

‘Form Design For Emotion’ with a Cameraphone Based Tool

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Abstract

Merging emotional value into products has become an essential strategy for increasing a product’s competitive edge in the consumer market. Indeed, this approach instills emotional value into products, to satisfy human emotional needs. Combined with this is the fact that designers usually work outside their design office using pen and paper, since ideas are usually stimulated. Yet, designers lack mobile computer-aided sketching (CAS) tools which truly link paper-based sketching with computer-based 3D modelling tools. As a step in this direction, this poster presents a framework that extends CAS technology to cameraphones. Furthermore, this framework is capable of providing emotional guidance about a form concept to satisfy the emotional needs of the customer, directly on cameraphones. A proof-of-concept tool has been implemented and evaluated. Preliminary evaluation results with design engineers in the cosmetic cases industry, indicate the positive impact that technology based on the framework developed will have on *DFe* in practice.

Conference theme: Design & Emotion – Methodological issues

Keywords: mobile design tools, design for emotion, computer-aided sketching

1.0 Problem Background

Good product functionality does not necessarily lead to product purchase, use or acceptance by customers. Presently companies can no longer compete simply on technology, mainly because many are facing competitors that are equal in technical expertise. It is no longer sufficient for a product to function properly, be usable and efficient or have aesthetic appeal, but it also has to provide positive emotional responses such as pleasure, inspiration, desire, positive surprise, etc. The design for the user desired product emotions (DFe) is being seen as a determining factor in the success of a product, and pleasurable products as a key contributor to the competitive advantage of a firm.

Combined with this problem, there is also the fact that it is common practice that designers also think of design concepts when they are away from their office (Bellotti and Bly, 1996). Given its portability and availability to use, a paper-based medium (e.g. a paper napkin) is usually used by designers to instantly express their spontaneous form ideas in such situations (Farrugia, Borg, Camilleri, Spiteri, 2005). However a paper-based sketch may not be sufficient to visualize an evolving product form idea; in such a case a 3-Dimensional (3D) model would be required. Furthermore, since a 3D virtual model rapidly generated from a sketch would assist a designer to visualize better the intended product idea, it would in turn provide a source of inspiration in increasing the emotional content within the product idea (by improving its emotional features). Yet, despite this, designers currently lack emotional support tools for remote early product design.

In view of the above issues, this research aims at developing a framework that provides designers with a 3D virtual model on a mobile device generated directly from a paper-based sketch of the form design concept. It also provides an enhanced emotion-driven design guidance on the mobile device resulting from an emotional classification of the concept.

2.0 Framework Architecture

The framework illustrated in Figure 1, consists of six frames with the aim of integrating computer-aided sketching with an emotional support tool, while preserving the important characteristics of mobility and paper-based sketching. In the *Form Concept Sketch Representation (FS)* frame, the designer's thoughts are first externalised using natural freehand

sketching. In order to robustly communicate the form concept to the computer, the form intent is then represented using a *prescribed sketching language (PSL)* (Farrugia 2008).

