A Method for Teaching Affordance for User Experience Design in Interactive Media Design Education

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Abstract. Today we are living in a world where boundaries among spatial design, object design and interactive media design (IMD) or human-computer interaction field are disappearing. Technological advances widen the abilities of interactive technologies day by day. We are on the verge of leaving the desktop metaphor behind while more natural and real life like interaction with interactive technologies is already on its way. As mentioned above, this is more about spatially interacting with new interaction modes such as gestures/touch/bio-feedback and new modes of showing content such as seamless/screen-free interfaces projected onto the eye or on different types of surfaces. These facts are highly related with the "user experience" subject. As put forth by Norman (1995), user experience paradigm aims to shift the focus from a more engineering approach to the emotions, behaviors of the human within his surrounding while interacting with the information. Today's designers are to design the user's whole experience, which means that traditional interaction design education concentrating on the media and computer is not enough. With this point of view, one of the aspects that is getting even more important now is ergonomics, thus affordance. This paper is about a method we are using in our interactive media design curriculum to study affordance and trigger the creativity of interaction design students.

Keywords: Interactive Media, Education, Affordance, User Experience, Curriculum, Natural User Interfaces.

1 Introduction

With the advent of interactive technologies, today we make continuous and location-independent interaction with digital information. Regardless of a specific location, we interact with HCI devices while walking, running, focusing on other things, carrying objects or interacting with other devices or people. Human factors research has been dealing with accessibility of interactive devices that are used under disabling conditions. Disabling environment term is used to explain situations that limit users' cognitive and behavioral abilities (Newell and Gregor, 1999). Newell and Cairns (1993) also claim that the design criteria for disabled users are mostly valid for normal functioning users' behaviors under disabling conditions. With another perspective, ARCHIE, an EU project, proved that an office worker nearly has similar

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accesibility level as an airplane pilot in the cockpit (Devnani et al. 1995). Both of these examples support the fact that disabling conditions provide valuable information for universally accessible interactive solutions. With this mindset, researchers like Hancock (Hancock and Miller, 1982), Newell (Newell and Gregor, 2002), Landau (Landau, 2002) have long been busy with the subject while it hadn't attracted much attention in design curriculum. However today we are living in a world where we nearly use interactive technologies only under disabling conditions. Here comes user experience design subject telling us that we need to change our design education perspective.

Within this world of continuously evolving technologies, it is getting harder for designers to develop rich, yet efficient, effective and satisfactory user experience solutions. We, in our IMD program in Yildiz Technical University, have been discussing interactive solutions used under disabling conditions as design case studies in IMD curriculum since 15 years. By then, it was an unfamiliar case study to encounter environmentally challenged computer use cases which we used as unfamiliar situations and obstructions for the design students to solve limiting problems like getting into interaction while standing up, moving or partial use of haptic abilities (Ozcan and Yantac, 2009). As a part of our breaking the rules education concept, it was a challenging design problem for the students for triggering their creativity.

But today, as mentioned above environmentally challenged interaction is almost a part of our everyday life. It is not uncommon for most of us, especially the young generation. Every interface has to be designed in a way that they can function effectively in many different environmental conditions. Thus, the careful planning of interaction between the interactive object, the user and the surrounding environment is significant. That is why we believe that affordance of interactive objects is one of the most important subject within the IMD curriculum while we see from the literature that there are not many examples of this. As one of the few examples, Faiola (2007) questions the lack of problem solving courses compared to the high number of usability, interface design and computing skills, and they (Faiola and Matei, 2010) propose the idea of having affordance at the center of HCID education, based on the arguments by Hollan et al (2000) claiming that the field should focus on "complex, networked world of information".

We hereby, in this paper, share our experiences with basic interaction design exercises focusing on affordance of natural objects, with which the students can explore user experience design solutions, pretentious space of interface ergonomics, alternative interaction possibilities, un-cliché design questions while having physical constraints caused by disabling environmental factors. We respectively discuss (i) problem space; (ii) explanation of exercises; (iii) insights from the study and (iv) further studies.

2 Problem Space: Teaching the Fundamentals of "Creative" User Experience Design

As mentioned above, it is clear that a new era of NUIs lies in the future of ubiquitous computing. The technology enables us to interact with computers by means of our

everyday gestures and use them anywhere, anytime. But today's systems merely act as an orientation for the up-coming future. We are in the verge of a big change. This brings many new challenges for both today's designers and design education institutions. However the dynamic ground of HCI has always been here. So it is not new that IMD education has to focus on universal design problems and build up a strong design-thinking basis that is not bound up with technologies and trends. For the clarification of the "design-thinking" term, we refer to the definition by Zimmerman et. al. (2007); a whole design process that involves grounding, ideation and iteration. Norman (1999) supports this idea by claiming that the most important components of a successful design are conceptual model and overall consistency.

