Goals, Personality, and Conversational Style

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Personality and Cognition

People often behave quite differently – especially in their style of interaction – in similar circumstances.

We often attribute these behavioral differences to distinctions in their *personalities*.

This raises an important and interesting scientific question:

- *How does personality relate to cognition?*

Psychology has long considered personality to be a legitimate scientific endeavor.

But little research in the area has made contact with results on high-level cognition.

Personality-Related Phenomena

We will focus here on four main phenomena; there is general agreement that human personality:

- *Varies across people*, who differ in the behavioral styles

- *Remains stable over time*, changing slowly if at all

- *Can influence behavior globally*, across many situations

- Affects both *coarse-gained and fine-grained behavior*

The psychological literature on personality reports many other findings, but these issues are more fundamental.

Frameworks for Personality

The mainstream literature has championed two quite different accounts of personality:

- Some psychological theories explain personality in behaviorist terms, treating it as a set of *stimulus-response pairs*.

- Other theories instead posit a set of fixed personality *traits* that influence behavior.

Trait theories have been adopted in most AI work on synthetic characters, but it provides only a shallow account.

Neither incorporates ideas from studies of high-level cognition.

An Influential Trait Theory

Digman's (1990) *five factor theory* of personality proposes five high-level traits:

- *Openness*. Tendency to appreciate new and varied experiences.
- *Conscientiousness*. Tendency to exhibit self discipline and planned behavior.
- *Extraversion*. Tendency to be stimulated in others' presence.
- *Agreeableness*.Tendency to be compassionate and cooperative toward others.
- *Neuroticism*. Tendency to experience unpleasant emotions like anger and anxiety.

These traits appear to describe personality differences in many cultures. An older theory (Catell, 1947) posited 16 distinct traits.

Aspects of Personality

We view many aspects of personality as central enough to name.

Friendly	Distant	Organized	Careless
Caring	Unconcerned	Thoughtful	Thoughtless
Selfless	Selfish	Giving	Greedy
Persistent	Relenting	Stubborn	Compromising
Judgmental	Forgiving	Relaxed	Tense
Loyal	Disloyal	Reliable	Unreliable
Energetic	Lazy	Confident	Timid
Brave	Cowardly	Open minded	Dogmatic

Even this partial list suggests that trait theories are unlikely to cover observed variations.

This also suggests a major *cognitive* component to personality.

Conversational Styles

Personality is often reflected in people's conversational styles.

We even have adjectives for different ways of saying things.

Inform	Complimentary	Insulting	Condescending
Propose	Polite	Authoritative	Demeaning
Question	Deferential	Demanding	Impertinent
Acknowledge	Appreciative	Nonchalant	Flippant
Accept	Agreeable	Ingratiating	Insubordinate
Reject	Apologetic	Combative	Offended

Some individuals regularly converse in these specialized ways.

A complete theory of personality would account for differences in conversational style.

Examples of Conversational Style

People can communicate very similar content in quite different conversational styles.

Consider a nonsmoker who encounters a smoker in an elevator:

- *Would you mind not smoking in the elevator?*

- *You know, smoking in the elevator isn't allowed.*

- *You really can't smoke in the elevator.*

- *You can't smoke here. Please put your cigarette out.*

- *Put that cigarette out now or I'll do it!*

We associate these utterances with different personalities that take distinct approaches to interaction.

A Cognitive Systems Account

We propose an alternative theory of personality that emphasizes *knowledge* and includes four postulates:

- Personality is determined by *long-term cognitive structures*

- These structures are very *general* and *domain independent*

- The structures occur at *different levels of specificity*

- Personality structures exert a *metacognitive influence* on thinking and external activities

The first three concern representational issues and the fourth with processing, which we discuss in turn.

Cognitive Structures of Personality

Our theory assumes that differences in personality come from differences in *knowledge structures* that:

- Reside in *long-term memory* and so change slowly

- Are *modular* and *compositional* in character

- Specify *abstract relations*, often with respect to others

- Often refer to an agent's *goals* and *activities*

This implicates *rules* or similar cognitive structures as building blocks for personality.

We also postulate three forms of personality-related knowledge: *skills*, *concepts*, and *motives*.

Skills and Speech Acts

We assume knowledge about conditions and effects of activities are encoded in *skills*.

These may be domain specific or more abstract, with skills for *speech acts* being instances of the latter:

inform(S, L, C)
   conditions   *belief(S, C), belief(S, not(belief(L, C)))*
   action   **inform(S, L, C)*
   effects   *belief(S, inform(S, L, C)), belief(S, belief(L, C))*

Skills for speech acts are similar to STRIPS operators but focus on the conversing agents' mental states.

Skills for Specialized Speech Acts

We approach conversational style with skills for specialized speech acts, such as:

inform-expected(S, L, C)
conditions   *belief(S, C), belief(S, not(belief(L, C)))*
action   **inform-expected(S, L, C)*
effects   *belief(S, inform(S, L, C)), belief(S, belief(L, C)),*
                        belief(S, belief(L, expected(S, belief(L, C))))

Here a particular way of talking (e.g., Didn't you know that…?) conveys that S had expected L to believe C in advance.

