Why and How CARPE Should be Personal?

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ABSTRACT

In this paper, the significance of modeling human personalities is analyzed for improving the value proposition of solutions for Capturing, Archiving and Retrieval of Personal Experiences (CARPE). Differences in human personalities have a significant and often an overriding impact on how raw events are linked and organized into threads of experiences. Recommendations and predictions are presented on how existing technologies and current research can be integrated for this purpose. The focus here is on the importance of using techniques for improving the quality of the experience thread formation from the raw stream of observation content and on harvesting personality information from analyzing the captured content. Personality models are used when clustering raw event content into such threads. The resulting threads will represent the subject’s experience in view of the subjects’ personality. The formations of the CARPE threads also contribute to the development of the personality. As a result, the real-life experience view of the subsequently built threads is further enhanced. Also discussed are ways of integrating various methods of building and integrating such models using personality profiling.

Categories and Subject Descriptors


General Terms


Keywords

Personalization, multimedia archiving, personality models.

1. INTRODUCTION

The CARPE community has already published extensive research and prototyping results in the area of computational resources and architectures needed for managing personal experiences. A number of methodological aspects have also been extensively addressed, such as the need for continuous capturing, passivity of capturing and archiving, the use of pattern recognition and trigger condition detection solutions. The relation of the experience capturing to the human subject has mostly been discussed in the context of the constraints implied by privacy concerns [14]. Several other aspects of this relation have not been adequately summarized yet. What can we gain by optimizing the extent of capturing the personality of the subject when capturing the experienced content and how should we go about it?

2. MOTIVATIONS

In most of the CARPE applications the value proposition of the solution usually centers on “saving” the subject’s personality by archiving the consumed and generated media content. In this sense, the content itself represents the personality, which would explain the personal trauma experienced when people are loosing their hard disk, bookmarks, etc. going way beyond the concerns over the business loss. Consequently, there is an inherent value in viewing the captured content as a footprint in the person’s image and as the legendary quote “I am the data” [15] would also imply it. The question is then, how good of an image is this content repository, what is missing from it to make it more complete and valuable. In other words, what are the personality semantics that can be harvested from such content and that also can be used to improve the interpretation of the collected content? To address this question, we first review in Section 3 what we know about personality models, why we segment the captured experience into threads of events in Section 4 that we could relate to various components of the personality models as shown in the rest of this paper.

3. PERSONALITY MODELS

Personality models have been researched and used in several layers and disciplines as shown on Figure 1:

Observed Experience Content Representation

<table>
<thead>
<tr>
<th>Knowledge / Semantics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain Specific Traits</td>
</tr>
<tr>
<td>Cognitive / Affective Traits, Facets and States</td>
</tr>
<tr>
<td>Cellular level</td>
</tr>
</tbody>
</table>

DNA

Figure 1: Personality Model Layers

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Copyright 2005 ACM 1-59593-246-1/05/0011…$5.00.
Contemporary psychology has accumulated a vast amount of knowledge about the categorization, interdependencies, and interactions between personality types and their development processes [1]. But up until recently, hardly any efforts were known to formalize this knowledge in order to enhance the value of information processing for human consumption, even though many personality psychology researchers agree with the hypothesis, that changes in the personality behaviors are state-transition like [1]. The issue is to determine the selection of the states, the transitions and knowledge to determine the conditions. Psychology is also likely to provide a very rich set of “use-case analysis scenarios”, where IT-analysis paradigms, such as message sequence charts and corresponding state transition sequences can be build that would reflect what stages the human goes through while participating in a typical, real-life scenario. The applicability of the state machine is implied in [1] by stating that “Traits refer to the probabilities of being in a particular state, or to the latency to achieve a state following a specific environmental elicitor”. Further, [1] quotes that “traits as well as emotional states effect the detection, encoding, storage and retrieval and integration of information.” There is also emerging a multi-disciplinary field of “Personality Science” [7] for researching personalities but without using their computational analysis or modeling.

In the last two years or so however, several efforts have been published to formalize the expressions and the models of the personality traits and states [11], [12], although yet to be seen how deeply these will be embedded in the personality science field. Publication [11] provides an introduction to personality psychology factors such as facets, traits and states, from the viewpoint of computational modeling them to support applications such as determining the “best fit” social roles of a person with measured personality facets and traits. In Section 5, these are detailed and their application is shown for a CARPE scenario.

