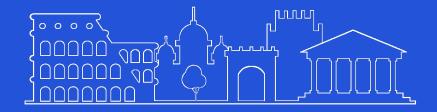


A Typology of Guidance Tasks in Mixed-Initiative Visual Analytics Environments

I. Pérez-Messina*, D. Ceneda*, M. El-Assady**, S. Miksch* and F. Sperrle***

TU Wien, Austria*, ETH AI Center, Switzerland**, University of Konstanz, Germany***



• 24th EG Conference on Visualization • Rome • 13-17 June 2022 •

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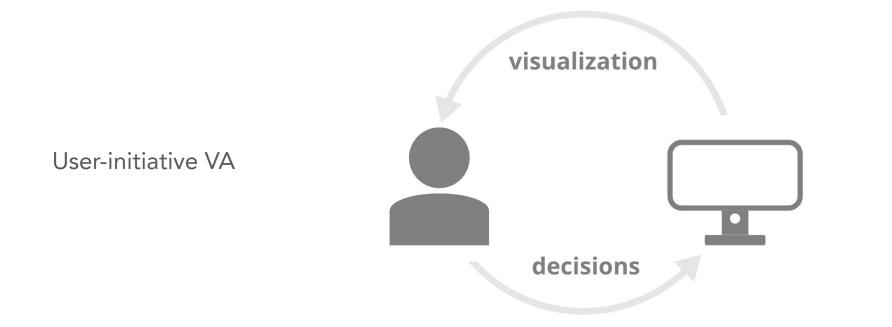
- Model of Knowledge Generation in Guided VA
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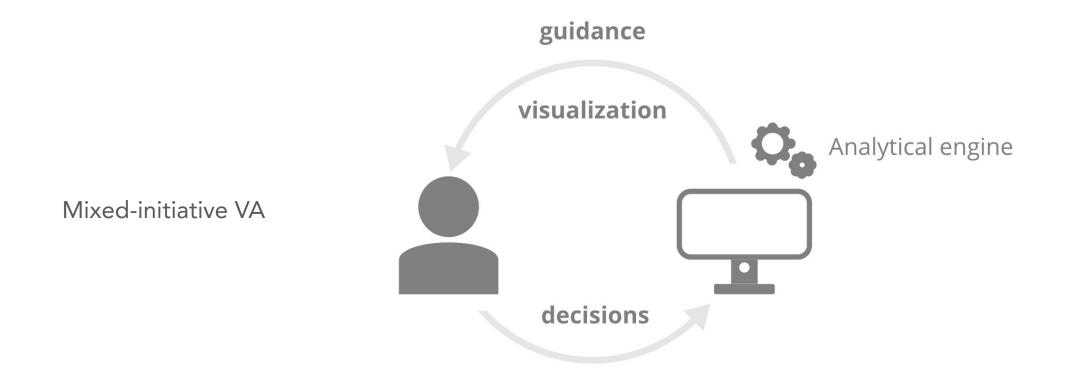
Guidance



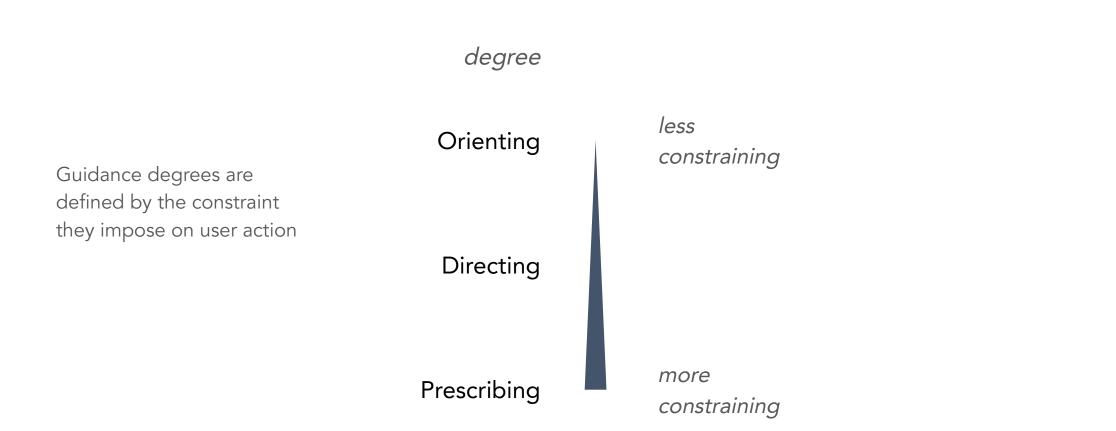


Guidance









Ceneda, D., Gschwandtner, T., May, T., Miksch, S., Schulz, H. J., Streit, M., & Tominski, C. (2016). Characterizing guidance in visual analytics. *IEEE transactions on visualization and computer graphics*, 23(1), 111-120.



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Eurographics Conference on Visualization), Borgo, G. E. Marni, and T. Schreck (and Editors) A Typology of Guidance Tasks

A APPARORY OF ORDERING LEARS I. Pérez-Messina¹, D. Ceneda¹, M. El-Assady², S. Miksch¹ and F. Sp.

PETH AI Center, Zitich, Switzerland PUniversity of Kon-



and / A Typology and guidance systems, from which we ction between user and guidance systems, from winar we a model of guidance degrees and how they relate to user with we call perspective change dynamics; (3) a typology in guidance tasks covering the why, how, what, and when in guidance to how the six does monstruted through (4) three which we call pers

To arrive at a better understanding of the role of guidance in the VA discourse, we first review the literature on guidance, analytic models, and analytical tasks. for what we call the "Guidan

Analytical Tasks. The con portance for mixed-initiative V, scribed as a task-driven process gue that, for the design of effect Guidance. The term guidance was first uidance. The term guidance was not introduced as "recommender systems", ify under a common framework terms as "recommender systems", ser support" and "assistance" within VA (SSMT13). Ceneda et L define guidance as "a computer-assisted process that aims to L define a loweridence gap encountered by users during an association of the set of t 1 define guidance on"[CGM*16, p. 2]. Several aspec high-level goals [GZ09; RAW*16 ing roals from a rized and use in which both the user and the VA system are co-active role in analysis [CGM19b] and adarture [CGM*18 have an SIB*20 niques les of bed analysis has bee Work describing visualization JB*21]. The study of gu ared (e.g., for biological gap between high miti-level task typology metion of c an of Norma

Loop and the Sensemaking Loop [PC05]. The comp and Model (see center part of Fig. 1) was fin Model (see center part of Fig. 1) was fin troduced by Keim et al. [KKEM10] sl otheses and insights gained in the n Loop. The ou

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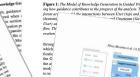
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11 We do not in

Piper-Marrine et al. / A Translater of Guide VA



The Mc



Tectively have ange incurred; ng an influence on the foi swing analytic discourse) or it can be "automatically" tran ito actions, by moving sideways through the Daniers perspectiveChang action of the Some guidance degrees ually the new in of the user is $arch_a \equiv search_b$), and so $arch_a \neq search_b$). We call one-click decision. The fore, the guidan or not it was a stiate them from is fed back to the s ase. Moreover, to diff . The result is that a search type can le second-order degree agency to the guidance. This is illust that goes all around the Exploration Le ated in Fig. 1 by the red or system) and the Exploration Loop (information from the set system) and the green line that stops at the Action block attain from the user). Thus, printance can be double-edged: it set analysis more fluid and enrich is, but it can also disrup aream flow (i.e., information rich interaction from the tuser), arises information about the users' goals, and constrain their s. We formalize this effect of guidance in the next set. ee that specify the ro arch task. The cor n make analusi e the mapping fur-lance and a finer owing, we de re (deriving fr

4. Perspective Change Dynamics

4.1. Disruptive Guid The model we introduced depicts the normal interaction betwee near loss a se also-second apprets the nermal interaction between metric loss and loss to continue the analysis, i.e., there is a loss of ea-ger loss and loss to continue the analysis, i.e., there is a loss of ea-ger loss of the gather of the loss of the loss of the loss of the loss of the gather of the loss of the loss of the loss of the loss of the gather of the loss of t Among all guidance cting and pre user's task change as circuit", which was (nation during the analysis, i.e., the path mension that is common to be gap. Howeve hardly the ca BM13] and know ledge gap [CGM*16] he fact that com Each analysis can be seen as the efforts users make while starch, semation. Our assumption is that guidar

erent. We call the ef ve Change, as is arch Types There

id it, they are n within a set of element f the users know hoth perform a lookun Thanks to the model of guid how the provision of guidance tasks. In particular, how they with different guidance deg imagined as a function that type and maps them to a sea

affect users' tasks by constr

lisers are n

Pérez-Messina et al. / A Typology of Guidance Tasks in Mixed-Initiative Visual Analytics Environme



Figure 5: UT and GT decomposition of the ForceSPIRE main interaction loop [EFN12].

Following the Parameter Setting, Model Building is the core objective of the system. Three main UTs are identified revolving around the refinement of a topic-tree: explore strategies (Fig. 4 around use remements or a topic-tree: *explore strategies* (rig. 4 UT3), where users can use speculative execution to observe the con-sequences of predetermined actions, *explore model-space* (Fig. 4 UT4), where the topic-tree is visualized and users can directly ma-nipulate the model, and *compare trees* (Fig. 4 UT5), where they can ompare a speculative tree to the current tree in a differential topic compare a speculative tree to the current tree in a differential topic-tree view. These tasks depend on each other forming a loop (address-ing the iterative, human-in-the-loop approach of the system). Then, we identify three GTs: show quality (Fig. 4 GT2), which encodes the quality metrics to orient the user shout the progress of the model and of speculative models; suggest strategy (Fig. 4 GT3), which pro-poses ranked actions to undertake on a parallel model; and encode stress (Fig. 4 GT4), which shows the quality of each topic cluster. indirectly leading to certain paths and targets.

Observations. We can see that the SpecEx employs d





change the model?" Observations. Both the iterative and mixed-initiative nature of the analytic discourse within ForceSPIRE, as seen in Fig. 5, are captured by our representation: the flow of information of the user-guidance task complex forms a loop where there is not an order of tasks imposed on users (they are free to start at any UT and to change tasks whenever they please). We can explain that the users of the conducted study "treated their investigation not as steering a model but rather synthesizing information" [EFN12] through the fact that the steering is actually delegated to the *orienting* GT, so the users can focus on their upstream (synthesizing) flow.



