A Palette Mixing Model of Information Seeking for Complex Queries

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ABSTRACT

This position paper offers a theoretical approach to considering how information retrieval (IR) systems can support highly contextual queries, such as *entertain me*. We argue that a natural way to pursue this query is by relying on multiple information sources—what we call micro-information interaction services (micros-IIs). In the course of a complex search, people sample from a subset of IR services that they deem relevant. This sampling and combining of services is analogous to the way artists organize and use their palettes. This paper contributes a definition of micro-IIs and an introductory treatment of a model of information seeking that we call *palette mixing*.

Keywords
Information seeking, complex queries, palette mixing model

1. INTRODUCTION

This paper proposes a framework for understanding how people interact with information systems as they pursue a complex query. In this case we focus on a single query, *entertain me*. Specifically, we imagine a use case where a traveller is planning an evening in Beijing and would like his or her evening to be fun.

We argue that a searcher with the query *entertain me* is likely to rely not only on iterative sub-queries to a search engine, but also on multiple, highly specialized *micro-information interaction systems* (micro-IIs). Each of these micro-IIs supports a single implicit or explicit query.

To understand how users employ these micro-II services, we introduce an information seeking model based on the metaphor of an artist's palette. Artists array colors on a palette in ways that are idiosyncratic, expedient, and often geared towards a particular type of painting (i.e. a particular task). The palette mixing model presented here complements established information seeking models to account for contemporary settings where search systems are distributed over multiple "apps" and multiple devices.

2. MICRO-INFORMATION INTERACTION

The *entertain me* query is inseparable from the context in which it is issued. Criteria for results' usefulness would be different if a person is bored at work or making plans from his or her hotel lobby in a foreign city. The complexity of planning an evening out invites us to consider querying as a set of sub-queries such as those in Table 1.

Table 1. Sample Sub-Queries for *entertain me.*

Where are SIGIR attendees meeting for drinks tonight?
What are good restaurants near my hotel?
I hate the theatre. What else can I do tonight?
What bus do I take to get from here to Chaoyang?

Traditional Web search engines and verticals have a role to play in these queries. But specialized services may be more helpful. Services such as Twitter, Facebook, Yelp, Google Latitude, and Foursquare integrate context and information structure into information interaction in a way that is difficult for a more broadly scoped search engine.

We refer to the act of using specialized services like these as *micro-information interaction*. Whereas standard IR systems field diverse queries, a micro-II system exists to handle a narrowly constrained problem. By virtue of this constraint, micro-IIs are able to (1) capitalize on context, (2) impose intuitive structure on results, and (3) utilize past user patterns in specialized ways.

With respect to context, the simple act of choosing to use a narrowly focused system is informative. Opening Latitude, a location-sharing application, expresses a user's interest in the geographic location of his or her friends at a given time. That is, choosing to use the service implies a type of query.

In addition to the contextual expressiveness of system selection, many micro-II services benefit from device-specific affordances. A person using a location-aware mobile phone can automatically transmit geo-location information, rather than manually specifying it. Affordances such as compasses and cameras inform the query representation in services such as Yelp's Monocle feature and the augmented reality browser Layar.

For complex searches such as *entertain me,* "macro" search engines and verticals can be of help, especially off-line. Bringing many sources to the problem, though, has been shown to be helpful [1]. Given the ubiquitous, lightweight computing increasingly enabled through mobile devices, it is likely that a user will approach *entertain me* with a smattering of focused apps—micro-II services.

3. PALETTE MIXING

Most information seeking models emphasize the temporal dimension of search. These models rightly account for the way queries, and indeed information needs, evolve during the search process. Models such as berry-picking [2] and information foraging [3] take different approaches with respect to the temporal nature of search. But time is central to both of these models.

We suggest another lens for considering information seeking: the artist's palette. The palette is highly personal. Individual artists are known for using idiosyncratic palettes. Additionally, a single artist may create a different palette for paintings of different types (e.g. still life, landscape, figure). In all cases, the artist arrays colors, chosen from a larger collection of paints, spatially. With this arrangement in place, he or she then uses color strategically, drawing on each hue as needed and mixing them to achieve the desired results. If he or she finds that the palette is lacking, he or she supplements it with additional colors.