Cell and DNA level - Known facts from brain-research could significantly enrich the human personality “object-model”. Different sections of the brain represent different functions in the human. For example, brain researchers have most recently discovered that the section of brain mostly damaged by the onset of Alzheimer is the same one that is mostly used in the earlier phases of life for “day-dreaming” which is an important facet of one of the major five affective personality traits [11]. These brain functions and abilities can be viewed as objects and relations can be established between them and other personality traits objects that may not have explicitly separable section on the brain – as far as known in the current state of the brain research. The research in the correlation between the personality psychology traits and the related physiological components are also summarized in [1].

Recent research also claims a potential ability to attribute the ability of recognizing specific visual objects, such as the face of specific persons to a single brain cells. While the utilization of similar discoveries can not be anticipated for short-term, this would clearly indicate the underlying ability to map the knowledge level personality model information to the cell-level, without necessary going through the layers of cognitive and affective traits and states, as shown on Figure 1.

4. THREADS OF EXPERIENCE
An important personalization issue addressed in this paper is using personality semantics for linking the incoming raw experience input into “threads of life experiences”. An example of the experience thread in [16] was a trip to a specific city where the captured thread content represented all the events related to this travel thread, such as booking the flight, hotel, taking the cab to the airport, boarding, flying, arriving, sightseeing, etc. The content sources can include e-mail, Web-access capture, camera, phone calls, microphone recording, etc. A battlefield thread example could be an explosion and all the follow-up activities to take the situation under control: rescue of the victims, repositioning the troops, etc. In the business word domain, holding a conference or expo can be a thread. Obviously, such event threads can be hierarchically nested, as well.

4.1 Why Experience Threads Are Useful?
An important and intuitive mode of retrieval of the archived multimedia experience is browsing by threads. Threads can also be conceived as high-level, composite events in personal experiences that the user would find valuable to use to search. Typical chapters of the conventional photo-albums are trips, wedding, graduation ceremonies, etc. For passive recording, the real-time thread formation can also be very important for limiting the volume of the archived content to thread-specific, or “in-thread” info only. A content segment may have to be discarded before archiving if it clearly does not belong to the thread and the key beneficiaries do not intend to be aware of it. Alternatively, such out-of-thread piece of content can be archived separately as something that was captured but does not really belong to the thread. The existence of an out-of-the-thread piece can still be used to infer and/or to confirm certain valuable personality attributes traits or states, as shown in the example of Section 6.2.3.

Retaining out-of-thread information as such can help clarifying or augmenting the in-thread content semantics. For example, the dress of people not related to a captured cultural event thread still can imply the time and the cultural environment of the place where the event took place [5]. Unrelated e-mail and web-site visits still might imply that the experience host had stressful times when the particular events took place. It could be arguable weather separating the in-thread content from the out-of-thread content needs to be done at the time of the thread formation before archiving or it can be done in a post-processing step before
or in-connection with the retrieval process. In reality, both can prove to be useful since at the time of capturing significant background semantics support knowledge may exists which is not retained by the time of the retrieval, for example temporal Website content that is difficult to access for archiving.

Another important potential value of archiving by threads is the support of completeness assessment of the life experience content archive. Assuming the existence of a somewhat accurate list of significant life experience event threads exist as a contextual metadata of the overall personal life experience content archive, this list and the threaded content repository can be matched to one another to assess content coverage.

Further values of using experience threads will stem from processing them based on personality model analysis. These advantages are described in Section 6. But first, we review an example of analyzing the impact of personality models on such threads.

5. AN ANALYSIS EXAMPLE
Changes in the video content scenes can be attributed to real new events of the thread or to a disruption in the thread due to the personality traits and states of the person capturing the video. In this section, we show how the five major personality traits and related attribute or facet details described in [1], [2], [11] can be analyzed on a hypothetical impact of the person’s affective traits and states on producing out-of-thread video scene changes. We then illustrate the likelihood of disrupting the video-thread along these five dimensions showing them on a personality traits spider-chart, also used in previous works [11] where it was suggested for illustrating personalities matching certain social role profiles.