Orienting guidance

Used to preserve or enhance the users' mental map

Does not constrain user action

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A Typology of Guidance Tasks in Mixed-Initiative Visual Analytics Environments

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¹TU Wien, Austria ²ETH AI Center, Zürich, Switzerland ³University of Konstanz, Germany

Abstract Considure, thus here proposed as a conceptual framework to understand how mixed initiative visual analytics approaches can actively apport sever as they solve analytical tasks. While user tasks received a fair have of attention, it is still not completely citedra from they consult be supported with guidance and how such support could induce the progress of the task itself. Our observation is that there is a research gap is understanding the effect of guidance tasks of the task itself. Our observation is that there is a research gap is understanding the effect of guidance is a value adaptive environment is usually indistinguishable from common visualization features, making user reposuse challencing is usual adaptive environment is usually indistinguishable from common visualization features, making user reposuse challencing is upredict and measure. Colordy aligned to exalidate our estimation of protocols and the proposed popular directly from a measure colored generation process and liberative is improached the proposed popular directly from a studees with how how our prophogy can be applied to analyze catting guidance exame. We agad these a class consistention of the stylent perspective, the analysis of datas in mixed-bitative approaches is theorempter. Faulty, by analyzing matching of user and guidance tasks, use elserishee how gained and the earliers in the elserishee task could either theory of the analyzing matching of user and guidance tasks, use elserishee how gained and the earliers to englishee tasks and advising in matching of user and guidance tasks, use elserishee how gained and the earliers of the analyzing matching of user and guidance tasks, use elserishee how gained and the elserish of the earliers and the endoys is or datask in mixed-bitative approaches is the mostly of charge and guidance tasks. The endoys is of datask in mixed-bitative approaches is the other hear consolution tasks and earliers how gained tasks and earliers how for the our comatches and the analysis

1. Introduction

In the traditional visual analytics (VA) process, knowledge is generated by users from data by exploiting visualizations, interaction, and the molelling capabilities of VA environments (SSS*14). Users' domain knowledge is distilled in goods and hypotheses that are fed to the interactive system as actions. The result of the machine processing is absorb back to the user, but how interprets it into useful insights and integrates it as new knowledge that can be used for decision-making (REMIO). The conventional information visualization process has begun to be expanded into what are known as used-insitive approache (CC+175), where the system plays an active role in the analytical discourse through the incorporation of dir-(B1742). The behaviorable (CC+175), where the system plays an active role in the analytical discourse through the incorporation of dir-(B1742). This behaviorable (CC+175), workerish and and encogenlate this phenomeneous which goes beyond information visualization and is at the core of the VA promise.

Guidance in VA is characterized at an active process addressing theoretical gaps.¹ for the users that hinder their analytical progress by identifying them and providing orienting, directing, and prescriptive guidance [CCMP10]. This dimension, namely the "guidance degree", has been identified over single- and mixted-initiative systems (CCM193a), proving to be an effective model to analyze systems with active user-supporting (Lz, guidan) capabilities.

Additionally, taxonomies of interaction tasks have had an important role in the design and understanding of user-initiative interactive visualization systems [BM13], as user tasks are considered the

© 2022 The Author(s) Computer Graphics Forum © 2022 The Eurographics Association and John Wiley & Sons Ltd. Published by John Wiley & Sons Ltd. building blocks of higher-order intellectual processes in VA. However, interaction task describe only one part of the story, as they only depict user intentions and interactions. System-side intelligent agents are left or tof this arraritize as well as their supporting role in human decision-making [DS21] and the procetive guidance they provide to the user. This makes it disturble to understand the complex provide to the user. This makes it disturble to understand the complex of the complex interaction of the complex of the complex provide to the user. This makes it disturble to understand the complex of the cystem's interaction and an advance of the complex of the cystem's interaction and the super states directed by the guidance of private the knowledge generation process? (20) How care the amisphical discovers and the super states directed by the guidance?

In this paper, our aim is to narveer these questions from a heteretical perspective. To accomplish this, we mits retarded R-Knowledge Generation Model by Sache et al. [SSS*14] by taking into account the contribution of the guidance system to the generation of might and knowledge. We show that ca the crossroad of human and humelenses and the structure of the structure time of the structure of the structure of the structure is useciently capative the interiorion, structure of the structure of the structure the interiorion, structure of the structure of user action. We then introduce the notion of *paintance tasks* and effect out on wy phology of guidance actions. We illustrate in acvter word to decompose the analysis in thy part part has the structure structure of the structure of the structure of the structure in structure (structure) and the structure of the structure of the stark by making exception the structure in structure structure of the structure of the structure of the structure in structure of the structure in structure of the structure of the structure of the structure of the structure in structure of the structure of the structure of the structure of the structure in structure of the st

We contribute the following: (1) An expansion of the Knowledge Generation Model in guidance-enriched VA environments showing the interaction between user and guidance systems, from which we derive (2) a model of guidance degrees and how they relate to user tasks, which we call perspective change dynamics: (3) a typology of system guidance tasks covering the why, how, what, and when of guided interactions, whose use is demonstrated through (4) three cases studies:

Pérez-Messina et al. / A Typology of Guidance Tasks in Mixed-Initiative Visual Analytics E

2. Related Work

To arrive at a better understanding of the role of guidance in the VA discourse, we first review the literature on guidance, analytic models, and analytical tasks.

Guidance. The term paidance was first introduced by Schult et al. to uitify under a commo framework terms as "recommender systems", "tures rapport" and "assistance" within VA [SSMT1]. Conclot et al. Ideltine paidance as "a computer assisted protect that aims to actively resolve a *loosoledge* gap encountered by users during an interactive (Yould WH 18), and to describe mixed-onitative approaches, for and and the second COM*16, for 2, 13. Seven1 appets of guidance have been characterized and used to classify the existing interative [CGM*16], and to describe mixed-onitative approaches, active nole in analysis [CGM*16] and datage to each other [SIM*20]. SIM*21, The subty of guidance has the lot on over VA techniques [SIM*18] and guidelines for design [CAA*20]. Different types of Koovledge and their importance for guidance have been described [CAS*18], FWR*17]. What is still missing, through, is a degree maderstanding of the role of guidance in the way inagils are guiden

from the data and in analytical processes. Models of Analytic Discourse. Models of analytic discourse (knowledge generation, sense-making, information retrieval, etc.) have up to now dealt only with user-initiative systems, i.e., systems where the computer plays nor to leaptr from executing the user's explicit actions. To arrive at an understanding of the interactions heween user and system, we must extend these models to consider a

higher degree of freedom in the computer, i.e., a system initiative. Our model, which will be presented in the following accession, exisrends the Knowledge Generation Model preposed by Siethis et al. (2008) and the second science many preceding models and is, to the best of our knowledge, the most V-sequefits. This model show data-driven knowledge acquisition by users as a strutured process composed by the computer (with a visualization sysm) and there computer low parts and the second science of its not a stand-alone piece and we can trace its elements back to previous models. The course structural foundation can be found already in Norman's model for cognitive engineering that pictures how the imman access interest with the computer (or gan physical system)

by leaping twice through the gulf that separates them: first by translating goals into actions (the gulf of execution) and then back by interpreting the feedback of the system into something meaningful (the gulf of evaluation) [Nor86]. Norman's model is not specific to data-driven research, but it captures the challenges any human undergoes when becoming a "user".

The idea that there is more than one process at work in the cognitive effort of the user, an interaction-intensive low-level loop and a more intellectual high-level loop, can be found 20 years later in Pirolli and Card's Sensemaking Process consisting of the Foraging

ELoop and the Sensemaking Loop [PC05]. The computer part of the Knowledge Generation Model (see center part of Fig. 1) was first introduced by Kinn et al. [KKEM10] showing how data, visualized tion, and model connect to human knowledge. Externating this siming model, we tretive the main structure of the Knowledge Generation ing model, where user interaction is found in the Exploration Loop which is controlled by the hypothesis and in the Exploration Knowledge Generation and the sensematic structure of the Knowledge Generation which is controlled by the hypothesis and insistent stands in the the sensematic structure of the Knowledge Generation and the sensematic structure of the Knowledge Generation and the structure structure structure structure structure structure structure structure the Knowledge Generation structure of the Knowledge Generation which is controlled by the hypothesis and in site hypothesis and in site hypothesis and in site structure the Knowledge Generation structure struct

uon stocet, warte user interaction is touta in the Exportanto Loop, which is controlled by the hypotheses and insights gained in the Verification Loop, The outermost loop, the Knowledge Generation Loop, includes the internalization and socialization of new knowledge [SSS*14]. In section 3, we describe a similar nested structure for what we call the "Guidance Process".

portance for mixed-initiative VA [CC1*15], as VN has been destrebed as a task-drive process [LAF-V95; MA14]. A mare et al. argue that, for the design of effective systems, **task** ranket prime over generational artisture, where low-level actions are derived from the system of the system of the system of the system of the ingrafic [BWD*19]. Furthermore, open-ended exploration in visual analysis has been empirically characterized as task-driven [BH19].

Work describing visualization tasks is abundant and specialized (e.g., for biological pathways) (MMPT), network evolution [APS114, genomic data [NHR19]), however, the first to traverse the pp between high-and low-level tasks was Berthner and Muzzar's multi-level task typology [BM13]. This general typology aloa 1 lows the costruction of complex task charks uncurrent. Similarly, a simplfiel schema of Norman's cognitive engineering model [Nw64] has been used to elicit complex still charks in computer games [Coc02]; HCD17]. This model consists of four steps (Thainking, Action, Synm, R-eeBuckk that form a "skill and", which is a single piece of knowledge about the game mechanics acquired through the saccessful completion of an interaction loop [

Until now, analytical tasks have been reserved for users and anatysts, as only humans are involved in the analysis process as decisionmakers [D321]. We do not intend to challenge this, however, the role of guidance is to *support* analysis and, consequently, it takes part in the decision-making process. Thus, it is necessary to complement user's tasks models with guidance.

