected only

dimensions of

Figure 3.3: Possible transitions between maps and charts

https://kartoweb.itc.nl/msc-carto-thesis/files/topic_workshop/Thesis_AnimatedTransitions.pdf

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EXAMPLE: OWN TOPIC

The process is similar, but more is in your own hands

Polygon Schematization for Thematic Maps
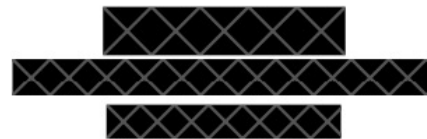
International Master of Cartography

Every map lies. Generalization is a concept, which is inherent to maps. Hence, generalization can neither be wrong nor right – *"As is often the case, two views might both be valid"* (Monmonier 1991). But still some questions remain: *What makes generalized maps look good and legible for the map reader? How can aesthetically pleasant maps be produced in an efficient way?*
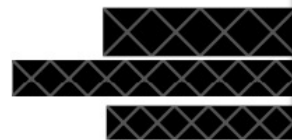
The proposed research aims to examine the latest algorithms for polygon schematization, to analyze their suitability for cartographic purposes and to test the generated designs regarding their aesthetics and readability.

https://kartoweb.itc.nl/msc-carto-thesis/files/topic_workshop/own_topic_example.pdf

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EXAMPLE: OWN TOPIC

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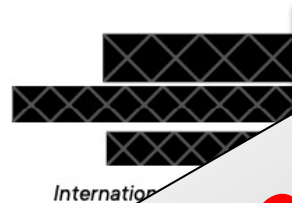
A   Collection of Related Questions

These questions could serve as idea pool during the process, or eventuall may pose further research questions based on this research work.

1. How can geodata (line and polygon features) be generalized automatically in a stylized way? (overview of already existing algorithms – not only from cartography)

2. How does generalization of administrative boundaries, coast lines, and other relevant features for thematic maps influence the perception of such maps?

   - Do prejudices and expectations regarding the readability, as described by Roberts and Vaeng (2016), also exist for thematic maps?

   - Differences in the perception / connotations of the map reader for different "generalization styles"? (compare)

3. Which parameters do such algorithm have? Are they suitable for cartographic applications?

4. Would it make sense / it is feasible to create a tool like mapshaper.org aiming for "map stylization" or "stylized simplification" (generalization), but not only in terms of reducing the file-size/number of anchor points, but rather with a focus on aesthetics, tailored for thematic mapping. (*maybe too practical for a master thesis?*)

5. What makes a generalization "style" aesthetically pleasent?

6. How can the relation between map scale and possible generalization styles be described or formalized?

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EXAMPLE: OWN TOPIC

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6. How can the relation between map scale and possible generalization styles be described or formalized?

Talk to coordinator and/or potential supervisors at an early stage....!

PART 2: DO IT YOURSELF

A) Go *Topic* ⟶ *Proposal* yourself

- **select one** from current list of proposed topics at
  https://kartoweb.itc.nl/msc-carto-thesis/topics/

  - OR –

- **use your own topic** idea if you have it

- **Ask yourself the following questions**:

  - What is or could be the <u>research objective</u>(s) (ROs) ?

  - What <u>research questions</u> (RQs) can be asked to reach the ROs?

  - What <u>methodology</u> could be used to answer these RQs?

  - Prepare a brief (1 page/few slides) presentation of your answers

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PART 2: DO IT YOURSELF

B) Explain *Topic* ⟶ *Proposal* to peers

- Explain your proposal to your peer(s)

  - convince them it would work!

  - Ask questions, discuss problems, point out weaknesses…

- *For 'own topics', also discuss if the topic is 'cartographic enough':*

  - *Is it more than just "science with maps"…?*

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Q&A

For further information & questions regarding your thesis semester:

kartoweb.itc.nl/msc-carto-thesis

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Local coordinator at UT–ITC
Coordinator of the Master's
thesis semester
b.j.kobben@utwente.nl
+31-(0)53 4874 253

https://xkcd.com/2268/

We believe this resolves all remaining questions on this topic. No further research is needed.

References

1. ...
2. ...
3. ...
4. ...

JUST ONCE, I WANT TO SEE A RESEARCH PAPER WITH THE GUTS TO END THIS WAY.