5.1 The Five Major Personality Traits
Here we first recap from [2], [11] how to characterize the personality attributes in the directions of the five major, affective personality traits dimensions.

5.1.1 Openness
“Openness to Experience—tendency to be intellectual, interested in the arts, emotionally aware, and liberal.” [2]. High level of openness traits has a fantasy facet of “imaginative” and “daydreaming”, aesthetics facet of “appreciates art and beauty”, actions facet of “prefers variety and tries new things”, ideas facet of “broad intellectual curiosity”. A low level of openness traits has fantasy facet of “focuses on here and now” aesthetics facet of “uninterested in art”, actions facet of “prefers familiarity” and an ideas facet of “narrower intellectual focus”. [11].

5.1.2 Conscientiousness
“Conscientiousness—tendency to set high goals, to accomplish work successfully, and to behave dutifully and morally.” [2]. High level of conscientiousness traits has order facet of “well-organized, neat, tidy”, dutifulness facet of “governed by conscience, reliable”, self-discipline facet of “focuses on completing the task”, deliberation facet of “thinks carefully before acting”. Other personal characteristics of highly conscientiousness people include “difficult to distract”. On the other hand, a low level of conscientiousness traits has order facet of “unorganized, unmethodical, weak control over impulses”, dutifulness facet of “casual about obligations, less focused on goals”, self-discipline facet of “procrastinates, distracted, more hedonistic”, deliberation facet of “spontaneous and hasty decisions” [11].

5.1.3 Extraversion
“Extraversion—trait associated with sociability and positive affect.” [2]. High levels of extraversion traits have an excitement seeking facet of “craves thrills” and a tendency to be “active physically and verbally”. On the other hand, low levels of extraversion have an excitement seeking facet of “low need for thrills” and a tendency to be “comfortable with being alone” [11].

5.1.4 Agreeableness
“Agreeableness—tendency to be a nice person.” [2]. High level of agreeableness traits has an altruism facet of “willing to help others” and a tender-mindedness facet of “easily-moved”. A low level of agreeableness traits has an altruism facet of “reluctant to get involved”, a tender-mindedness facet of “hard-headed” and is associated with a “focus on personal norms and needs rather those of the group” [11]. On the other hand, people with medium degree of agreeableness traits have a tender-mindedness facet of “responsive” and more likely to exhibit “situationism – interdependence” and “move from leadership to followership as the situation demands” [11].

5.1.5 Negative Emotionality
“Negative emotionality, or neuroticism—trait associated with emotional instability and negative affect.” [2]. High level of negative emotionality trait has worry or anxiety facet of “worried, uneasy”, impulsiveness facet of “easily tempted”, and vulnerability facet of “difficulty of coping with stress”. On the other hand, a low level negative emotionality trait has worry or anxiety facet of “calm, relaxed”, impulsiveness facet of “resists urges easily”, and vulnerability facet of “handle stress easily” and “rational” [11].

5.2 Impact on the Thread Disruption

![Figure 2: Personalities with high (O) and low (★) levels of inclinations to take out-of-thread video shots.](image)

As shown on Figure 2, one would ordinarily anticipate that a person of high degree of openness, extraversion, agreeableness and negative emotionality or a low degree of conscientiousness and agreeableness would also be more likely to get diverted from the primary thread of experience events and include a video shot that does not belong to that main thread. On the other hand, a low level of openness, extraversion, negative emotionality or a high
level of conscientiousness or a medium level of agreeableness would favor adhering to the main thread in all shots.

The overall affective personality trait map for the highest and lowest degree of inclination of taking out-of-thread video shots was also illustrated on Figure 2. If no sufficient, other meta-data is available, the distance to these maps can help determining if a content piece is likely to be a part of the experience thread. These personality maps could also be useful in determining missing personality trait values, if metadata is available for qualifying a content fragment as being or not being part of the thread but the judgment and/or the decision of the subject was playing an important role in taking or not-taking the shot.

6. PERSONALITY INTEGRATION

6.1 Personality Profiling Integration

The example in Section 5 to correlate the personality traits information with the video scene change detection events is only a small, potential part of the scope of the opportunities in harvesting personality model information from the content. A more complete list of these would also include the following:

Text mining – is primarily used on e-mail and Web-access mining, and also on video, book and music titles. Popularly researched area, mainly for uncovering domain specific traits, e.g. how the person is using the video recorder/player [18] and what are the sentiments in relation to commercial products [17]. With increasing success in visual object and speech recognition, their substitution with text strings can broaden the scope of text mining.