On the other hand, another critical concern for IMD education is creativity. "Why?" Relying on the fact that creative skills can be learned, we believe that a design curriculum should always have the notion of triggering the "lateral thinking skills" (De Bono, 1990) and give the vision to push the traditional boundaries and be creative. Creativity, in this sense, is "bringing something into being that is original (new, unusual, novel, and unexpected) and also valuable (useful, good, adaptive, and appropriate)" as explained by Osche (1990).

Design research literature has been focusing on these two big concerns of design education; giving design thinking basis and triggering creativity. With regards to research through design approach (Frayling, 1993), which uses education results as research artifacts to create knowledge instead of products (Zimmerman, et. al., 2007), many design curricula takes advantage of studio-based learning to overcome above problems. With the aforementioned perspective for grounding their studio-based design education to creativity and design thinking, Faiola and Matei (2007), consider "affordance" as a key conceptual concern in HCI education. They task their students to start the design process not from abstract functionality but from defining the way the device presents itself physically. With an activity-oriented approach, we believe that affordance seems to be a very good challenge for IMD students in this sense.

With a similar perspective, we have been focusing on natural interaction exercises in our curriculum. This has been a part of our educational approach of "Breaking the Rules" (Ozcan and Yantac, 2009) inspired by Lars von Trier's film Five Obstructions (Leth 2003) for which Von Trier claims that creativity thrives on limitations (Tabak 2004). We want the students to explore non-predictable ideas when they confront unfamiliar or extra-ordinary design problems and obstructions. Regarding the problems of giving a design-thinking basis and triggering creativity in IMD education, we've been employing different "rule breaking" exercises for 15 years such as;

1. Disabling environment (auditory/haptic/visually limited environmental conditions) (Ozcan and Yantac, 2009),
2. Re-reading old cultural traditions for interaction (Ozcan, 2005)

However, due to above-mentioned changes in the field, disabling environment case studies started to be inadequate for triggering the students' creativity when compared to 10 years ago. Instead, we have been employing 2 different exercises for exploring natural user interfaces (NUI);

3. Learning NUI through creative drama (Unluer and Ozcan, 2012)
4. From natural objects to interactive artifacts,

The idea beneath the second of above exercises is to task the students to explore affordance of natural objects, the way we interact with them in real life and imagine how they would turn it into interactive artifacts in unfamiliar situations. We, hereby, share our insights from our studies on this "unfamiliar actions with natural objects" exercise. We will first briefly explain the procedures, pedagogical approaches and a few results of this exercise.

3 From Natural Objects to Interactive Artifacts

Main idea of this exercise is to make IMD students explore natural interaction using ontological metaphors, mediating artifacts, personification with natural objects. These widely used methods for practicing ideation process in architecture, industrial or graphic design schools, is here employed to explore fundamentals of affordance besides triggering creativity and productivity by means of NUI, and forming the basis of design-thinking. Instead of dealing with technological limitations or traditional design boundaries or trends, students focus solely on a natural object and its physical, chemical, material substances in interaction with a user and surrounding.

3.1 Pedagogical Approach

For provoking the productivity of students, the exercise (Figure 1) takes advantage of well-known methods such as personification, mediated artifacts and ontological metaphors (Lakoff & Johnson, 1980) that are used popularly in design education. A natural object is imagined in many different random situations where an action is applied on to it and it replies this action. For the beginning stage, there is no need for detailing but students practice the productive ideation process by exploring many possibilities of interaction sets. Sometimes the object is personified; sometimes the idea comes from ontological metaphors. That is why we want the students to start exploring with action based verbal ideas and play with sentences, words and then continue the exploration process with hand-drawn sketches where they can investigate visual clues of physical attributes and actions. Following this preliminary ideation process, students start to detail the concept in order to turn the object into an intelligent interactive artifact where they confront limitations as a part of our breaking the rules method. They analyze the object the object with its physical, functional, conceptual, lexical attributes. For the interaction design solutions (input, feedback, predictability…), they are forced to stick to some attributes of the original object as well as being limited to one main function for practicing consistency. The process ends by shaping all the interaction map of a re-constructed interactive artifact for which they are free to en-richen the artifact with graphical, auditory, luminous, action related abilities. The artifact is in continuous communication with the user and their surrounding. However, as our education curriculum focuses on IMD and doesn't teach industrial product design or 3D ergonomics in detail, we don't want the students to work on the physical shape of the object but re-think all possible human-object-environment interactions regarding this artifact.

