

NON-INTRUSIVE PSYCHO-SOCIAL STATE DETECTION: RESULTS FROM BED REST JOURNALSC.A. Miller¹, S.Schmer-Galunder¹, Tammy Ott¹, P.Wu¹ and J.M. Rye¹¹{cmiller, sgalunder, tott, pwu, jrye}@sift.net

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ABSTRACT

Our research is developing automated verbal-processing techniques to assess individual and team psycho-social states non-intrusively, from existing textual (or speech converted to text) data streams captured as a part of normal space operations. We have been looking at both individual journal data and interactive task dialogs to provide assess different states. The data reported here focuses on journal analyses to assess individual emotions and attitudes.

In our first year, we tested various analysis techniques [1-3] using historical and publicly available astronaut journals [4-5] and showed individual and temporal variations, but we had no independent data about the writers' emotional states for validation. Hence, this second year has focused on (1) verification of our automated text processing metrics, and (2) on using those metrics to produce relevant data about psycho-social states. We are participating in multiple studies, but chiefly the Bed Rest Study Campaign 11 conducted at the Flight Analog Research Unit at UTMB. During this ~100 day bed rest trial, we had participants spend ~20 minutes each day providing a free-form journal entry and completing a short survey about their attitudes to serve as "ground truth" for our automated analyses. Journaling has a long history in exploration environments, has known psychological benefits [6] and private journals have been a valuable source of individual psychological state data for astronauts [7], albeit with labor-intensive human review of the entries, while public journals have long been used for NASA publicity purposes [4-5].

We have analyzed journal data from 12 subjects (852 entries) to date using variations on Pennebaker's Linguistic Inquiry and Word Count [2] and Latent Semantic Analysis [3] to identify affect, temporal focus, team vs. individual focus, and sentiment correlations with various topics (e.g., food, physical state, the study). Specific survey question correlations are consistently significant indicating the potential to substitute journal keeping for surveys:

- Use of Negative Emotion terms predict Negative Emotion survey responses on PANAS,
- Verb tense usages predict reported subjective focus—past, present and future,
- Use of terms associated with the study predict positive attitude toward the study on survey questions
- Use of terms associated with physical and body state predict negative assessment of own physical state
- Use of "we" predicts "self" focus ratings; use of "you" predicts "other" focus ratings

Automated journal analysis has benefits beyond substituting for surveys, however. Simple topic term detection provides a general assessment of what's "on the mind" of the writer. Our analyses show reductions in emotion and perceptual terms throughout subjects' stay—implying attentional narrowing and loss of interest in surroundings. Cross-correlation of word category use and sentiment/valence is providing insight into *why* a writer is feeling the way they do about a topic. We have found evidence suggesting that though most participants feel strongly about food, they do so for different reasons; some associating it with physical concerns (e.g., weight gain/loss), some with nostalgic memories and/or family, etc. Finally, comparing correlations between automated journal analyses with subjects' own ratings vs. subject ratings provided by staff, we have preliminary evidence that journal analysis may be more accurate than even opinions formed by team members in daily close contact with the subjects.

The speed and ease with which automated techniques permit analyses of this rich source of data makes it possible to analyze many sources of data, and to create novel analytic techniques to answer specific questions of interest. We will illustrate this claim via statistics on our analysis time, through sample results from a second study involving a long duration habitat study (HI SEAS) and through a companion paper reporting a novel set of analyses examining bed rest participants' attitudes about exercise.

REFERENCES

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