Comparative Personality Profiling is using known personality models with known content consumption preferences to correlate the measured content consumption preferences with unknown personality models. Typical such content consumptions are video, book and music titles. This approach is a “black-box” profiling, since it does not break down the content into its constituents. Typically, it does not break down the personality models either.

A white-box personality trait-state profiling takes video and image characteristics, such as color, shape, brightness, motion rhythms, etc.; music and speech characteristics such as rhythms, tone, frequency harmonics, etc.; movement characteristics of haptic sensors and the effects of composition of the above multimedia content and correlates those with the constituents of the personality models. Speaker emotion detection and face emotion recognition also belongs to this category.

When using wearable biometric and brain-wave sensors, the mapping between the personality traits and the actual sensor reading constituents are implemented by the human body itself and this mapping needs to be “simply” discovered and computationally modeled.

6.2 Potential Benefits

6.2.1 Predicting the Subject’s Reaction to Events

For example, an introverted and highly conscientious person heavily focusing on a specific task to be accomplished is less likely to get distracted by out-of-thread events and changing video scenes to capture them.

6.2.2 Predicting Personality Changes

Potential impact of specific types of events on changes in the personality traits and states can be easier predicted and/or validated. There are at least two categories of such changes:

a) “Natural” changes in personality traits as the person ages and/or develops. Publication [11] describes examples of how the average person is likely to change her or his personality traits along the five major dimensions of personality traits. The captured content may carry indications of such transitions.

b) Sudden, unexpected events such as explosions, major winning events, death, etc. may have more sudden change impact.

6.2.3 Enhanced Predictive Personality Model

The scope of the available personality model definition information can be enhanced while performing thread formation.

6.3.1 Inference across Specific and Generic Traits

There are extensive interdependencies between the domain specific personality traits and the generic ones. By discovering some of the domain-specific traits from the experience content can help inferring some of the generic ones. For example, Sparacino was using Bayesian networks to classify museum visitors from their exhibit traversal patterns into, let say “art expert visitor with specialization” [3]. If similar conclusions are drawn in several, different domains, a generic openness [11] personality trait can be inferred since the subject demonstrated high level of aesthetics by “appreciating art and beauty”, high levels of actions facets by “preferring variety and trying new things” and strength in the ideas facet by demonstrating “broad intellectual curiosity”.

Similarly, the knowledge of some of the generic traits can enable the prediction of domain-specific traits, as well.

6.3.2 Inference within Generic Traits and States

Some unknown personality traits within the same generic category can also be discovered by inferencing from the known generic personality traits. In the scenario of Section 5, a conclusions of capturing an unrelated out-of-thread video shot would imply an aggregated personality trait statement where some or most of the traits may have already been known. For example, if four personality traits were known but not the “conscientiousness” trait, the existence of too frequent out-of-thread video shots beyond a certain threshold could also imply or confirm a low degree of “conscientiousness”.

6.4 Assessment of Archive Completeness

We could enable a completeness assessment of the captured life experience content in terms of the coverage of the overall personality traits and states by the scope of the traits and states derived from the archived content. Such coverage analysis could uncover what types of traits remained unknown or highly ambiguous and what personality traits were exhibited by what frequency.

As a result, users will have a much better understanding of the entropy value of the captured experiences. This understanding could also help clarify what other CARPE thread information is missing. In our example scenario, the subject might have been
taking some out-of-thread shots while some thread-relevant events were happening. The personality model assisted approach helps understanding how objective the view is as represented by a specific CARPE thread.

6.2.5 Personality Traits Based Experience Retrieval
For example, I retrieval query statement might state: “I want to see Bob where he was a) exhibiting his openness, preference to variety and trying new things” (affective personality trait); or b) demonstrating his high IQ” (cognitive trait); or c) using his expertise and interest in impressionist arts” (domain specific knowledge and personality traits). A variation of this feature could be utilized in more advanced applications where such query statements are computationally inferred from certain personality model changes.

