What’s Cool? - Collective Fashion-like Behavior Emerges from Neuro-psychological Conditioning

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ABSTRACT: We present an agent-based model of the emergence of fashion-like collective behavior, based on a simple abstraction of individuals neuro-psychological conditioning. Our results show that fashion-like collective behavior can emerge from social interaction and the working of individuals’ neuro-psychological mechanisms, within a wide range of plausible assumptions about the levels of social stratification within a population and cognitive inertia.
What do miniskirts, afro haircuts, and body tattoos have in common?

• They are all forms of body accessories that have had a characteristic fashion-like career. They emerge out of obscurity and spread through a population very fast, only to, shortly after they have reached their maximum popularity, vanish again from the cultural landscape, sometimes to surge again long after.

• Current Explanations:
  
  – Simmel Effect

  – Information cascades

  – Externalities

  – Decay of value

• Our Proposal: Individual Conditioning drives collective behavior
An agent-based model of fashion emergence (1)

Agent attributes:

\[ a_i = \langle q_i, t_i, v_i^0, v_i^1 \rangle. \]

Model pseudo-code:

```plaintext
repeat (T) {
    for all agent {
        update trait values;
        switch to most preferred trait;
    }
}
```
An agent-based model of fashion emergence (2)

Trait value update rules:

\[ v_i^1(t) = v_i^1(t-1) \cdot \alpha + \frac{1}{N} \sum_{a_j : a_j \in M_i \wedge t_j=1} q_j \cdot (1 - \alpha) \]

\[ v_i^0(t) = v_i^0(t-1) \cdot \alpha + \frac{1}{N} \sum_{a_j : a_j \in M_i \wedge t_j=0} q_j \cdot (1 - \alpha) \]

Parameter settings:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value(s)</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P )</td>
<td>population size</td>
<td>50</td>
<td>small sample</td>
</tr>
<tr>
<td>( N )</td>
<td>number of models</td>
<td>5</td>
<td>small</td>
</tr>
<tr>
<td>( E )</td>
<td>assortment</td>
<td>4</td>
<td>( r \approx 0.75 )</td>
</tr>
<tr>
<td>( \alpha )</td>
<td>1 - learning rate</td>
<td>0.2</td>
<td>fast learning</td>
</tr>
<tr>
<td>( \sigma )</td>
<td>standard deviation</td>
<td>2</td>
<td>cognitive or material</td>
</tr>
<tr>
<td>( D )</td>
<td>delay</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
Results (1)

Bit map of trait usage across time ($D = 4$):

Frequency of trait usage across time ($D = 4$):
Results (2) — Deterministic model

Bit map of trait usage across time \((D = 4)\) with deterministic selection of model:

Notes:

- Small deterministic neighborhood changes behavior of model

- Propagation of trait usage / avoidance is more regular

- General Caveat: Spatial analogies of social strata can bias results
Results (3) — Sensitivity Analyses

Bit map of trait usage across time ($D = 10$):

Bit map of trait usage across time ($D = 0$):
Conclusions and Future Work

- Fashion like collective behavior can emerge from individual conditioning

- Model is very sensitive to delay parameter $D$

- Complex networks of traits may have more complex dynamics

- Models with multi-valued trait may also have more complex dynamics