Bystander Effects in a Single-player, Anonymous Contest

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1 Introduction

- Performance improves when individuals in large groups differentiate into roles [3]
- Personalities and experience play a role in differentiation [4]
- For example, in collective movements:
  - **Bold** individuals generally **lead**
  - **Shy** individuals generally **follow**
- Our work shows that distinct personality types can emerge by experience alone [1]
- Faster distinct personality type emergence leads to higher overall success
- How can we improve emergence rate?
- Bystander effects can maximize an experience's impact
- **Bystanders** can observe a leader's success or failure and get experience

- Do bystander effects promote faster personality type emergence?

2 Materials and Methods

- Modified collective movement model to include personality [5, 2]
  - **Bold**: ⇑ Initiate, ⇓ Follow, ⇓ Cancel
  - **Shy**: ⇓ Initiate, ⇑ Follow, ⇑ Cancel
- All personalities were updated after an attempted movement

$$p_{t+1} = p_t(1-\lambda) + \lambda r \qquad (1)$$

- Bystander winner and loser effects may differ from true winner and loser effects (i.e., different λ values)
- Interactions are anonymous and individuals only update their own personality

3 Results

- Figure 1 shows a representative personality history for a baseline simulation without bystander effects
- Figures 2–8 show representative personality histories for simulations using bystander winner (BW) and bystander loser (BL) effects
- Percentages indicate strength of bystander λ relative initiator's λ
- Personality values:
  - 1.0 — Bold
  - 0.5 — Moderate
  - 0.0 — Shy

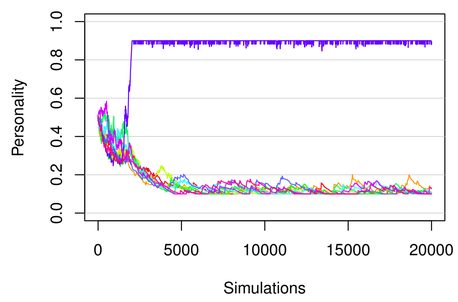

Figure 1: Baseline

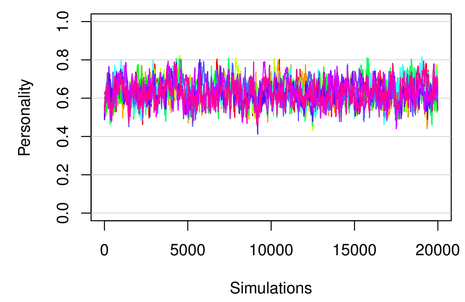

Figure 2: BW 100%, BL 100%

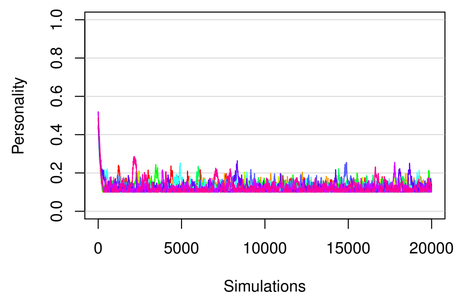

Figure 3: BW 100%

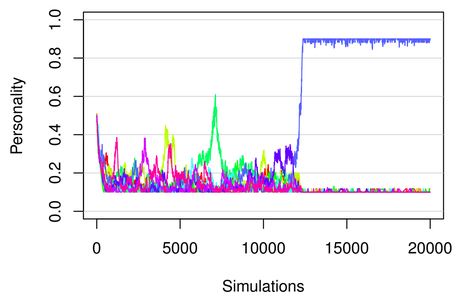

Figure 4: BW 50%

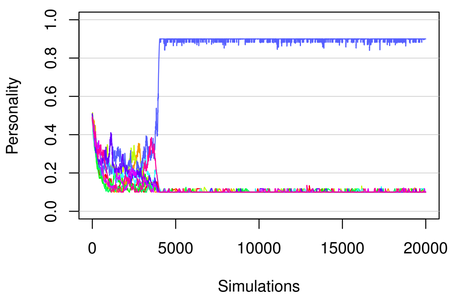

Figure 5: BW 25%

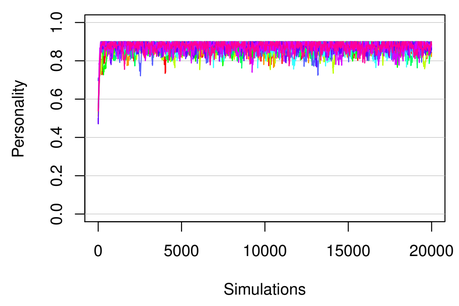

Figure 6: BL 100%

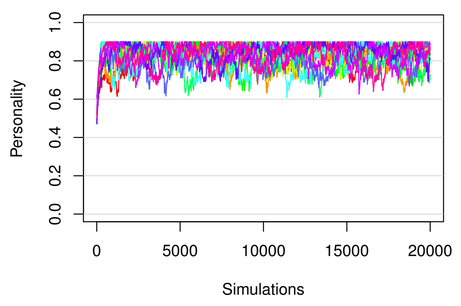

Figure 7: BL 50%

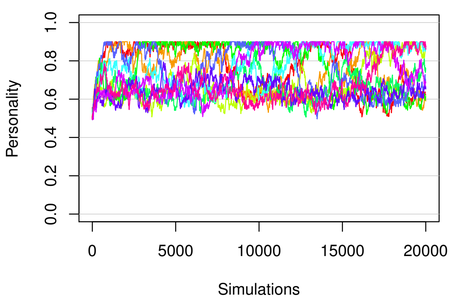

Figure 8: BL 25%

4 Discussion

- Strong bystander λ values inhibited distinct personalities from emerging
- BL effects were particularly detrimental
- Due to common failures and feedback loop
- With only BW effects did distinct personalities emerge
- High BW effects, require more simulations for emergence (KS test, $p < 0.01$)
- Only at BW 5% was there no significant difference with baseline simulations
- Bystander effects do not promote faster emergence of distinct personalities unless extremely weak

References

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