# Photostorming: A Tangible Technique for Evoking Tacit Knowledge

**Kevin Collins**
Stanford University HCI Group
Computer Science Department
Stanford, CA 94305-9035, USA
kevinc@cs.stanford.edu

## ABSTRACT

Owing to the associative nature of human memory, external stimuli can often trigger references to past experiences. We explore photostorming, a low-threshold tangible interaction to evoke life experiences with visual imagery in a brainstorming context. Our implementation attempts an evocative dialectic – tangible letters evoking words, words generating images, images evoking words – which we test against traditional brainstorming practices and explore as a catalyst of evocative engagement.

### Author Keywords

Tacit knowledge, evocative interaction, dialectic interaction, tangible interaction.

## INTRODUCTION

Because of constraints in time and space, brainstorming is usually done outside the context it is focused on. As such, it can be difficult to maintain perspective on the practical reality of the target context. While photographic imagery cannot replace the benefits of real life experience, it can evoke prior experiences in a way that is otherwise difficult, if not impossible.

The successes of tangible, computer-less evocation tools for brainstorming, like IDEO's TechBox [2], demonstrate the utility of evocative interaction during brainstorming. We attempt to extend this range of tools with digital content.

## SYSTEM

The photostorming implementation combines character tiles, a carved wooden rolling cart and a computer display. Participants create words from the tiles, place them in the cart and start/stop photo imagery on the display using two buttons on the cart. A cart-mounted webcam reads the tiles and displays full sized images (with black background) from Flickr based on the word(s) the participant created. When the users are done, they hold down the stop button and a web link is displayed for an artifact of their photostorm.

Internally, the system was built entirely in Java. In combination with the low quality webcam output, the computer vision module was the least reliable and most challenging part of the implementation (see appendix A).

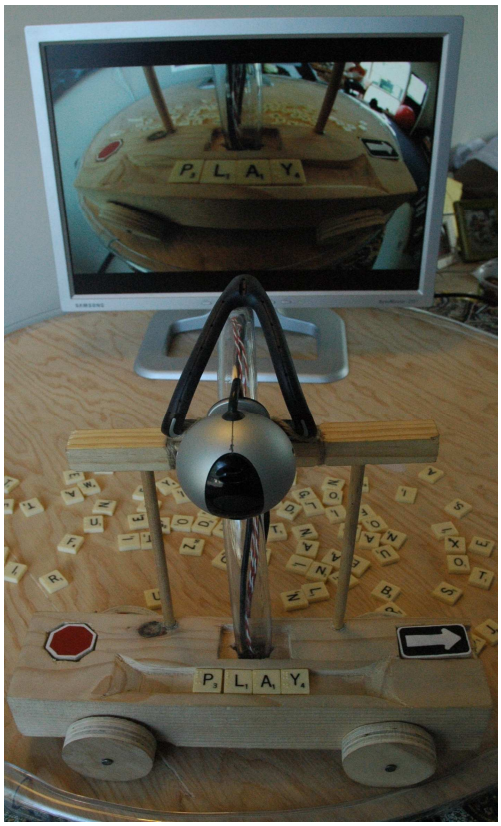



**Figure 1: The current photostorming interface**

## TESTING

After ongoing testing throughout the project, the current system was tested with a group of two, a group of three and two individuals (2 designers, 2 entrepreneurs, 2 researchers and 1 woodworker in total). Participants did at least two brainstorms relevant to their field; one each with and without the photostorming implementation.

### Failure

For individuals, photostorming was less successful than an earlier low threshold software-only prototype interface. Similarly, for group brainstorming, the current photostorming implementation was not preferred to traditional brainstorming techniques.

Despite the successfully low threshold of the tangible interface, the interaction was too distracting for most brainstorming. The imagery was too engaging and drew attention away from the brainstorm topic. Similarly, the character tiles, while consistently reported as enjoyable, distracted from the overall brainstorm and were cumbersome when participants wanted to switch topics quickly.

One group reported and demonstrated that the technique worked well when their brainstorming topic was fairly limited – indicating that the imagery was worth the attention and time of the interface only for topics they were going to delve into deeply, and not for topics they touched on briefly.

With increased familiarity over time and improvement in the character detection (incorrect detections further distracted attention to the photostorming interface) it's possible that the attention demanded, and distraction caused, can be lowered to more workable levels. Further investigation requires improvement to the vision implementation and a longitudinal study. However, even in the best case, the heavyweight nature of character tile input remains an issue.

### Success

Aside from the failure in achieving its intended goals, the system evoked a strong and very positive response from participants. All of the testers continued playing with the interface well after the official study was complete, and in most cases, for longer than they spent on the study itself. Additionally, they enthusiastically raised many suggestions for improvement and additional uses.

At every stage, subjects were impressed by the quality and utility of the "random" content (Flickr results filtered by tag and sorted by "Interestingness").

Participants particularly enjoyed the tile interaction. One reported a feeling of role reversal "the computer is responding to me instead of me responding to it" and that typically "I'm not even thinking about the words, my fingers are just a part of the computer." Another participant mentioned that, spending lots of time working with computers, he frequently finds himself "thinking in text" and greatly enjoyed the tangible characters.

Finally, the dialectic between tiles and images through words was unmistakable in every test and was clearly a factor in the extended post-study engagement that occurred. More often than not, the images evoked new words. However, every session had at least one obvious instance of a tile-evoked word. There was also a subtle dialog between users as they checked out each others words and tile-fragments, although, based on our current studies, it is not yet clear how this affected their actions.