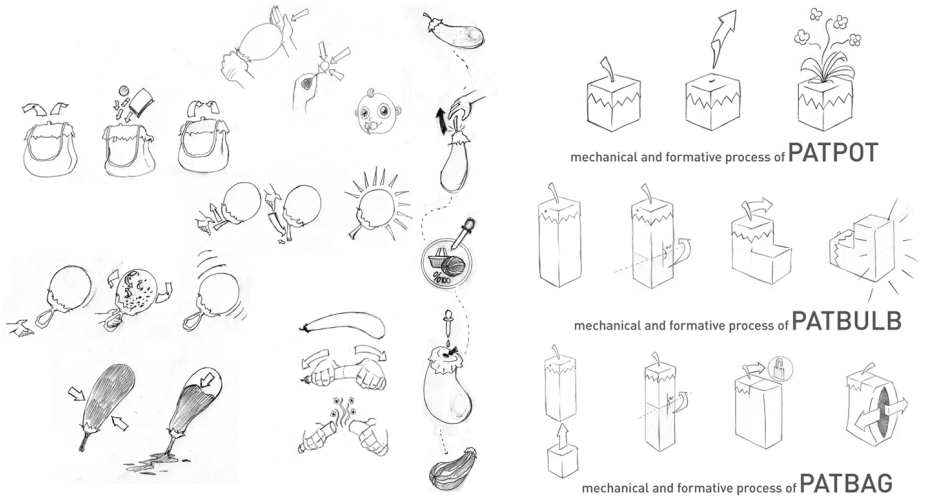

Fig. 1. Sketches on an interactive eggplant artifact (left). Final ideas on the artifact (right) (Mustafa Ahmet Kara, 2008)

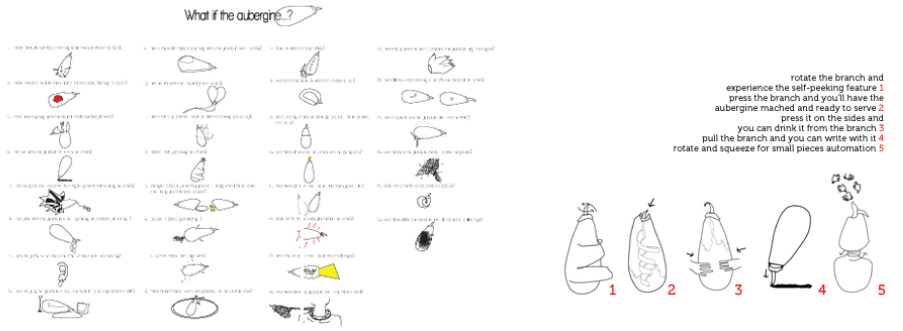

Fig. 2. 4th procedure of the process; defining 40 ideas (left) and 5th procedure; 5 of the eliminated ideas for in interactive eggplant artifact (Bruno Santos, 2008)

3.2 Procedure

From 2008 to 2013, the exercise has been implied to 2 different student groups; 2nd semester (1st year) and 5th semester (3rd year) of an 8 semester, bachelor level IMD program. Each group involved 40 students and 80 students in total did the study. We first tried the study with 3rd year students with a more detailed process running as 12 studio sessions. This was deeply exploring the latter parts of the process by details on efficiency and consistency of the artifact. Later on we started running the study with a more basic format with the 1st year students as a 3-session process. This time we focus more on the ideation process instead of detailed design solutions. Briefly, both studies included following procedures:

1. Define a natural object (We suggest them to work with unusual, provocative, interesting objects that have different parts)

   e.g: A mushroom, pineapple, pomegranate, pine cone, starfish…

2. Explore its substance; Physical attributes, Form, Color, Material, Stiffness… (Here they explore physical attributes of the original object on its affordance)

   e.g: Mushroom's body has a cap on top, pores at the bottom of the cap, elastic stipe carries the cap, yellowish grey, soft, spongy…

3. Investigate all other attributes such as feeling (taste, smell…), function (edible, medicinal, protective…).

   e.g: Strong taste, odor, edible, poisonous, fertile…

4. Write down 40 fictive sentences (Figure 2) explaining how it would react when confronting an unfamiliar action from the user or the surrounding.

   e.g: What would the mushroom do if it was thrown into the air by being turned 360° around itself?