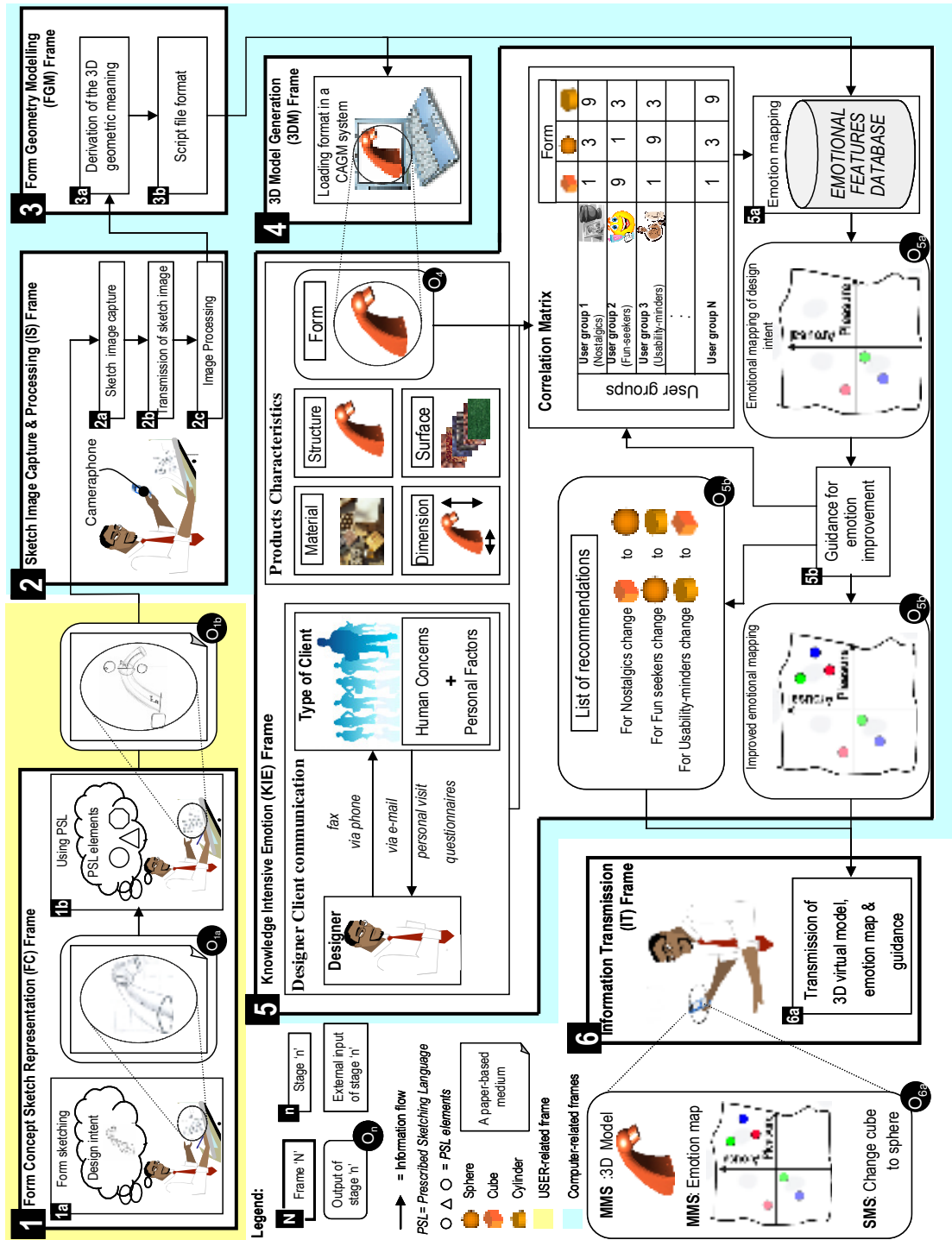


Figure 1: Framework architecture for the proposed tool

In the *Sketch Image Capture and Processing (IS)* frame, a digital image of the *PSL* sketch representation is first captured by a cameraphone. Image (pre-)processing routines are then applied on the transmitted image to extract the 3D geometric information. Based on *PSL* rules,

the 3D geometric meaning is derived in the *Form Geometry Modelling (FGM)* frame and converted in a format which can be encoded by a CAD system in the *3D Model Generation (3DM)* frame. The resulting 3D model is inputted into the *Knowledge Intensive Emotion (KIE)* frame, which contributes to the provision of the emotional space map together with a list of recommendations to increase the emotional value of the 3D virtual model. The *Information Transmission (IT)* frame is required to transmit the generated 3D virtual model, the emotional space map and the list of recommendations to the cameraphone. Further details on the first four frames are provided in (Farrugia 2008). This poster focuses on the *KIE* frame, detailed next.