3. Model of Knowledge Generation in Guided VA

As we have seen, guidance and its role in the analysis are not typically considered when describing how knowledge is generated. Hence, in this section we provide an expanded version of the knowledge generation process, with the inclusion of guidance. We performed this expansion after analyzing existing guidance approaches [CCMH]a). We chose as a base for our discussion the Knowledge Generation Model discribed by Sacha et al. [SSS⁴¹]. because it provides in the simplication structure of the analysis process, ing a fundamental inspiration for this work. The Lies Side is keep the same as in the original model (see to portion of Fig. 1). Our expansion considers the addition of a "Guide Side" (bottom portion of Fig. 1), opposed to the Use Side, which interast with the Computer

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Directing guidance

A ranked set of options for the user to choose from

Partially constraints user action



Guidance has been proposed as a conceptual framework to understand how mixed-initiative visual analytics approaches can actively support users as they solve analytical task. While user tasks received a fair share of attainin, it is still associated effect how they could be supported with guidance and how such support could influence the progress of the task list(! Curobervation is that there is a reason's pair understanding the effect of guidance on the analytical discourse, in paircialar, for the howledge generation in mixed-initiative approaches. As a consequence, guidance in a visual analytic environment is sumally indicating inhibit from common visualization framer, maining user responses childinging to predict and measure. To address these issues, we take a system perspective to propose the notion of guidance tasks and we present it as a typology colorly digred to established user masks trapologies. We derived the proposed prology directly from andold of guidance in the knowledge generation process and illustrate its implications for guidance design. By discussing three canse indices, we show how are typology can be appliefed analytics existing guidance design. By discussing three canse studies, we show how guidance tasks, and eacher how guidance tasks and ever present is a suppology the specified constantiative expression. See argue the studies and constructions of the system perspective, the analysis of tasks in mixed-initiative approaches is incomplete. Finally, by analyzing matchings of users and guidance tasks.

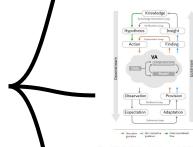


Figure 1: The Model of Knowledge Generation in Guided VA showing how guidance contributes to the progress of the analysis. The different arrows model the interactions between User (top) and Guide (bottom). Downstream (User-to-Guide) and Usptream (Guide-to-User) arrows signal he two directions in which information can flow. The model is an expansion of the well-known Knowledge Generation Model. (SSS'14).

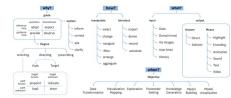


Figure 3. Typology of young additioner sakes. It spores the drave dimensions of the multi-hort-ismitistication task prodogy (HMIII) plose a new dimension that coproduces the analytical objective of an analytic share (Wenth). It allows extension theory coproduces the total by 10 total direct detail levels (sing, forst- and second order degree), also with an accomparing explanation task (explain); the suggestion method (box) is never a disconstruction of the suggestion direction of the structure of the suggestion method (box) is never a disconstructure of the suggestion direction of the suggestion in the structure of the suggestion method (box) is never a disconstructure of the suggestion of the structure of the suggestion in the suggestion method (box) is never a disconstructure of the suggestion of the structure of the suggestion method (box) is never a disconstructure of the suggestion of the structure of the suggestion method (box) is never a disconstructure of the suggestion of the structure of the suggestion method (box) is never a disconstructure of the suggestion of the structure of the suggestion method (box) is never a disconstructure of the suggestion of the structure of the suggestion method (box) is never a disconstructure of the suggestion of the structure of the suggestion of the suggestion method (box) is never a disconstructure of the suggestion of the structure of the suggestion of the suggestio

8. Conclusion

We have presented a typology of system guidance tasks that enables a joint analysis of user and guidance task interdependence, illustrating it with different examples. We have also shown the effects of guidance over user tasks and vice versa, deriving finer-grained guidance within the VA knowledge generation process. Our typology appears to serve well the purpose of describing, abstracting, and generalizing VA systems with mixed-initiative approaches, providing succinct representations that we hope will enrich the incursion into guidance design and improve the communication of results, stimulating the production of guidelines that, with time and testing, may expand design considerations in VA.



Prescribing guidance

Mandatory actions or step-by-step instructions that can be automatically enacted on acceptance

User action is constrained to either accepting or declining

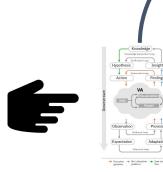


Figure 1: The Model of Knowledge Generation in Guided VA showing how guidance contributes to the progress of the analysis. The different arrows model the interactions between User (top) and Guide (bottom). Downstream (User-to-Guide) and Upstream (Guide-to-User) arrows signal the two directions in which information can flow. The model it an expansion of the well-known Knowledge Generation Model. (SSS 14).

Abstract

Guidance has been proposed as a conceptual framework to understand how mixed-initiative visual analytic approaches can actively support areas as they solve analytical tasks. While user tasks received a girls that of attention **BLENH and Completely** *Care how they could be supported with guidance and how such support could influence the progress of the task itself.* Our observation is that here is a secarch app in understanding the effect of guidance on the analytical discourse, in pairicular, for the howoledge generation in mixed-initiative approaches. As a consequence, guidance in a visual analytics environment is sunally indifferentiable for consensor visualization for guidance makes and we present it as a typology to active task provides and the asystem perspective to propose the notion of guidance tasks and we present its a topology to the project the considered and the project of the source of the system perspective, the analysis of tasks in mixed-initianive approaches tasks. The stark that is of the system perspective, the analysis of tasks in mixed-initianive approaches tasks the law thoras is class considerations of the system perspective, the analysis of tasks in mixed-initianive approaches tasks that who and a functions of user.

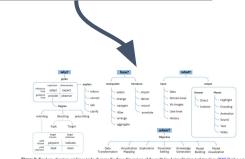


Figure 3: Typology of system guidance tasks. It spans the three dimensions of the multi-level visualization task typology [BM13] plus a new dimension that cosparse the analysical objective of an analysis plane (when?). It allows derectiving: system task intent (why?) by different detail line(i ain, 11)-ai a cosmodorier dirgery), also within an ecomogenetic gepandation task (statistic), the suggestion made (bow)? It stream of data manipulations and means of communication; and the information inputs and type of onput relative to the targeted sore task (what D).

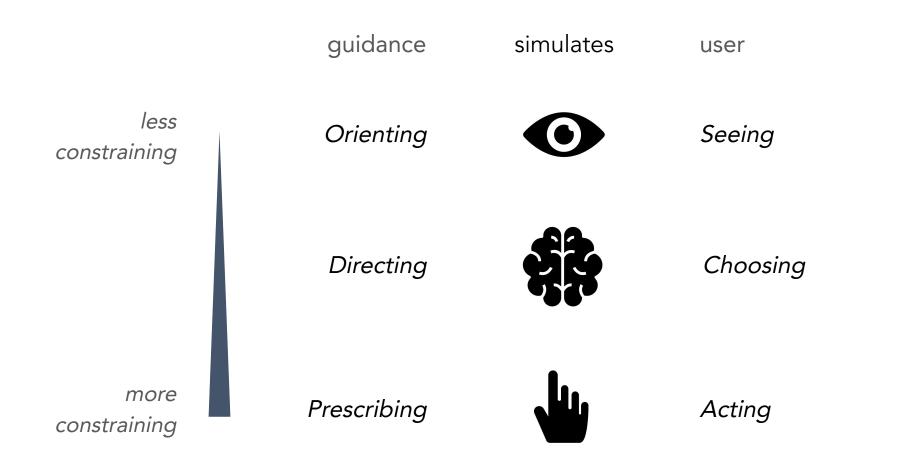


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8. Conclusion

guidance over user tasks and vice versa, deriving finer-grained guidance degrees in the process. This is supported with a model of guidance within the VA knowledge generation process. Our typology appears to serve well the purpose of describing, abstracting, and generalizing VA systems with mixed-initiative approaches, providing succinct representations that we hope will enrich the incursion into guidance design and improve the communication of results, stimulating the production of guidelines that, with time and testing, may expand design considerations in VA.





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Introduction

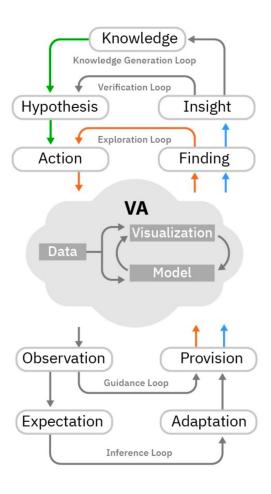
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- Guidance Degrees

Models

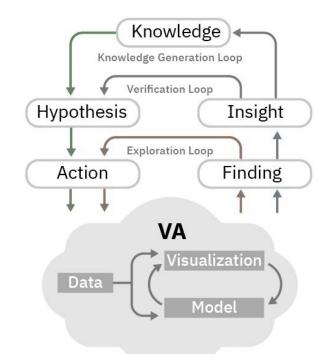
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- Model of Perspective Change Dynamics
- Typology of System Guidance Tasks

Case Studies

Conclusion

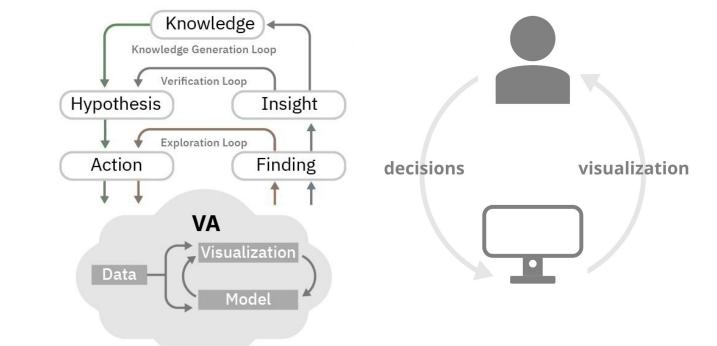






Knowledge Generation Model



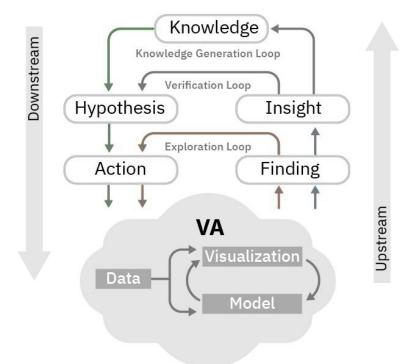


Knowledge Generation Model



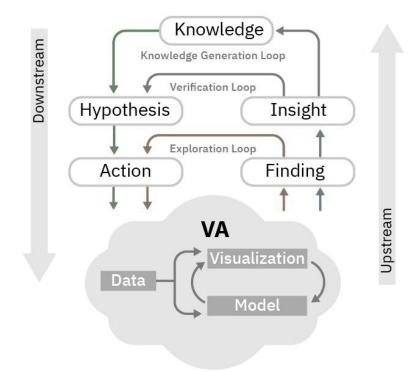
Information flow directions

- Upstream (to the user)
- Downstream (to the system)