6.2.6 Personalized Trigger Events
When the content is captured by a wearable device such as SenseCam in [6], a typical trigger event to start recording is a wearable motion detector. By personalizing the motion detection trigger event point threshold values, a significant improvement could be reached in the completeness and relevance of the captured content and in optimizing the use of the wearable device storage capacity. For example, the magnitude and frequency of the position and tilt changes could significantly vary for similar event threads depending on low or on high values of the subject’s personality traits and states variables, such as openness, extraversion, negative emotions, anxiety, etc.

6.2.7 Improved Privacy and Security Impact
When using personality model driven CARPE solutions, much finer-grade and higher-fidelity privacy control can be specified and implemented than simply using a more or less static “privacy bit” [14]. Privacy policies can also passively evolve with the personality states and traits. For example, an intuitively obvious approach would be to passively stick the “privacy bit” to content fragments that tend to raise the experiencing subject’s anxiety level. Active, fine-grained privacy control definition could be feasible by the experience subjects explicitly specifying privacy motivated access control policies in terms of their passively derived personality states and transitions.

7. A FUNCTIONAL MODEL
The use of personality models in thread formation is aimed at releasing the constraints on the prior CARPE efforts treating the event threads as a personality-agnostic information repository. A personality model represents a cluster of similar human personalities. The most specific personality model represents the personality of a single subject at a given moment of time. Such personality models are built for the purpose of tuning thread formation to subjective personal experiences. An iterative approach of developing the personality model containing the most pertinent personality traits and states components for improving the thread formation performance is illustrated on Figure 3. It starts out with a “blank” personality model template that is common to all persons. This Generic Personality Model (GPM) template can then subsequently be customized based on apriori known external factors, such as the DNA, social environment and prior experience. The resulting Static Customized Personality Model (SCPM) templates evolve into the subject’s Current Customized Personality Models (CCPM) as a secondary effect of using them for shaping the experience threads from the raw event logs.

Figure 3. Personality Model - Assisted Thread Formation

The Raw Event Collection (RAC) module is connected to the real-world devices that input the raw event content into the system. This module will integrate the content from multiple device sources with a synchronized encoding and annotated with real-life meta-data such as the subject ID, time and date stamp and if known, with information identifying and describing the objectives and the circumstances of the session of the content collection. The resulting integrated content stream is fed into the Thread Formation Engine (TFE). The TFE is controlled by two sources: by the static Personality Agnostic Thread Formation Policy (PATFP) and by the iteratively refined Thread Formation Control by Personalities (TFCP). The TFE is producing the experience event threads, which is the resulting repository of the captured
experiences. But in some cases, the new experiences may imply changes in the personality models, which are either real changes in the personality or just changes in the available information on the personality that was captured in the CCPM. Such inferences are made in the Personality Change Control (CCPM) module to update the CCPM.

7.1 Application Scenarios and Benefits
A battlefield example of using such functional model could be an explosion in the event thread that is detected by sound and light effects pattern recognition in the TFE. The accompanying stress level change is measured by voice analysis and heart rate wearable sensors. Given the knowledge of how much battlefield experience the person already had and using highly abstracted personality models including personality traits and states, this stress level change can be used in the PCC to conclude that certain adjustments are needed in the CCPM personality traits and states along the axis of neuroticism vs. stability [1]. In other words, the log thread development here may trigger some changes in the personality model. The personality traits and states, in combination with others such as extraversion vs. introversion [1], [11], [12], will then be used, if relevant in the TFCM module to aid the TFE in calibrating the determination of new event thread starts. More complete personality trait impact integration was shown in Section 5.

Because the enabled, future applications will let the users gain a better understanding of the subject’s personality traits, behaviors and the ways and probabilities of changing those, the personality model assisted platform could enable the localization of the needed changes in the personality aspects by customizing the built-in personality models with minimum impact on the rest of the system. The use of more complete personality models may also lend new personalization features that otherwise would not have been emerged in the software analysis and design phase.

8. EVOLVING PERSONALIZATION
The MyLifeBits [6] companion, wearable capturing device SenseCAM utilized sensory trigger conditions to turn the capturing and archiving functions into passive processes. This was a major qualitative improvement to the original MEMEX vision which assumed manual i.e. active capturing process.