We argue that using micro-IIs to solve complex problems is analogous to applying colors mixed from a palette. The user chooses services that might be of interest (loading these onto his or her phone, or simply keeping URLs in mind). As sub-problems arise, the searcher turns to the services that will be useful, using combinations of services to solve the problem. A complex query such as *entertain me* is does not necessarily entail a single mode of response. Instead, a user negotiates a variety of specialized response types, from transportation directions to food recommendations, to places best avoided.

To the best of our knowledge, the only prior consideration of information seeking in this vein was proposed by Foster [4]. But in Foster's paper, the palette is ancillary; colors are compared to *activities* such as browsing rather than services such as micro-IIs.

Figures 1 and 2 schematize the metaphor of information interaction as palette mixing. N.B. The three columns in Fig 1 and 2 are not meant to be directly comparable. Fig. 1 shows photos of three artists' palettes[1] downloaded from Flickr, each one unique in in its arrangement and the colors it contains. On Flickr, each photo is described by text articulating artists' motivations for mixing a particular palette.

Fig. 2 demonstrates an ad-hoc pallet mixing approach to a sample scenario: considering things to do from a Beijing hotel lobby. The user (one of the authors) has organized applications in a way that is personally useful. He traverses possible leads between them, as denoted by the yellow arrows. The user organizes found information in the notes of a final app, Evernote, which syncs among his devices (phone, tablet, laptop).

Micro-IIs are effective due to their specialized, niche uses, which are at once strongly tuned to a given task and easily grasped by users. To use a micro-II, a user need not engage in Pallet-mixing (it could be used in isolation). However, with respect to design principles, a micro-II's usefulness can be extended if people can integrate it into diverse interactions with the goal of forming a cohesive understanding of the overarching query.
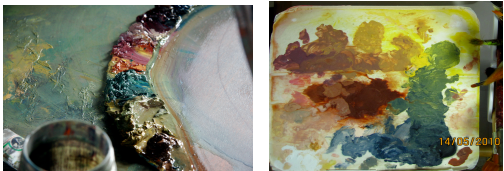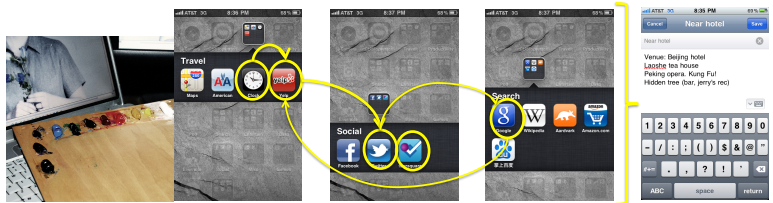
A pallet mixing-influenced service could be a micro-II in itself, acting as a broker between a user's context and other relevant micro-IIs. This system would specialize in understanding the context of the query, pairing the right services for the user's need and perhaps helping organize the user's preferred results from each service. With respect to IR, *relevance* in this setting would involve presenting a coherent palette of micro-IIs. Here the unit of retrieval would be a micro-II. The result set would be a coherent palette or set of palettes that address the information need. While a query in this context might be as terse as *entertain me*, contextual considerations would be paramount to inducing a viable model of information needs. Such a model would of necessity include contextual cues (implicit and explicit). Affordances of mobile devices would be useful in this regard. But in this brief treatment we remain device agnostic, leaving query design for micro-II retrieval as a future challenge.

Contexts other than a traveller abroad are easy to imagine. A user at home during bad weather could see Internet browsing services such as StumbleUpon, TV schedules, and Netflix instant streaming recommendations. A worker in an office cubicle might appreciate a chain of apps where output from StumbleUpon is piped as a query to youtube and Wikipedia, with their output piped to a final micro-II that arranges the results for browsing.

There is more to consider in the palette mixing model. But we believe that a piecemeal, fragmented information interaction is realistic for a complex, evolving goal and that understanding the creativity that goes into this process offers promise for studying real-world information needs such as *entertain me*.

4. ACKNOWLEDGMENTS

5. References

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Figure 1. Three Artists' Palettes.

Figure 2. A Sample Micro-Information Interaction.