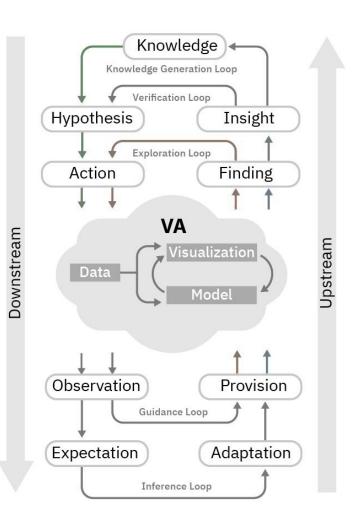
The Exploration Loop is the basic interaction loop





Guidance side

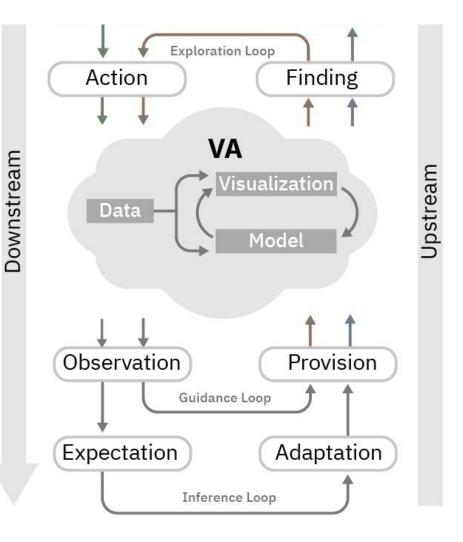
It interacts with the user through the VA system





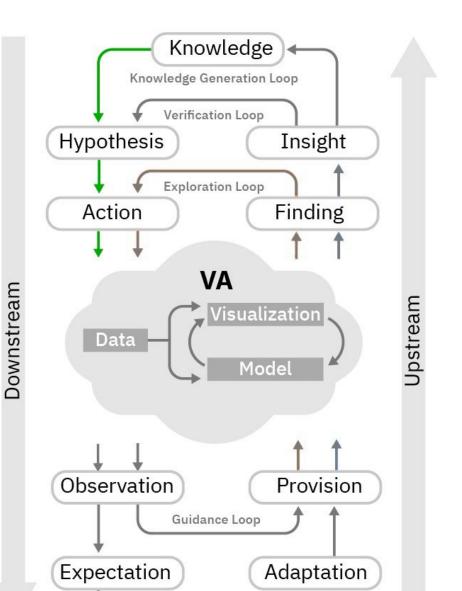
Guidance Loop First-order loop of interaction with the user

Inference Loop Second-order loop of self-interaction



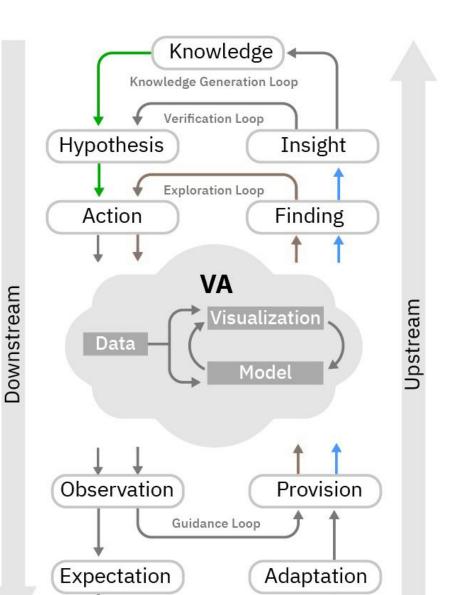


Information from the users' analysis process flows downstream and is observed by the guidance system



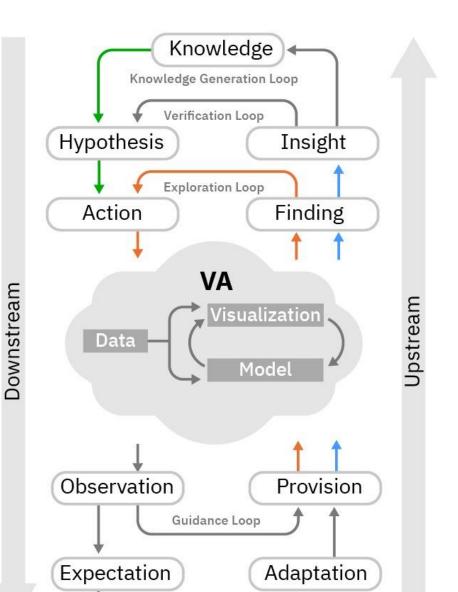


Guidance (non-disruptive) is provided upstream



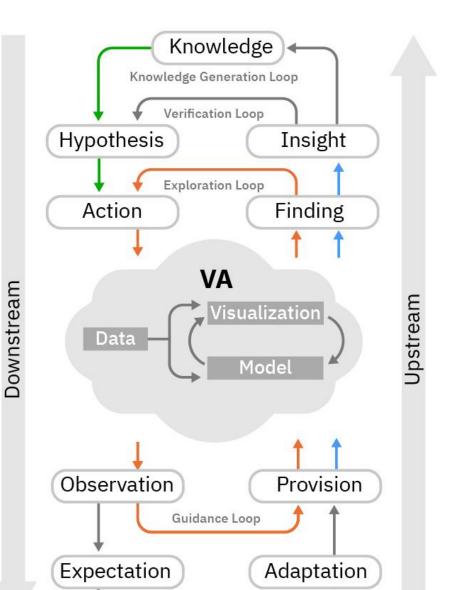


Disruptive guidance is provided and fed back into the system, short-circuiting the exploration loop



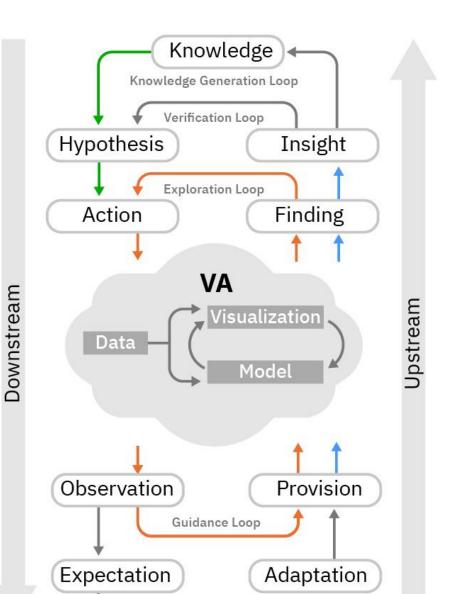


Disruptive guidance is provided and fed back into the system, short-circuiting the exploration loop





Where does the difference between disruptive and non-disruptive guidance stem from?



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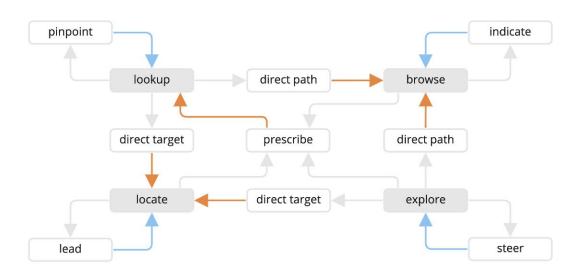
• Guidance Degrees

Models

- Model of Knowledge Generation in Guided VA
- Model of Perspective Change Dynamics
- Typology of System Guidance Tasks

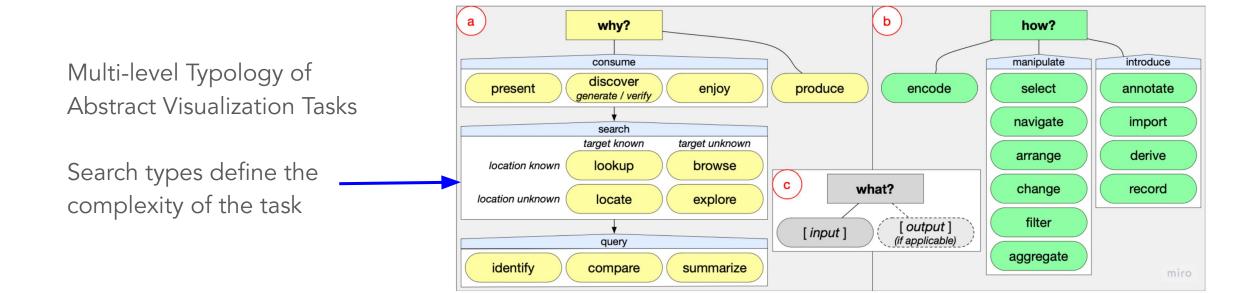
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User Tasks





Search Types



Search types define the space where the target and path of analysis are either known or unknown to the user

		target	
		known	unknown
path	known	lookup	browse
	unknown	locate	explore



The movement from one search task to another during analysis

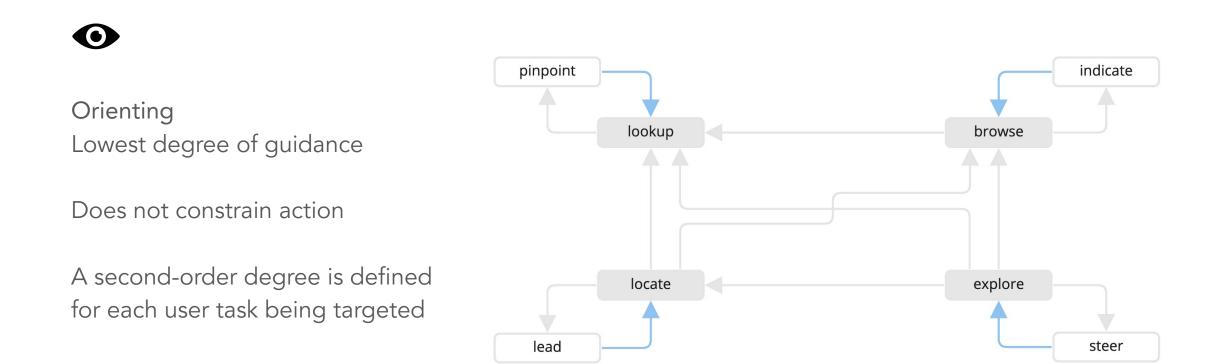
		target	
		known	unknown
path	known	lookup	browse
	unknown	locate	explore