The resulting literals often lead naturally to other inferences, say about the agents' *emotions*.

Emotional Concepts

Ortony et al. (1988) describe 22 configurations that describe the cognitive structure of emotions.

These patterns involve relations among an agent's goals, beliefs, and expectations, and to inferences about others' mental states.

We say someone is *disappointed* about an event if he wants an event, expected that event, and believes it did not occur.

> *disappointed(Agent, Event) :-*
> *goal(Agent, Event), expect(Agent, Event), belief(Agent, not(Event)).*

Such emotional concepts specify the abstract conditions under which emotional instances arise.

Specialized speech acts can indirectly produce such emotions.

Emotions and Personality

Emotions (or emotion *instances*) are transient; personalities are reasonably stable.

But the two clearly have a close relationship, in that personality depends on factors like:

- How easily one exhibits certain emotions
  - E.g., some people are easily angered, others are often happy
- How one responds to a given emotion
  - E.g., some raise their voices when angry, others are quiet

Personality traits are simply descriptions of these long-term relational structures, but how can we encode them?

Goals and Motives

We assume a third type of cognitive structure – *motives* – state the conditions under which top-level goals arise.

A person may want someone he respects to be proud of him:

 belief(A, respect(A, B)) => goal(A, belief(B, proud(B, A))) 5.5

Another person may have an 'eye for an eye' motive, so that if someone causes him disappointment, he wants to reciprocate:

 *belief(A, disappointed(A, E)), belief(A, cause(B, E)) =>
        goal(A, belief(B, disappointed(B, _))) 10.2*

Each motivational rule also specifies its goal's numeric priority.

Motives may conflict when they propose goals that, through inference, lead to other goals that are inconsistent.

Cognitive Processes for Personality

Our theory posits that processing involves a cognitive cycle of three main stages:

- Drawing inferences from working memory elements

  - Including emotional instances based on speech acts

- Using motives to activate / deactivate goal instances

  - Including goals to elicit emotions in other agents

- Selecting skills instances based on expected utilities

  - Taking into account values of goals an action would satisfy

Thus, behavior is guided by goal-oriented evaluation criteria, with different priorities for different personalities.

Personality and Metacognition

Metacognition (Cox, 2005) inspects traces of an agent's base-level cognition and modulates its operation.

Goal-driven accounts of personality clarify how such abstract processes can influence an agent's:

- physical behavior (e.g., tendency to flee or use force)

- cognitive processing (e.g., amount of planning before acting)

This suggests in turn the *personality metacognition hypothesis:*

- *Personality plays a metacognitive role that operates over and influences base-level cognition.*

But personality has even higher-level effects than emotions, as they inspect and modulate the latter.

Relation to Basic Phenomena

Recall our desire to explain four phenomena, that personality:

- Varies across people, who differ in the behavioral styles

  - *Due to different motives and associated priorities*

- Remains stable over time, changing slowly if at all

  - *Motives are stored as long-term memory structures*

- Can influence behavior globally, across many situations

  - *Motives are encoded as abstract, relational rules*

- Affects both coarse-gained and fine-grained behavior

  - *These rules can be more or less specific and detailed*

Our theory appears to handle each of these findings, albeit at an abstract level.

Related Research

We have borrowed ideas from a number of earlier efforts:

- Personalities as abstract prioritized goals (Rizzo et al., 1997)

  ✦ Different priorities lead to different behaviors

- Abstract operators for speech acts (Allen & Perrault, 1980)

  ✦ Specify relations among goals, beliefs, and intentions

- Appraisal accounts of emotion (Ortony et al., 1988)

  ✦ Abstract relations among goals, beliefs, and expectations

- Origin of top-level goals (Talamadupula et al., 2010; Choi, 2010)

  ✦ Conditional rules for generating specific goals

Our approach also bears many similarities to Evans' (2011) approach to personality in synthetic characters.

Plans for Future Work

We should explore a number of avenues in our future research:

- Extend framework to include hierarchical skills

- Support planning in addition to reactive execution

- Specify the details of speech-act generation

- Use motives to encode common personality terms

- Implement these ideas in a running system

- Demonstrate the system in conversational scenarios

Together, these will give a more complete theory of personality and conversational style.

Summary Remarks

In this talk, I reported a theory of personality and conversational style that includes:

- Cognitive structures that underlie personality, including:
  - *Skills* for specialized speech acts
  - *Conceptual rules* for emotions
  - *Motives* that specify when to adopt goals
- Cognitive processes that operate on the structures, including:
  - *Skill execution* based on expected utility
  - *Conceptual inference* of beliefs, including emotions
  - *Goal generation* based on current mental state

This theory builds on earlier ideas but combines them in novel ways to explain an understudied facet of intelligence.

End of Presentation