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An Introduction To Experience Requirements

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***Abstract*—We consider the application of requirements engineering principles and techniques to the elicitation, capture, and representation of the output of the user experience design process. A stimulus-perception-response model is used to motivate experience requirements, defined as descriptions of user experiences that must be met (functional experiences) or are satisfaction goals (non-functional experiences). We identify potential benefits and look at experience requirements in video games.**

Keywords: Experience requirements, user experience design, non-functional requirements.

User eXperience Design (UXD) is the deliberate creation of one or more aspects of the user experience. An intersection of many schools of design, one could consider UXD a superset of HCI, industrial design, and the fine arts.

The field of Requirements Engineering (RE) is based, in part, upon the premise that if one sets out to design something (anything), it is best to know *a priori* what that thing is for and what it should do – *i.e* the requirements are defined. In this work, we present early results of our investigations into the intersection between UXD and RE.

I. Experience Requirements

We define the application of RE to UXD as *experience requirements*. Experience requirements are descriptions of user, player, and customer experiences that must be met (functional experiences) or are satisfaction goals (non-functional experiences), for products or services. These experience descriptions may be constructed using generally accepted requirements engineering principles and techniques or they may use less traditional techniques such as concept art or sound effect samples. We note that even though the customer experience is considered a basic tenet of product quality (for example, as *aesthetics* in Garvin's "Eight Dimensions of Product Quality" [3]), it is not addressed by the section on software quality in the ISO 9126 standard [4] (except, perhaps as an element of usability) despite the standard's attempts to be exhaustive.

It appears that a new model could be useful. We follow a relatively strict constructivist approach, rooted in classic engineering principles, when defining this model: we identify the domain of interaction, then use decomposition and refinement to create the model. Then, using a thought experiment process, we apply the model to a domain to see how well it works, possibly identifying particular strengths and weaknesses. To date, we have investigated elements of expressiveness – the ability to elicit, capture, and represent the user experience. The model's success as an expressive medium will determine whether deeper investigation is warranted.

II. A Model

Maintaining the constructivist stance, we assume a stimulus-perception-response model guides the design of the user experience: First, the desired user response is specified. A stimulus, that is (to be) perceived by the user, is then designed to engender the desired response. We note that the stimulus-perception-response model is a representation of the ways in which the designer can affect the user – informally, we could say via the emotions, the intellect, and the senses. We find that, for each element of this model, there are *tangible* and *intangible* elements, examples are noted below.

STIMULUS: Tangible stimuli exist in the world around us – they can have physical and temporal aspects. Intangible stimuli affect our conscious and unconscious selves, cognitive and emotional responses are examples. While tangible stimuli exist in the four dimensions that we perceive in the world around us, we note that intangible stimuli allow an effectively infinite expansion of the dimensions.

PERCEPTION: The user can only perceive the stimulus via their five senses. However, the stimuli may generate a meta-level perception. For example, the stimulus may be a block of text that is read by the user. The block of text actually contains a message to the user – it is this message that we want the user to perceive and not the block of text *as a block of text*.

RESPONSE: The user may generate a tangible (observable) response. They may also have an intangible response such as learning a new fact, or entering a new emotional state; responses that we can not directly observe.

Experience requirements could be considered a type of non-functional requirement (even though our definition notes that experience requirements can capture functional experiences). Non-functional requirements are often referred to

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as the "-ilities": reliability, usability, maintainability, *etc.* Except for usability, even the most extensive investigations into non-functional requirements such as that by Chung [2] do not appear to address the intended user experience. It appears that the field of requirements engineering could take a more holistic approach to the user experience and that experience requirements may be a worthwhile addition to the domain.

III. Potential Benefits

Extending existing development practices to include experience requirements could provide a number of benefits. For example, any media or software element identified in an experience requirement is an element that must be implemented by the production team – experience requirements could reduce the risk that the existence of the element has only been inferred in the specifications or can only be identified by implication. Any element identified in an experience requirements is also a *mission-critical* element, necessary for creating the intended user experience, and the implementation of the element can be prioritized.

Design reviews are facilitated by the explicit identification of the critical elements and appropriate test plans can be devised earlier in the process and with greater certainty. Experience requirements can also provide guidance for play testing and player satisfaction testing. By more explicitly capturing the designer's intent for an experience, we enable greater certainty in design reviews, and the design and development of tests for both verification and validation. (For example, if the designer has specified that a particular use-case is expected to make the user laugh, then the test team can monitor users for the expected response.) The documented experience requirements may reduce production's dependence upon the designer's availability and we anticipate that the more structured representation could enable greater certainty in development planning, project estimation, and project scheduling. Finally, prioritizing experience requirements during requirements negotiation efforts may also lead to increased customer satisfaction, potentially improving the quality of the user experience.

Focusing on experience requirements during product conceptualization and design means that experience requirements will be captured before other (more traditional) requirements (*i.e.* functional or non-functional). We expect that this temporal precedence will tend to subordinate the traditional production requirements during requirements negotiation activities.

IV. Experience Requirements in Video Games

We have been exploring the use of experience requirements as a mechanism for capturing the game designer's vision for the player's experience. To date, our work has shown that the user experience for this domain, when captured as experience requirements, will address one or more of the following items:

1) Emotional experience
2) Gameplay experience
    a) Cognitive experience (*e.g.* puzzles or quests)
    b) Mechanical experience (*e.g.* command sequences, combat 'combos')
3) Sensory experience
    a) Visual experience
    b) Auditory experience
    c) Haptic experience (if available)

Our prior reported work focused on the emotional experience, represented by emotional requirements [1]. We have found that our emotional requirement techniques have been effective for capturing the intended player experience in a side-scrolling platform-jumping game, in a racing game, and in multiple scenarios within a first-person-shooter game. There are some restrictions: our visualization techniques only support transitions between one emotion at a time (for example, from happy to sad and do not support, for example, transitions from a mix of anger and fear to sad. Our current work is addressing the gameplay experience. While results to date are showing promise, the complexities of capturing and representing cognitive experiences are greater than anticipated.

V. Conclusions and Future Work

Our initial results with experience requirements indicate that it may be possible to use experience requirements in user experience design efforts. Experience requirements apply requirements engineering techniques very early in the typical product definition process and, as with all methodologies, their application to the creative phase should be carefully managed to ensure that creativity is not negatively impacted. Initial results in the video game domain show promise, but the complexities are greater than anticipated. Further work appears warranted, based on results to date.

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