<table>
<thead>
<tr>
<th>Passive</th>
<th>Personality Profiling</th>
<th>Personality Model Driven CARPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personality Modeling</td>
<td>MEMEX</td>
<td>SenseCam-MyLifeBits</td>
</tr>
<tr>
<td>Active</td>
<td>Capturing</td>
<td>Passive</td>
</tr>
</tbody>
</table>

Figure 4. Passive vs. Active Capturing & Personalization

The most recent and advanced efforts in formalizing the personality models [12] still describe methods of collecting personality data using manual means. Keeping the overall process passive, even when using a personality assisted thread formation will cause a major challenge, although there is a rapid progress in developing passive personalization technologies both in research [3], [8] and in commerce [9]. Starting a personality assisted thread formation experimentation with a fully automated thread formation execution platform would introduce unreasonable risk factors due to the fundamental unknowns both in the thread formation and in the personality impact areas. Therefore initially, applying human expertise for manual thread formation with an understanding of the implications of the underlying personality traits is needed to move up gradually from the personality-agnostic context. These manually applied personality context heuristics could be programmatically utilized in subsequent versions of the thread formation policies.

9. MODELING TECHNOLOGIES
The personality model driven thread formation approach is based on a view that human personalities can be analyzed, modeled and captured by existing, conventional software analysis and design methods. The Unified Modeling Language (UML) is currently the most commonly used such method. The first real application attempts will clarify to what extent should the personality models be “crisp” UML models. Later, these first crisp models will be further refined into “Soft UML”, i.e. fuzzy and/or probabilistic models in order to explore the magnitude of the resulting thread formation performance improvements.

Personality profiling using Bayesian nets [3], Markovian models [18] and neural nets is in widespread use to derive domain-specific personality classifications based on data mining. In commercial products, these are mostly utilized in Customer Relationship Management (CRM) solutions. The CRM domain is however different from processing live experience content logs and represent the needs of specific vertical enterprise functions, such as sales, marketing, etc.

9.1 White-Box / Black-Box Models
When building models for personality traits and states [12], the model can either view the internal states and transitions as an individual cognitive architecture (white-box) or as a declarative profile (black-box). Table 1 illustrates an example of the white-box approach. Using another black-box approach in [8], tracking daily schedules, locations and people connections can also provide valuable contextual cues to aid media semantics for experience thread formation.

9.2 A Social Interaction Analysis Approach
Here we review another sample scenario to analyze how the personality driven CARPE thread formation reacts to video scene changes depending on the differences in personality traits. At this time, we select a scenario that has already been analyzed and addressed before in [12] by building formalized cognitive architecture based personality models for the purpose of simulating organizational impact. The modeled organizations happened to be peacekeeping units in [12]. Since the captured content in CARPE is simply a – perhaps partial - representation of fragments of interactions between the human subject and the environment such as an organization, it is reasonable to anticipate for us to be able to mold the CARPE thread formation impact model into the cognitive organizational interaction model.
Table 1 illustrates how we capitalize on this analogy and how already existing cognitive architecture models for organizational simulations can be enhanced (shown in italics) to support CARPE solutions for implementing personality-specific, improved fidelity experience event thread-formation.

<table>
<thead>
<tr>
<th>CA Module / CARPE TFE Action</th>
<th>Normal Personality State Effect</th>
<th>Anxious Personality State Effect</th>
<th>CA Module Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention / TFE Scene Change Detection</td>
<td>Hostile large crowd</td>
<td>Hostile large crowd</td>
<td>Limited # high threat self cues / detect TFE</td>
</tr>
<tr>
<td>Perception / Situation Assessment</td>
<td>Danger to unit and to self low</td>
<td>Danger to unit and to self high</td>
<td>Perceptual threat and self bias</td>
</tr>
<tr>
<td>Expectation Generation</td>
<td>Danger from crowd unlikely</td>
<td>Danger high + Career success threatened</td>
<td>Threat and self oriented expectations</td>
</tr>
<tr>
<td>Affect Appraisal</td>
<td>Anxiety Normal</td>
<td>Anxiety high</td>
<td>Rapid on-set of high anxiety</td>
</tr>
<tr>
<td>TFE PM State Impact</td>
<td>No state impact</td>
<td>Elevated Anxiety State</td>
<td>TFE -&gt; PCC</td>
</tr>
<tr>
<td>Goal Selection</td>
<td>Psychology Operation situation</td>
<td>Reduce anxiety &amp; Defend unit</td>
<td>Threat and self focus goals</td>
</tr>
<tr>
<td>TFE PM Trait Impact</td>
<td>No trait impact</td>
<td>Contextual Perm Anxiety</td>
<td>TFE -&gt; PCC</td>
</tr>
<tr>
<td>TFE Decision</td>
<td>Scene change out of thread</td>
<td>Scene change within thread</td>
<td>TFE -&gt; Event Thread Repository</td>
</tr>
</tbody>
</table>