Arrows point in the direction of decreasing complexity







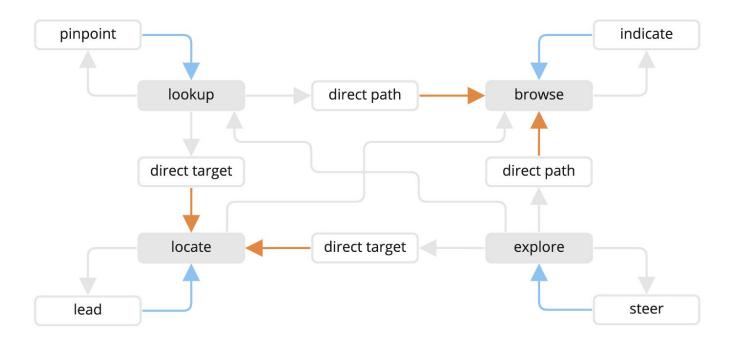


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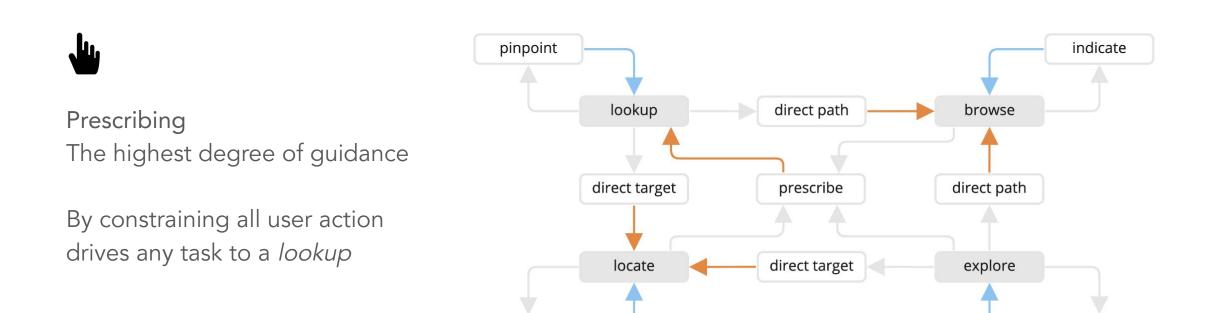
Directing The middle degree of guidance

Leads to *browse* and *locate tasks*

Two second-order degrees depending on the axis it moves the task: *path* and *target*







lead

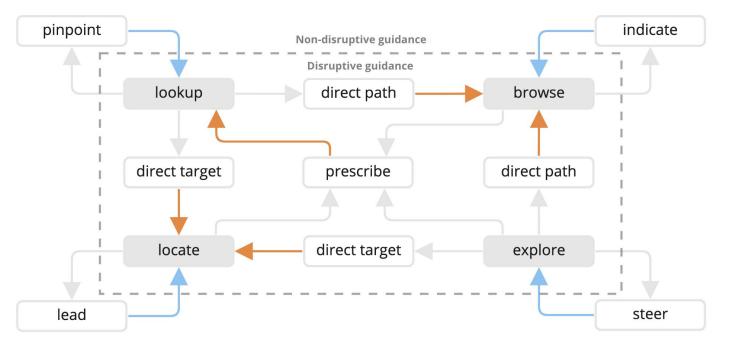
steer



Non-disruptive guidance

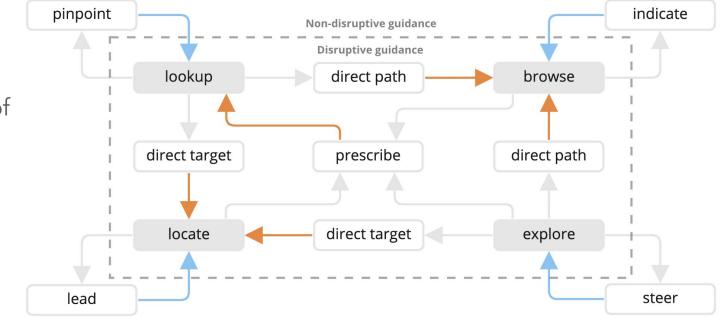
correspond to guidance tasks that do not change the user task

Disruptive guidance corresponds to guidance tasks that induce perspective change on the user





If a user tasks is defined by a kind of search, a guidance task is defined by its intended effect over this search.



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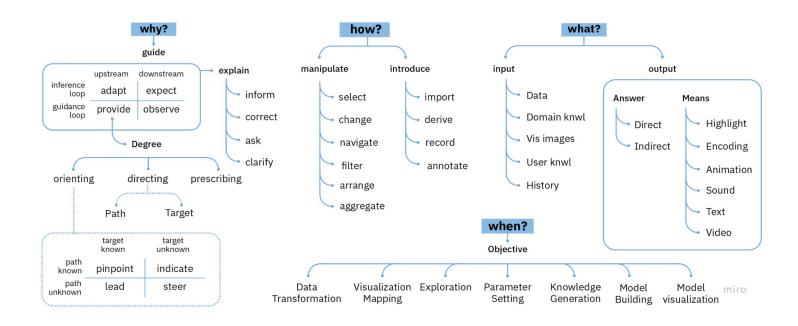
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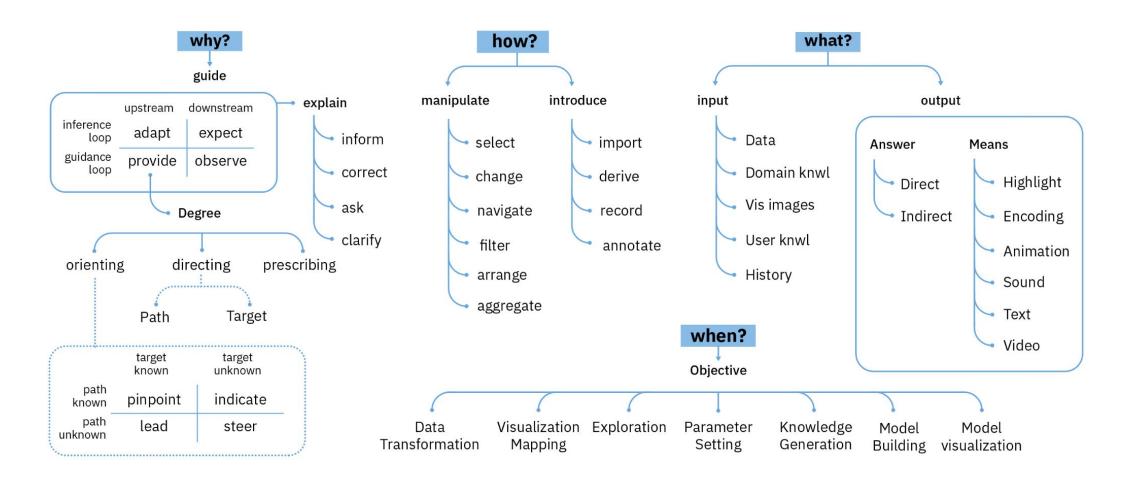
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A Typology of Guidance Tasks in Mixed-Initiative Visual Analytics Environments

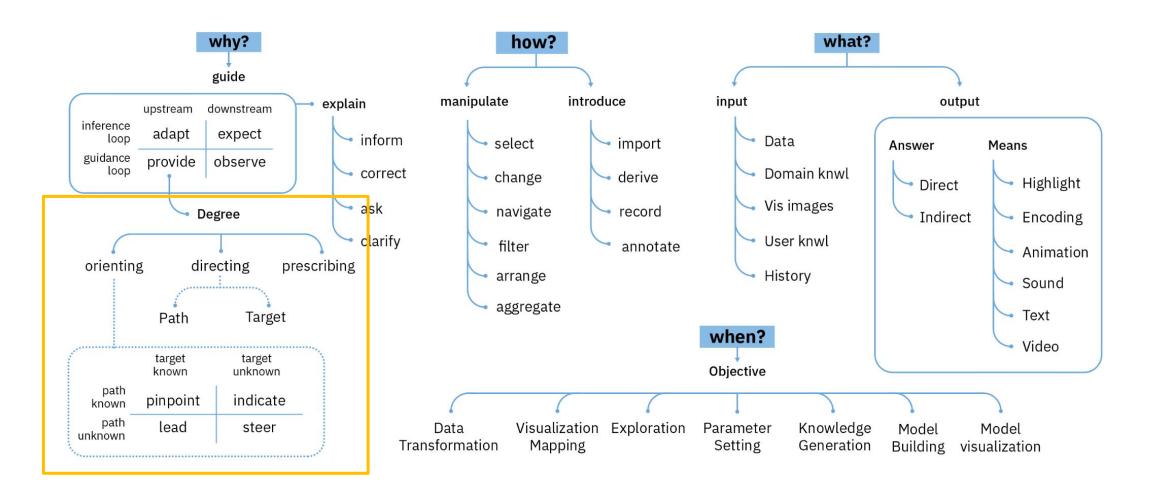




3+1 Dimensions

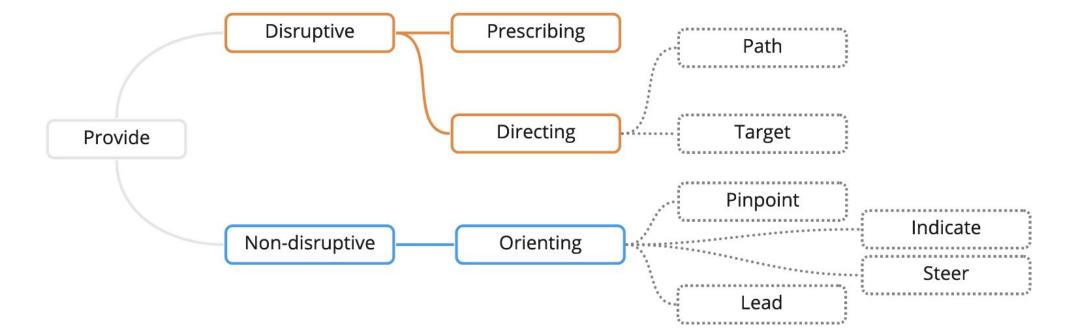
A Typology of Guidance Tasks in Mixed-Initiative Visual Analytics Environments





Semantic Zoom on guidance provision





Using the typology



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D.P. Jalla Husiness Institute Driversity of Kush Lumper Gena Globel Perspective.