2.1 Knowledge Intensive Emotion Frame

The starting point in designing for emotion is to understand the potential consumers for whom the product is to be designed. Based on the customers' subjective requirements, user groups are realized for a specific product. As a starting point, three user groups were considered, namely, *Nostalgics*, *Funseekers* and *Usability-minders* (Caruana, 2007). *Nostalgics* relate product emotions with their past experiences and memories. These consumers fancy rectangular forms and soft curves which transmit reliability, security and pleasure at the same time. On the other hand, *funseekers* correlate product emotions with the enjoyment provided by the product. *Funseekers* are attracted to products which exhibit circular shapes, soft curves, and are free from sharp edges. This blend should psychologically be perceived as playful for *funseekers*. Finally, *usability-minders* are more concerned with the ease-of-use of the product setting aside product emotions. *Usability-minders* prefer high concentration of angular profiles in their products.

Emotional product stimuli are mostly related to these products' characteristic properties namely; structure, form, material, dimensions, and surface. Manipulating such product characteristics can in turn help create an emotionally engaging product and provide unique experiences to the clients buying the product. This research concentrates only the product form. Moreover, as a proof-of-concept, research efforts were made on generating emotional knowledge from a set of 3D primitives (e.g. a sphere).

Different combinations of 3D primitives building up a geometric shape are prioritized according to the user groups' emotional needs which build up correlation matrices. This means that every geometric shape has a pleasure-arousal mapping onto the emotional space map for different user-groups. The emotional space map consists of two bipolar, independent dimensions that describe subjective emotions, based on the dimensions of *pleasure* and *arousal* (Schlosberg 1952). The former refers to the condition of consciousness or sensation from the enjoyment or anticipation of what is felt or viewed as good or desirable; enjoyment, delight, gratification. On

the other hand, ‘arousal’ is defined as bringing about a feeling or response in someone, leading to increased heart rate and blood pressure and a condition of sensory alertness, mobility and readiness to respond.

To illustrate the underlying principle of the framework, a proof-of-concept was implemented. Following is a case study that demonstrates how the emotional mapping is produced from the input *PSL* form representation.

3.0 Case Study

For this case study, a perfume bottle was considered, whose form was represented with *PSL* as a lofted body with circular cross-sections and a set of 3D primitives (see Figure 2). The 3D virtual model, the list of recommendations and the emotional space map generated by the prototype tool are depicted in turn in Figures 3 to 5.