5. Eliminate these interaction stories into 10 consistent functions that would turn the object into an interactive artifact used for a specific need.

   e.g: The mushrooms can be used as small containers used for mixing, storing, duplicating mixtures of sauces or drinks.

6. Reconstruct the natural object in a way that the user can predict how to use its functions and what would the results be; carryout the actions easily; watch results of the interactions (While re-structuring the object, students need to keep some of the attributes such as the main form, but can play with others).

   e.g: The mushrooms cap and stipe can be separated and brought together again when needed. The cap can be screwed on the stipe…

For all of these steps, the student draws sketches (Figure 3) and detailed illustrations explaining interaction steps such as; the first state of the object (predictability); user's first action (input); object's external reaction (feedback, WYSIWYG, mental model); object's internal reaction (functionality, navigation). The process, which is presented as (1) sequential images showing the actions, (2) a still image showing the whole (3) and an animation in the end, is evaluated with jury critics. The jury considers the level of exploring the affordance of the object, creativity in the ideation process, productivity and presentation.

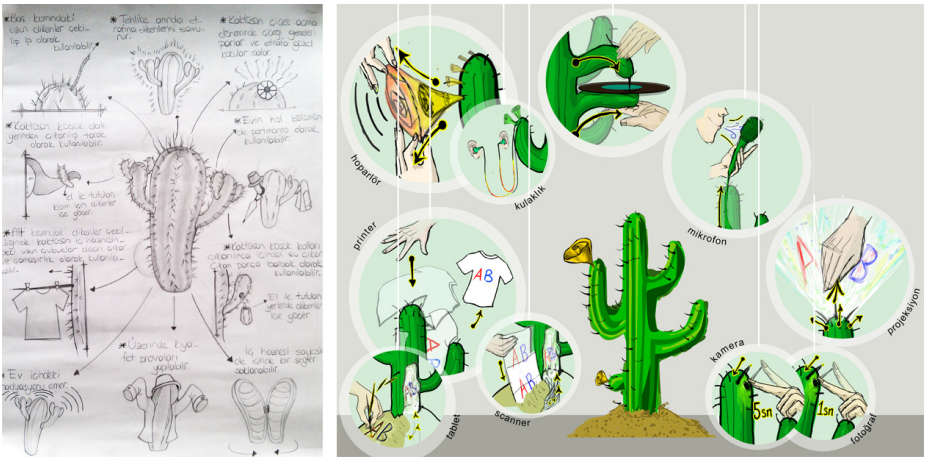

Fig. 3. Two different cactus ideas; An interactive cactus for general home use (Başak Gence, 2013) (left); A second interactive cactus for home entertainment (Özge Kantaroglu, 2008) (right)

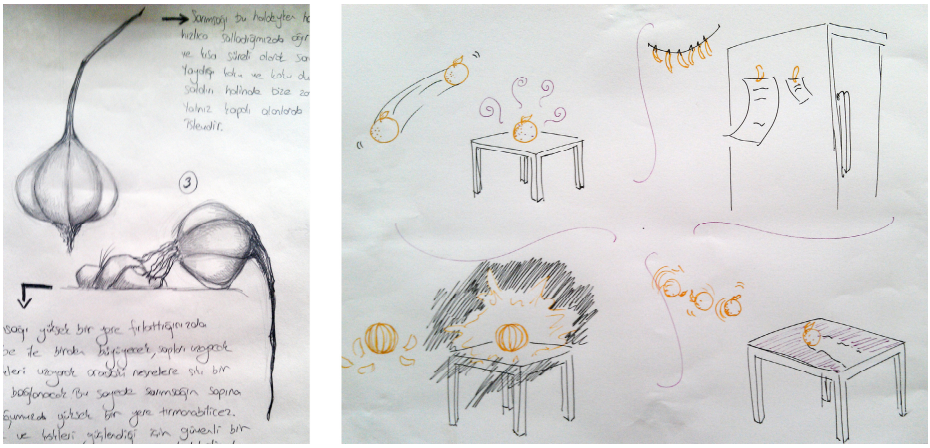

Fig. 4. Preliminary ideas on a garlic artifact used for camping (Birnur Yıldırım, 2013) (left); An orange artifact used for hygienic functions (İmge Akbulut, 2013)

4 Discussion

As detailed above, we started implying the exercise as a more detailed study to the experienced students before they start working on spatial interaction design case studies. But this exercise lacks focus on detailed problem solving. It is more about creativity and productivity in the ideation process and doing this by means of affordance of a natural object. Thus we continued by implying the study to the less experienced 1st year students as a part of the basic interaction design education. In the basic interaction design education, we feature exercises that focus on ideation and

presentation skills of students. What we experienced by this change is that this exercise fits better to the early stages of interaction design curriculum to help forming the design thinking skills for user experience design and fundamental interaction design principals.