Case studies

DesignScape

Tweak Your Design

Euro.tive MBA Programs

Executive

MBA Programs

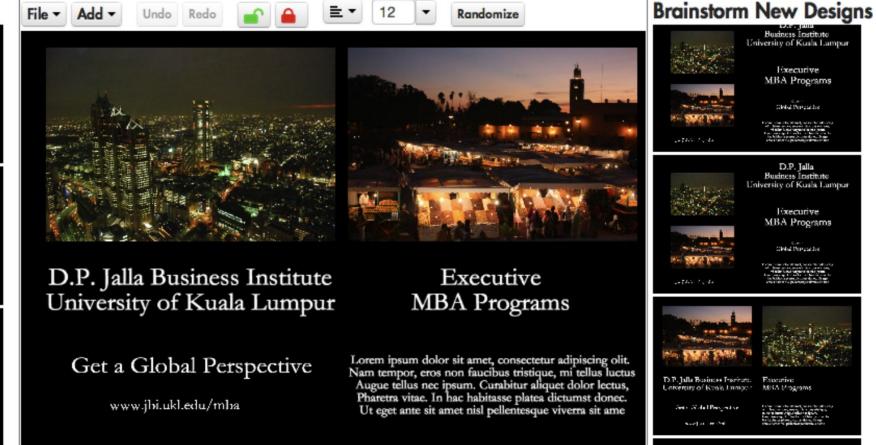


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Gent Global Perspective And the second





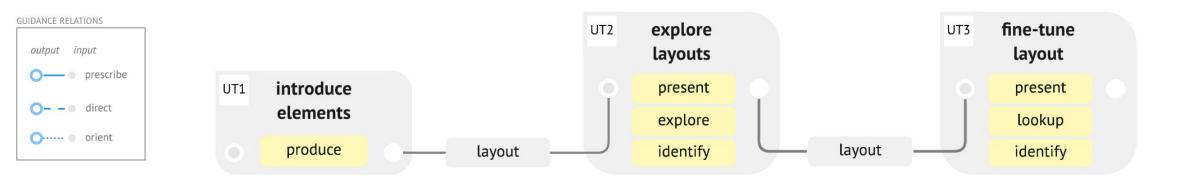




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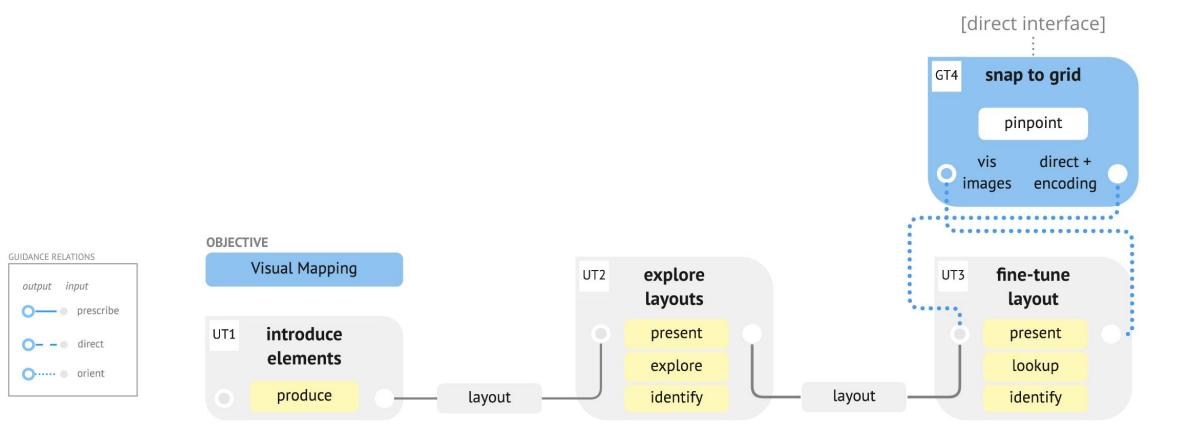
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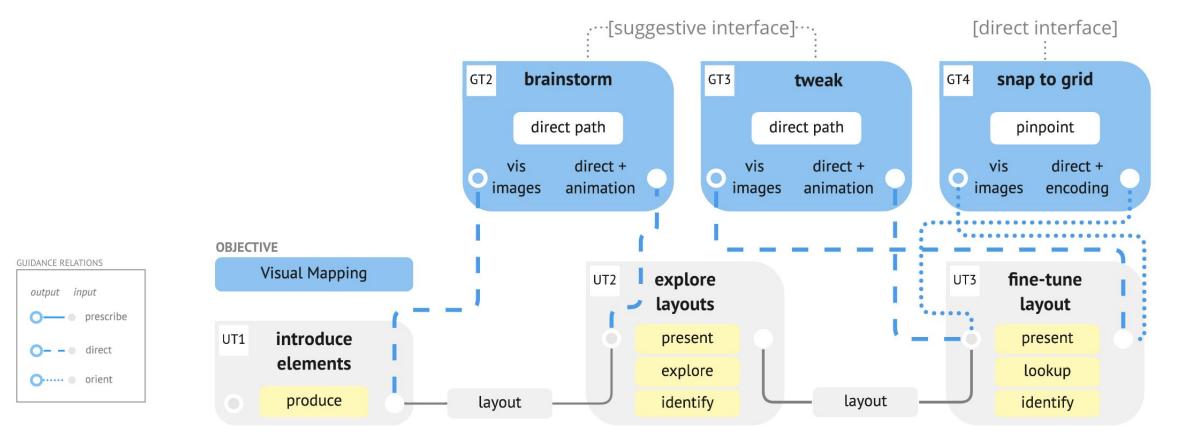