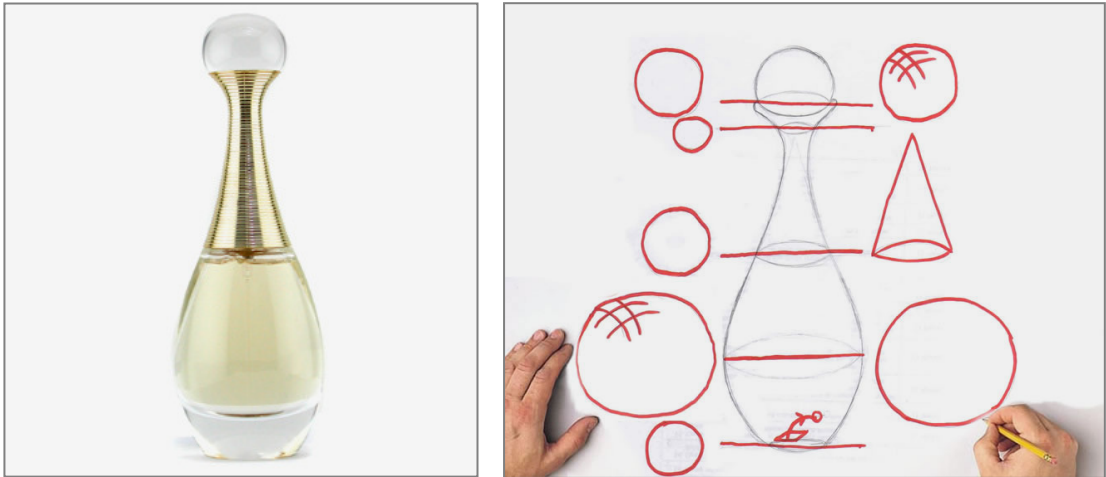


Figure 2: Perfume bottle and its *PSL* representation

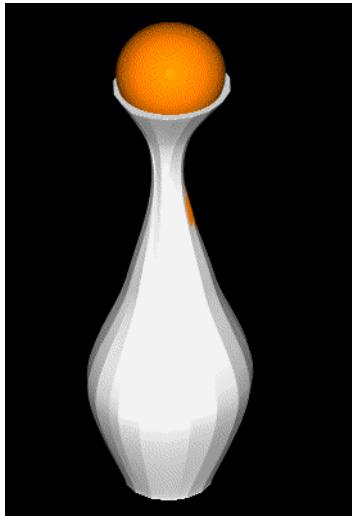


Figure 3: Rendered 3D virtual model

LIST OF RECOMMENDATIONS

Funseekers:

The KIE does not recommend modifying the product form since the current combination *sphere - sphere - cone*; exhibits more soft curvilinear features than any other combination. This is clearly depicted on the Emotion space map since the initial mapping and the improved mapping for Funseekers are superimposed on each other. This combination in the product form is emotionally engaging to the users classified under Funseekers.

Nostalgics:

The current combination *sphere - sphere - cone*; is less emotionally engaging when compared to the combination *sphere - cube - cone*; since the latter contains more rectangular features. This is clearly depicted on the Emotional space map. To achieve the improved emotional mapping for Nostalgics the Knowledge Intensive Emotion recommends changing one sphere into a cube. This modification in the product form will increase the emotional value and should attract users classified under Nostalgics.

Usability-minders:

The current combination *sphere - sphere - cone*; is less emotionally engaging when compared to the combination *sphere - sphere - wedge*; since the latter contains more concentration of angular profiles. This is clearly depicted on the Emotional space map. To achieve the improved emotional mapping for Usability-minders the Knowledge Intensive Emotion recommends changing the cone into a wedge. This modification in the product form will increase the emotional value and should attract users classified under Usability-minders.

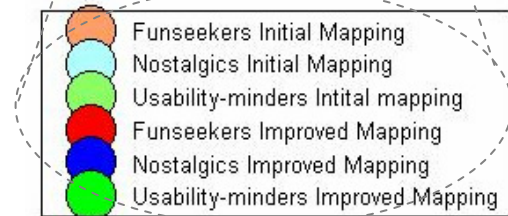
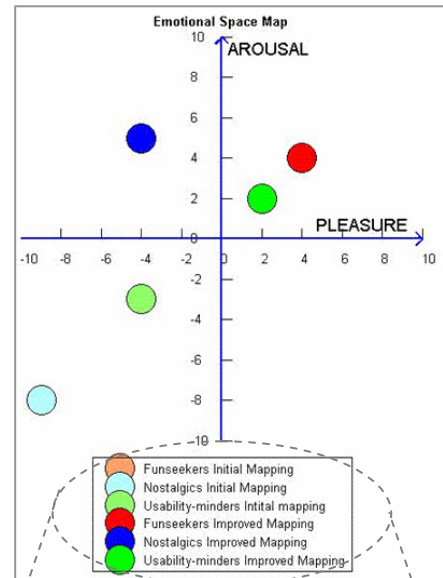


Figure 4: List of recommendations

Figure 5: Emotional Space Map

Based on the previous list of recommendations, the original perfume bottle design can be modified to produce different form concepts (see sketched examples in Figures 6 and 7) in order to match the user groups' emotional needs.