The effectiveness of these exercises was evaluated through the analysis of 7th semester design studio works, which focus on the design of spatial interaction in a physical space. Generally speaking, these exercises about affordance of natural objects guided the students to have a better understanding of the physical tools and ergonomics of the objects, so they had reached a new level of awareness in choosing/shaping the mediated artifacts in relation with its surrounding and user's experience. Besides, they created inspiring solutions for the use of wearable, mobile and surface technologies.

In this paper, we share our insights from experiences with an exercise we implied for teaching fundamentals of user experience design by means of affordance in interactive media design education curriculum. For the exercise, students choose a natural object, explore its attributes and re-construct it in a way that it is a responsive, interactive artifact which functions efficiently and consistently. This gives a student the opportunity to brainstorm about the interaction of the artifact with the user and their surrounding. We learned from our experiences that these exercises help building the design-thinking basis for user experience design however it functions better when used in the preliminary stages of the curriculum.

References

1. De Bono, E.: Lateral thinking: Creativity step by step. Harper & Row, New York (1990)
2. Devnani, N., Cairns, A.Y., Cobley, A.E., Glynn, H., Ricketts, I., Scott, D.: Inside ARCHIE - A Description of the ARCHIE System Architecture and Functionality. In: Adjunct Proceedings of HCI 1995, Huddersfield, pp. 182–184 (1995)
3. Faiola, A.: The design enterprise: Rethinking the HCI education paradigm. Design Issues 23(3), 30–45 (2007)
4. Faiola, A., Matei, S.A.: Enhancing human–computer interaction design education: teaching affordance design for emerging mobile devices. International Journal Technology Design Education 20, 239–254 (2010)
5. Frayling, C.: Research in Art and Design. Royal College of Art Research Papers 1(1), 1–5 (1993)
6. Hancock, P.A., Milner, E.K.: Mental and psychomotor task performance in an open ocean underwater environment. Research Quarterly, 247–251 (1982)
7. Hollan, J., Hutchins, E., Kirsh, D.: Distributed cognition: Toward a new foundation for human computer interaction research. ACM Transactions on Computer-Human Interaction 7(2), 174–196 (2000)
8. Lakoff, G., Johnson, M.: Metaphors we live by. University of Chicago (1980)
9. Landau, K.: Usability criteria for intelligent driver assistance systems. Theor. Issues in Ergon. Sci. 3(4), 330–345 (2002)
10. Leth, J.: Five Obstructions. Directed by Jørgen Leth. Produced by Lars von Trier. Trust Film Sales (2003)

11. Newell, A.F., Cairns, A.Y.: Designing for extra-ordinary users. Ergonomics in Design, 10–16 (1993)
12. Newell, A.F., Gregor., P.: Extra-ordinary human-machine interaction: what can be learned from people with disabilities? Cognition, Technology & Work, 78–85 (1999)
13. Norman, D.A.: Affordance, conventions, and design. Interactions 6, 38 (1999)
14. Norman, D., Miller, J., Henderson, A.: What You See, Some of What's in the Future, And How We Go About Doing It: HI at Apple Computer. In: Proceedings of CHI 1995, Denver, Colorado, USA (1995)
15. Osche, R.: Before the Gates of Excellence: The Determinants of Creative Genius. Cambridge University Press, Cambridge (1990)
16. Ozcan, O.: Turkish-Ottoman miniature art within the context of electronic information design education. Journal of Technology and Design Education 15(3), 237–252 (2005)
17. Ozcan, O., Yantac, E.: Breaking the Rules in Interactive Media Design Education, Digital Creativity, Routledge, UK, vol. 17(2), pp. 115–124 (2009)
18. Unluer, A., Ozcan, O.: Current Problems in Design Education on Natural User Interface Using Creative Drama Technique. In: Design Thinking Research Symposium (DTRS 2012), the School of Design, April 18-19. Northumbria University (2012)
19. Zimmerman, J., Forlizzi, J., Evenson, S.: Research through design as a method for interaction design research in HCI. In: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI 2007), pp. 493–502. ACM, New York (2007)