## RELATED WORK

Tacit knowledge [1] is an underlying inspiration for evocative interaction. Existing evocative physical interfaces [2] imply potential for more virtual ones like photostorming. Our choice of a tangible interface builds on the relative strengths of physical and virtual media in creativity support systems [3] and we directly leverage visual imagery as an evocative mechanism [4] for creativity. Finally, calm technology [5] serves as fundamental inspiration for our implementation.

## FUTURE DIRECTIONS

Having evoked a positive and highly engaged response from our initial tangible evocative interface, albeit not completely aligned with our initial goals, we are encouraged to explore the area further.

Specifically, to address participants' desire for a lighter-weight and more ambient input photostorming interface, we intend to build a listening implementation to display imagery by culling tags from higher-than-normal word frequencies in brainstorming discussions.

Also, based on test participants' enthusiasm and feedback, we believe repurposing the existing implementation for language education may be fruitful. The participants' high engagement with the photographs and character tiles (in fact, too high for brainstorming), indicates the current system may be well suited to situations where high engagement is a primary goal. In a similar vein, one participant referred to the system as a "visual dictionary".

More broadly, with the convergence of improving online content repositories and cheaper computing devices, evocative techniques in the spirit of photostorming may afford novel uses of online content outside the desktop window.

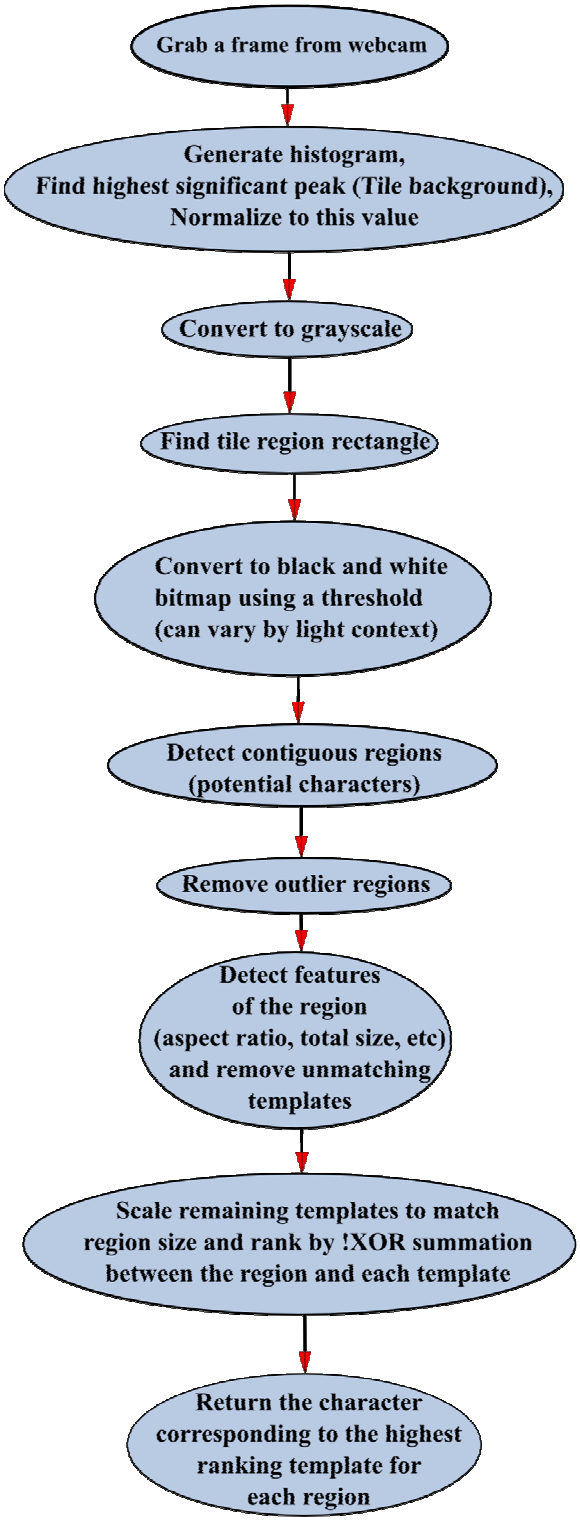
## ACKNOWLEDGMENTS

Thanks to June Zhang, Scott Klemmer, Bjoern Hartmann and all of the test participants who volunteered their time.

## REFERENCES

1. M. Polyani. The Tacit Dimension, New York, New York, 1966.
2. J. Preece. Interaction Design, New York, New York, 2002.
3. J. Eales. Creativity in Action: Some implications for the design of Creativity Support Systems. In *CHINZ 2005* pages 9 – 14, Auckland, NZ, 2005.
4. K. Nakakoji, Y Yamamoto and M. Ohira. A Framework that Supports Collective Creativity in Design using Visual Images. In *Proceedings of the 3rd conference on Creativity & cognition*. Pages 166 – 173, 1999.
5. M. Weiser and J. S. Brown. The Coming Age of Calm Technology. Xerox PARC, 1996.

## Appendix A: Vision Process Diagram




**Notes:**

**The mechanism is very sensitive to rotation shifts.**

**Because of the irregularity in webcam sensitivity across light conditions, for some characters, multiple templates are used.**

**The use of Scrabble tiles was detrimental because of both the small character size and the small number close to the character itself (sometimes detected as contiguous and sometimes not). They are not recommended for future work.**

**The vision mechanism was originally tested with images taken from a digital SLR camera (Nikon D70) and detection approached 100% across a wide range of light conditions. After switching to a Creative Live! Pro webcam, detection went below 50%. Finally, after switching to a Logitech QuickCam Pro 4000 webcam, and making changes to the vision process, detection is over 90% in most conditions.**