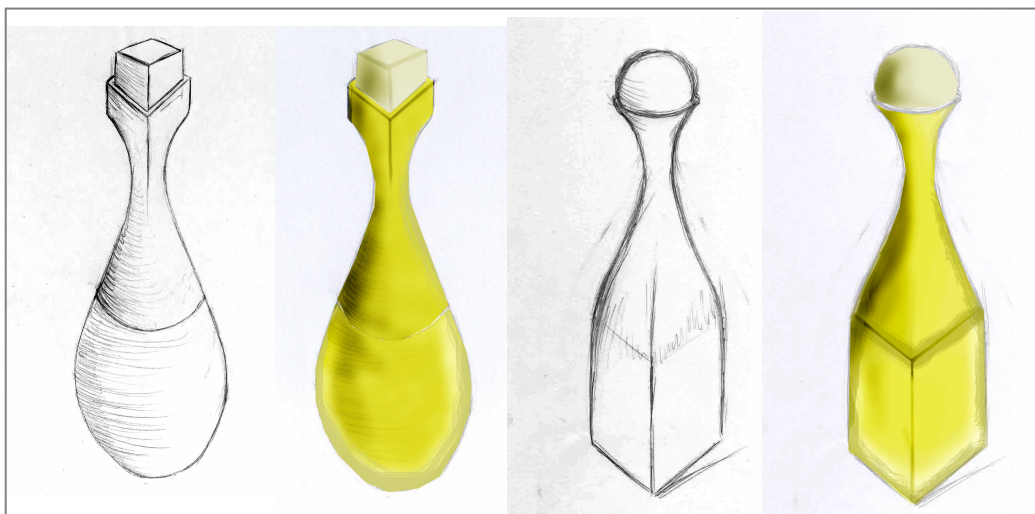


Figure 6: Form ideas for Nostalgics

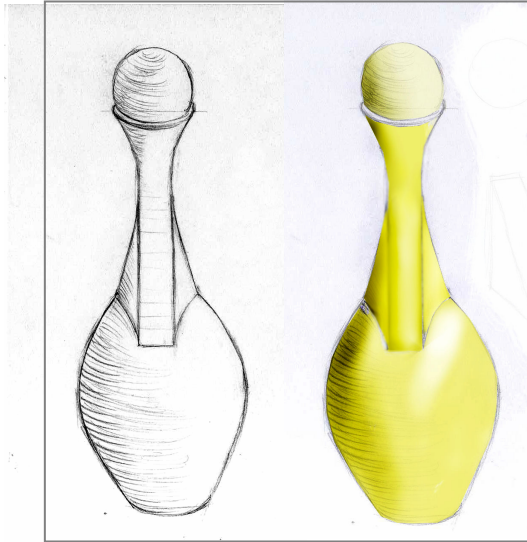


Figure 7: Form idea for Usability-minders

4.0 Evaluation

The prototype tool was evaluated with six professional engineering designers working in different sectors, including that of cosmetic cases. Each subject was first given a tool demonstration and was then engaged in a semi-structured interview. Following are the key results obtained from the qualitative data gathered.

Subject to a number of enhancements, 66% of the designers considered the proposed tool would be useful for market research, manufacturing planning and decision making. When asked about the limitations of the tool, 50% of designers found it difficult accessing the results on the cameraphone. Despite the limitations they encountered, the evaluators gave favourable comments, showing a positive attitude towards the tool. In fact, it turned out that all designers would consider using it in practice. One evaluator noted that the database for the KIE system demands credibility i.e. this would work very well if linked with a *trends agency*. Trends agencies foresee trends in the market place. Another finding was that 83% of the designers agreed that the proposed system would closer reach the customer's emotional needs if all product characteristics are considered.

5.0 Conclusion

In conclusion, this poster presents an innovative tool whose unique characteristics are the generation of 3D models and a list of recommendations to improve the emotional content of a product form, directly on cameraphones. Due to these characteristics, this tool has a number of implications on adopting a *DFe* approach in a mobile design context. This has been reflected in

the qualitative evaluation results obtained. Nevertheless, more research work is required in order to extend the practical utility of the tool.

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