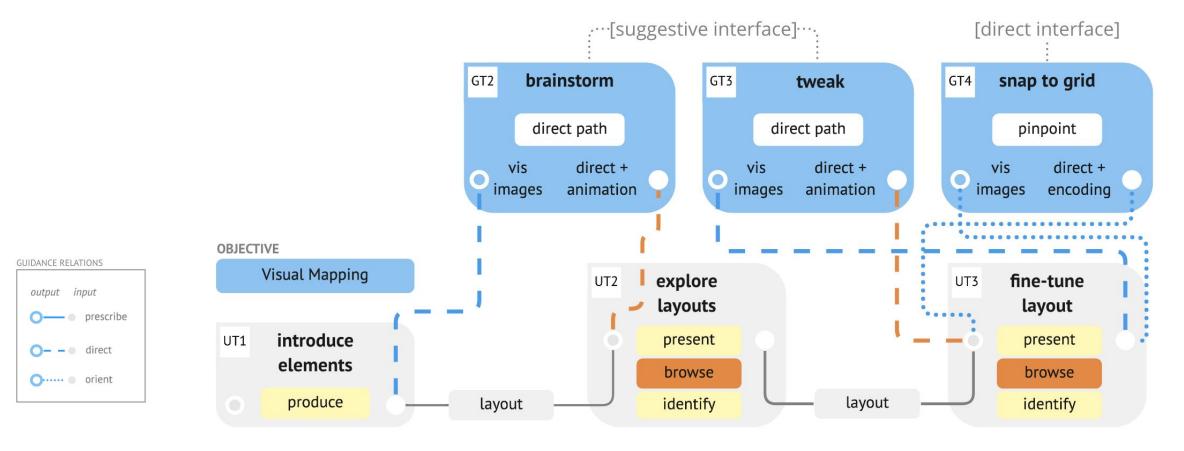






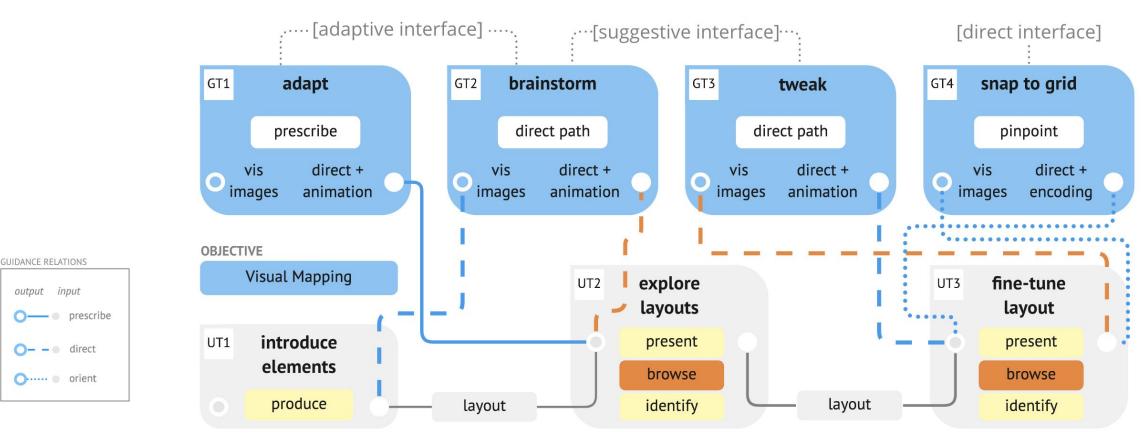






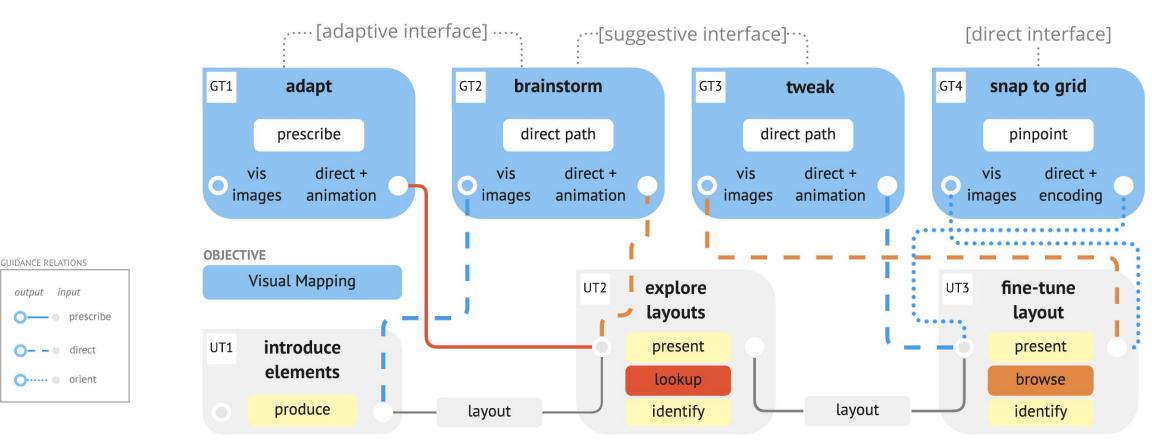






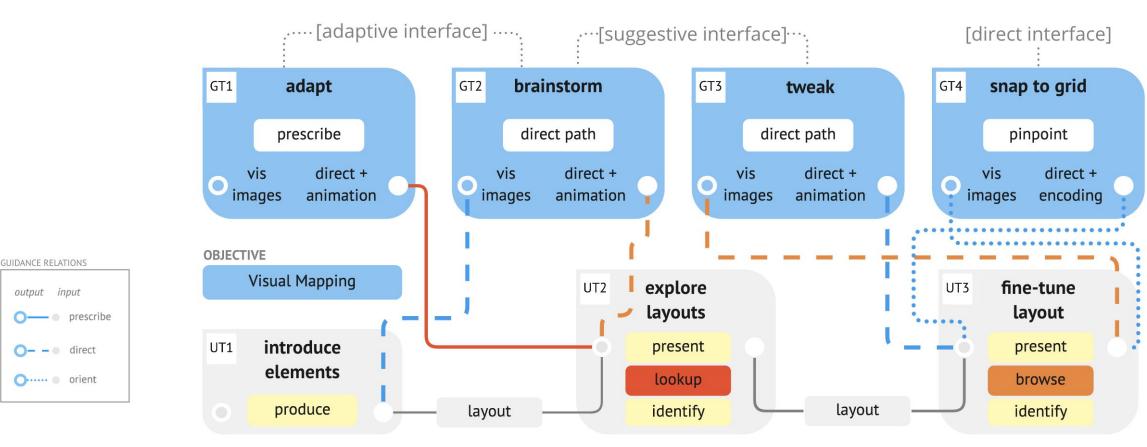










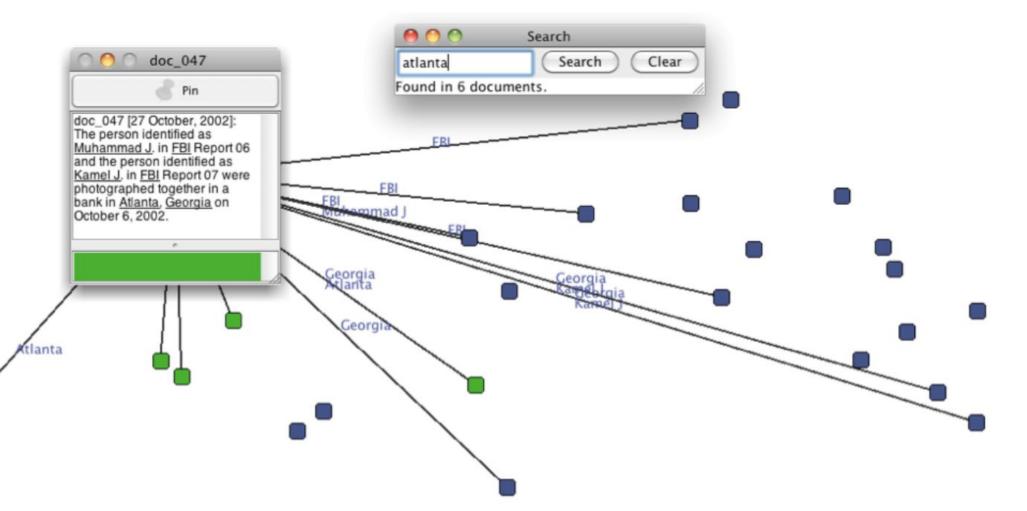




Users felt frustrated by the lack of agency in solutions they found nonetheless good (using the adaptive interface).

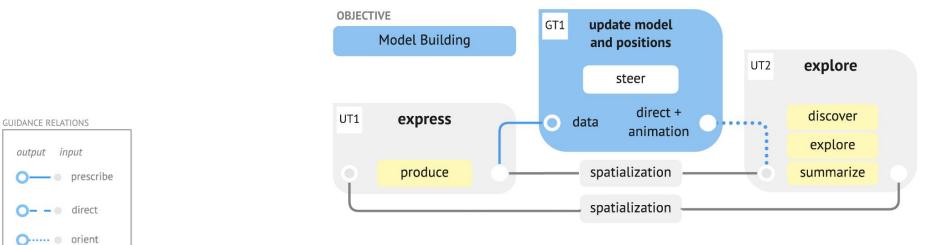
Case studies ForceSPIRE

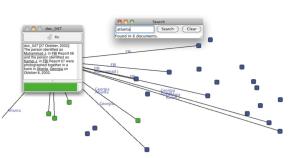




Case studies ForceSPIRE

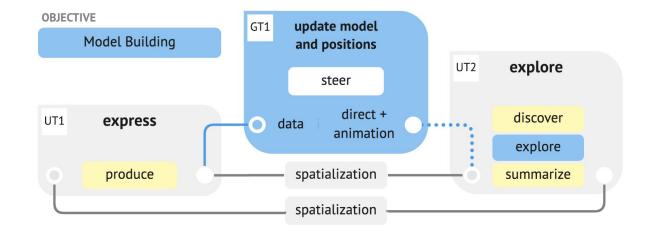


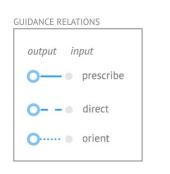


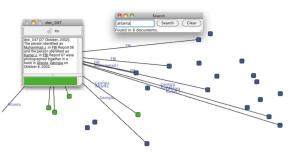


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"[Users] treated their investigation not as *steering* a model, but rather synthesizing information"

Case studies Topic-Tree

Speakers

BACKBONE

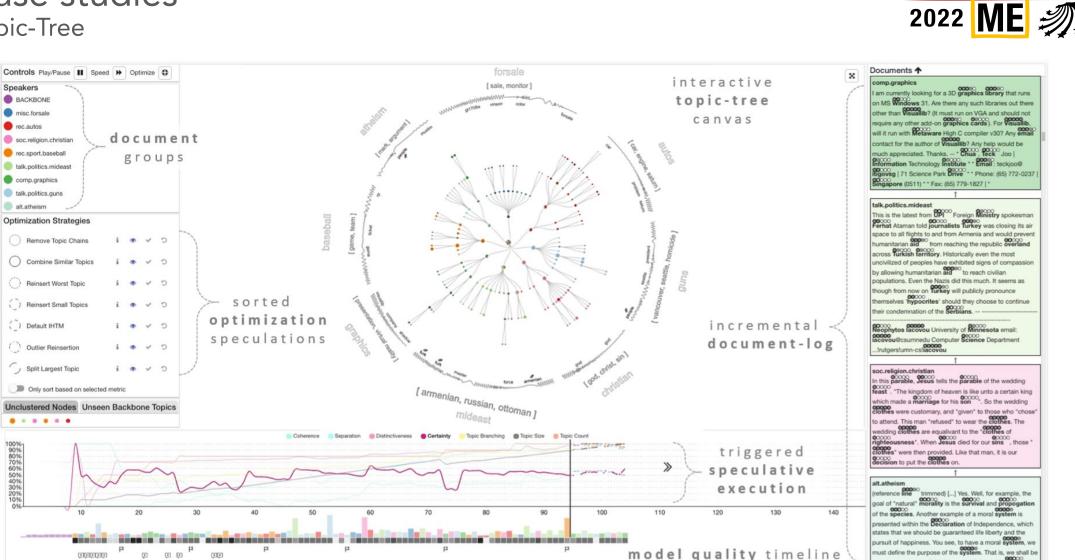
misc.forsale

e rec.autos

alt.atheism

100% 90% 80% 70% 60% 50% 40% 30% 20% 10%

.