Table 1. Cognitive Architecture (CA) Use for Interaction Analysis and Experience Event Content Thread Formation

Depending on the personality state along the axis of Normal<-High-Anxiety and the personality trait along the Stability vs. Neuroticism, the cognitive architecture may come to a conclusion of reporting high danger alert from a newly formed crowd or ignoring the crowd formation. From the CARPE thread formation point of view, sending the same scene change-detection message to the thread formation engine (TFE) may also result in two different conclusions: the scene change detection does not imply the start of a new experience event thread, or it does, depending on the results of the affect appraisal module. Naturally, personality traits and states other than traits along axis of Neuroticism vs. Stability also will play a significant role in the inferences to classify new scene detection. Another typical personality trait is the Introversion vs. Extraversion, which is also very much likely to influence the dominance of the underlying vs. external motivations for a new scene selection.

9.2.1 Degree of Awareness

The personality modeling approaches for social interaction purposes also include a Feeling Of Confidence (FOC) factor [12] that can also been derived from observations and it can also have a significant impact on making decisions on how to interact within the organization. From the CARPE point of view, a Degree Of Awareness (DOA) factor should be very relevant, that could qualify a content fragment in terms of the subject’s awareness of that piece of content at the time of capturing it. For example, when a 360 degrees camera is mounted on a hat, the DOA value in front of the subject is close to 1 while at the back of the person is close to zero. The DOA value of the captured sound content is decreasing with increased distance from the source of the sound. Similarly, semantical proximity could also be quantified in the DOA knowing the subject’s interests, knowledge space and situational context.

![Figure 5. Degree Of Awareness Correlated with Feeling Of Confidence](image)

The DOA factor as media metadata characteristics could be very valuable at retrieval, in questions such as: “What was this XYZ aspect of my experience that I noticed at that time but I just can not recall it any more?” Or just the opposite: “Was anything else very relevant and potentially important there that I could not notice?”

Another valuable tool could be the correlation between these two factors: with increasing FOC the DOA of in-the-thread content is increasing while the out-of-thread content is decreasing, as shown on Figure 5.

10. EVALUATION PROCEDURES

For quantifying the impact of using personality models, it is necessary to measure the scope and the extent of performance improvements gained from the interaction between the development of he CARPE threads and the changes in the personality models. The thread formation performance can be measured by replaying the resulting CARPE event thread to the live subject and by asking her/him to determine, 1) if this is what happened, indeed, 2) what’s missing and 3) what out-of-thread content got included that has no use. In order to answer these questions, formalized questionnaires can be presented to the subjects that are tailored to the use case scenario. The thread formation engine performance is then evaluated by comparing the thread formation success across the following configurations:

- a) with no personality model impact, this is the personality-agnostic CARPE thread formation;
b) impact by the generic personality model, or GPM;

c) impact by the SCPM Static Customized Personality Model;

d) with the on-going two-way interactions between CCPM personality model and the Thread Formation Engine module.

11. CONCLUSIONS
A personality model-assisted thread formation is based on probing and maintaining “personality models” to perform contextual inferences for enabling improved identification and extraction of key information content from multiple raw multimedia input streams. In this way, improvements can be made to CARPE applications by modeling the experience subject’s personalities, partially deriving modifications to the models from the experience content and using the updated personality models for improving the structure of the archived experience threads. Progress in the area of personality psychology related formal modeling and data mining efforts could enable the use of generic and domain-specific personality traits and states models for developing such improvements to CARPE. In addition, the use of CARPE-enhanced personality models would also open-up a new application space in addition to the current personality profiling opportunities.

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13. REFERENCES