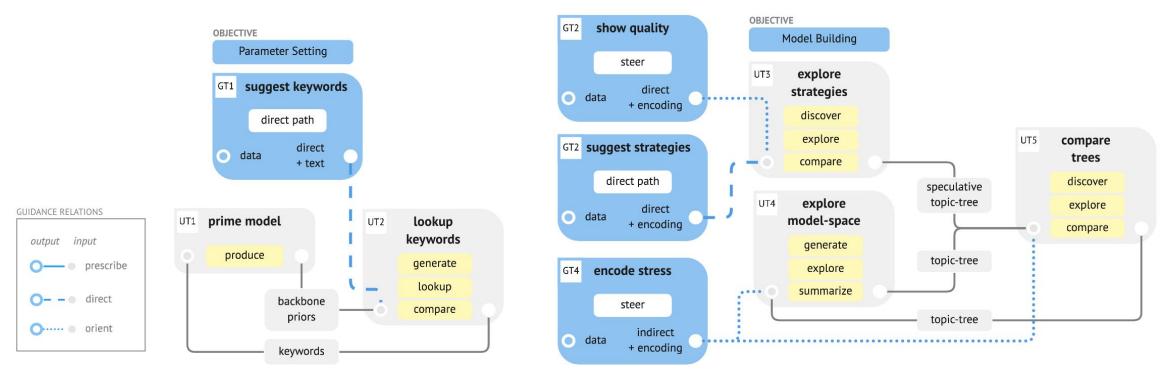


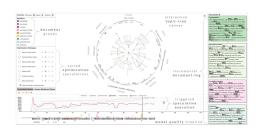
ral unto what end? Well, murder violates the golen rule

EU RO VIS

Case studies Topic-Tree





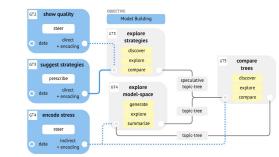


Case studies Topic-Tree

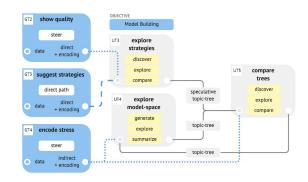
Objective

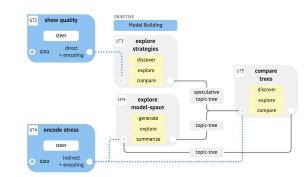
Parameter Setting

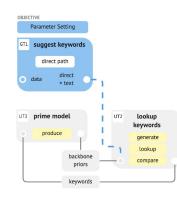
Model Building



Prescribing

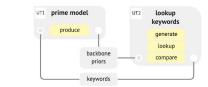






Directing

No guidance

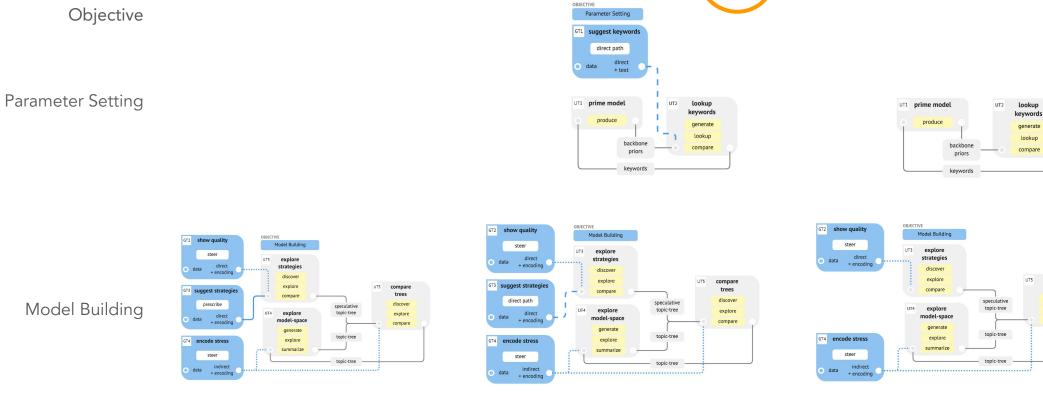




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Users consistently choose directing guidance over no guidance, followed by prescriptive guidance, as giving the best results.

Directing



Case studies Topic-Tree

Prescribing 3



No guidance

compare

trees

discover

explore

compare

Conclusion



- We have proposed a high-level model of guidance
- We have proposed the low-level model of perspective change
- We have proposed the concept of guidance tasks and a typology for them
- We have shown the applicability of guidance tasks in the analysis of mixed-initiative systems





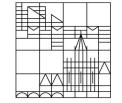
I. Pérez-Messina, D. Ceneda, M. El-Assady, S. Miksch and F. Sperrle







Universität Konstanz



Takeouts

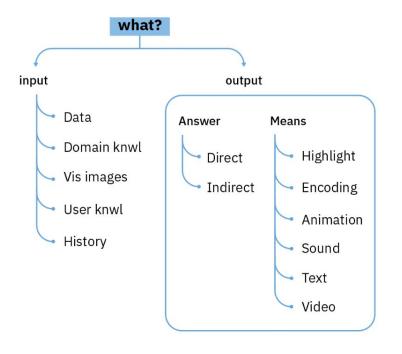


- There are guidance tasks
- Guidance tasks affect and change user tasks
- We can generalize results from mixed-initiative VA systems using guidance task analysis



What?

Receives information from user tasks and provides an answer to the knowledge gap to user tasks.

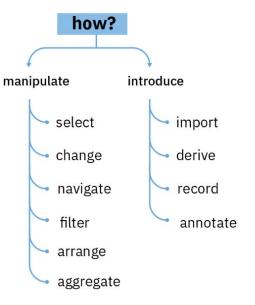




How?

Abstract operation that is provided as guidance

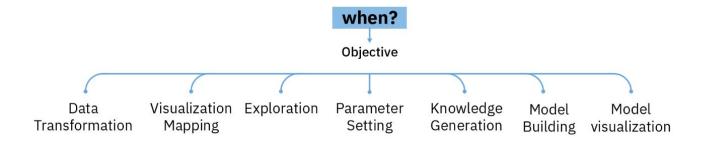
Taken explicitly from Brehmer & Munzner, 2013





When?

A global dimension that affects both user and guidance tasks (both must share the same **Objective** to be effectively connected)

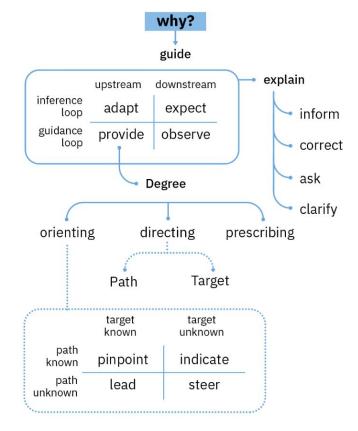




Why?

- Guide
 Divided into the 4 blocks of the
 Guided KGM (+Explain)
- Provide

Divided into the 3 guidance degrees (subsequently divided into subdegrees)

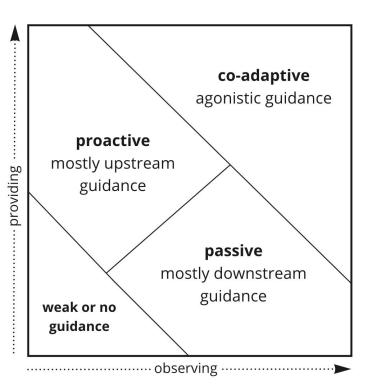


Guidance Phase Space



Guided VA System can be divided into:

- Weak or no guidance
- Passive
- Proactive
- Co-adaptive

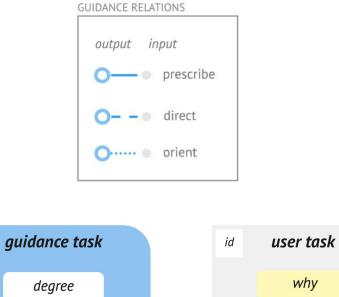


Using the typology



Composition rules

- 1. UTs and GTs are first described independently of one another.
- 2. UTs and GTs are assigned to analytical objectives.
- 3. Each GT must target at least one UT.
- 4. A targeting relation can be *observing*, *providing*, or *co-adaptive*, indicating the direction of the information flow.
- 5. *Produce* tasks may only be targeted by *observing* relations.

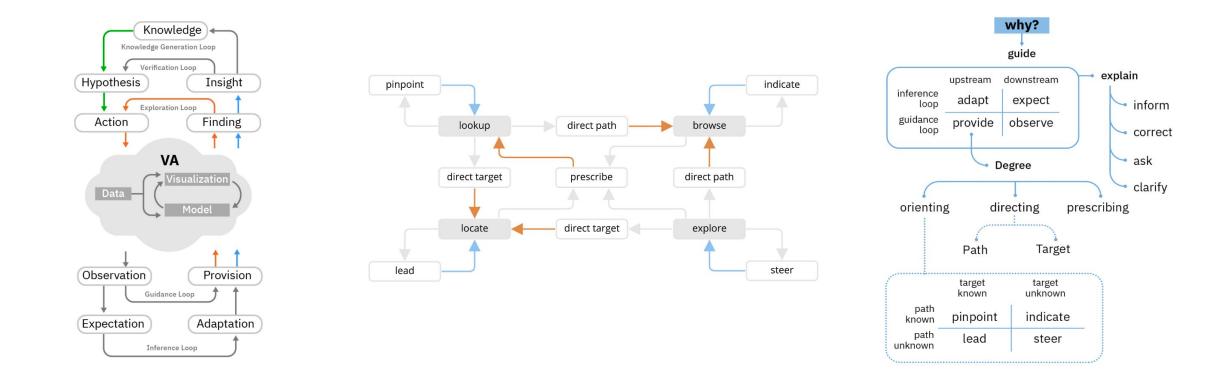


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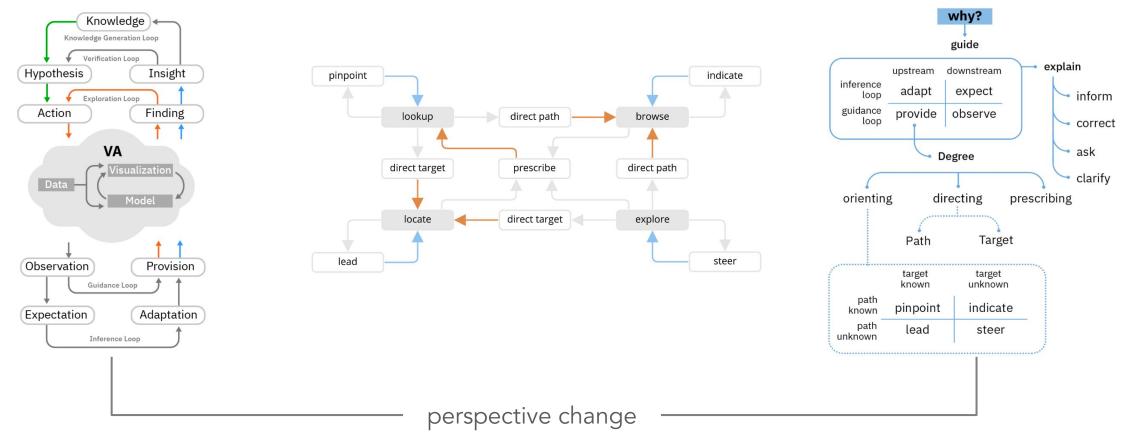
What do a Typology, a Model of Knowledge Generation and a Task Schema have in common?





What do a Typology, a Model of Knowledge Generation and a Task Schema have in common?











Ignacio Pérez-Messina Davide Ceneda Silvia Miksch

Menna El-Assady

Fabian Sperrle





Universität Konstanz

