# An Epistemic Logic of Desire

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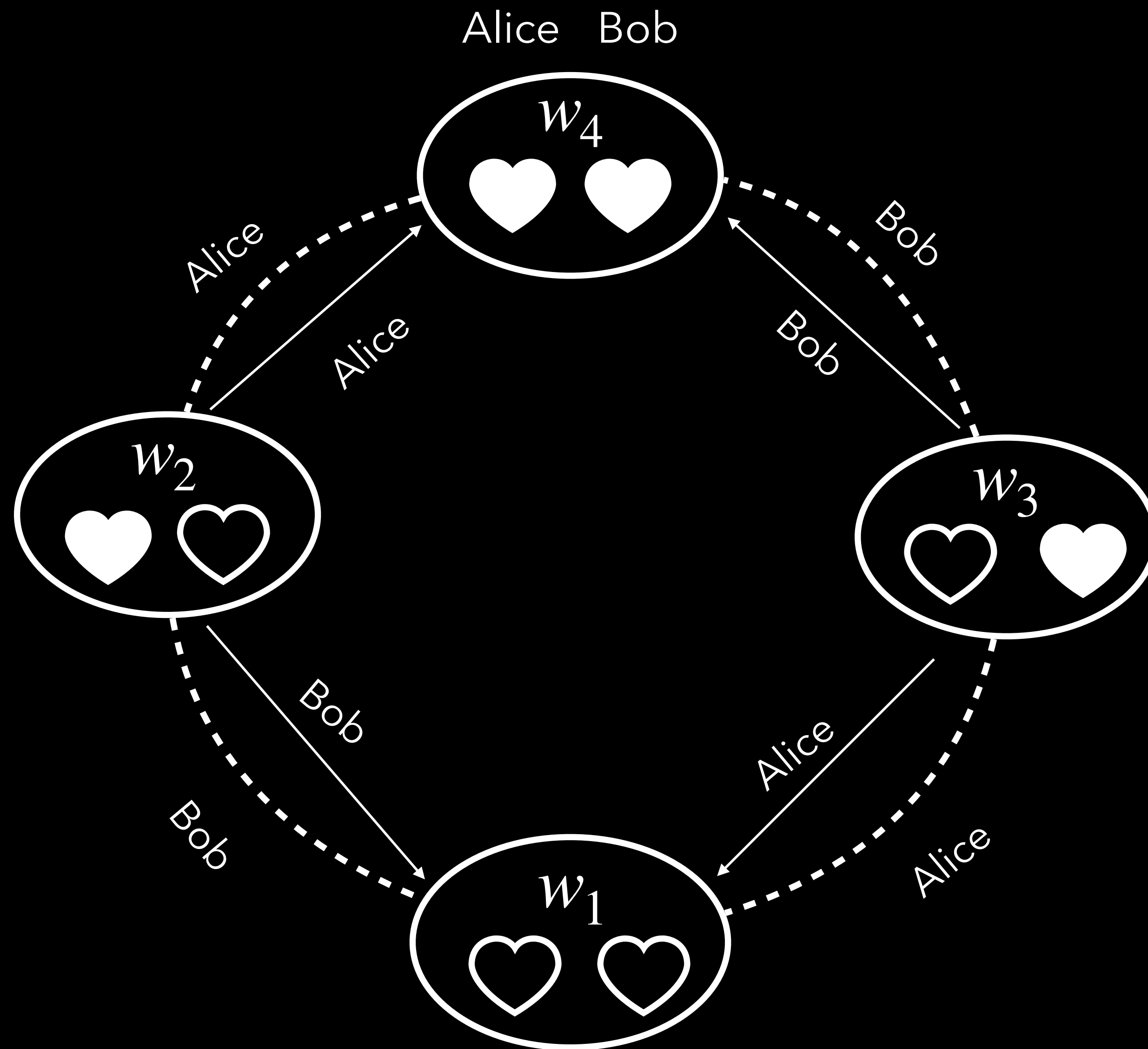


Pavel Naumov

# Main Results

Complete list of axioms describing desires, with a 'coherence' axiom representing the interplay between desire and knowledge.

Completeness and soundness of logical system.
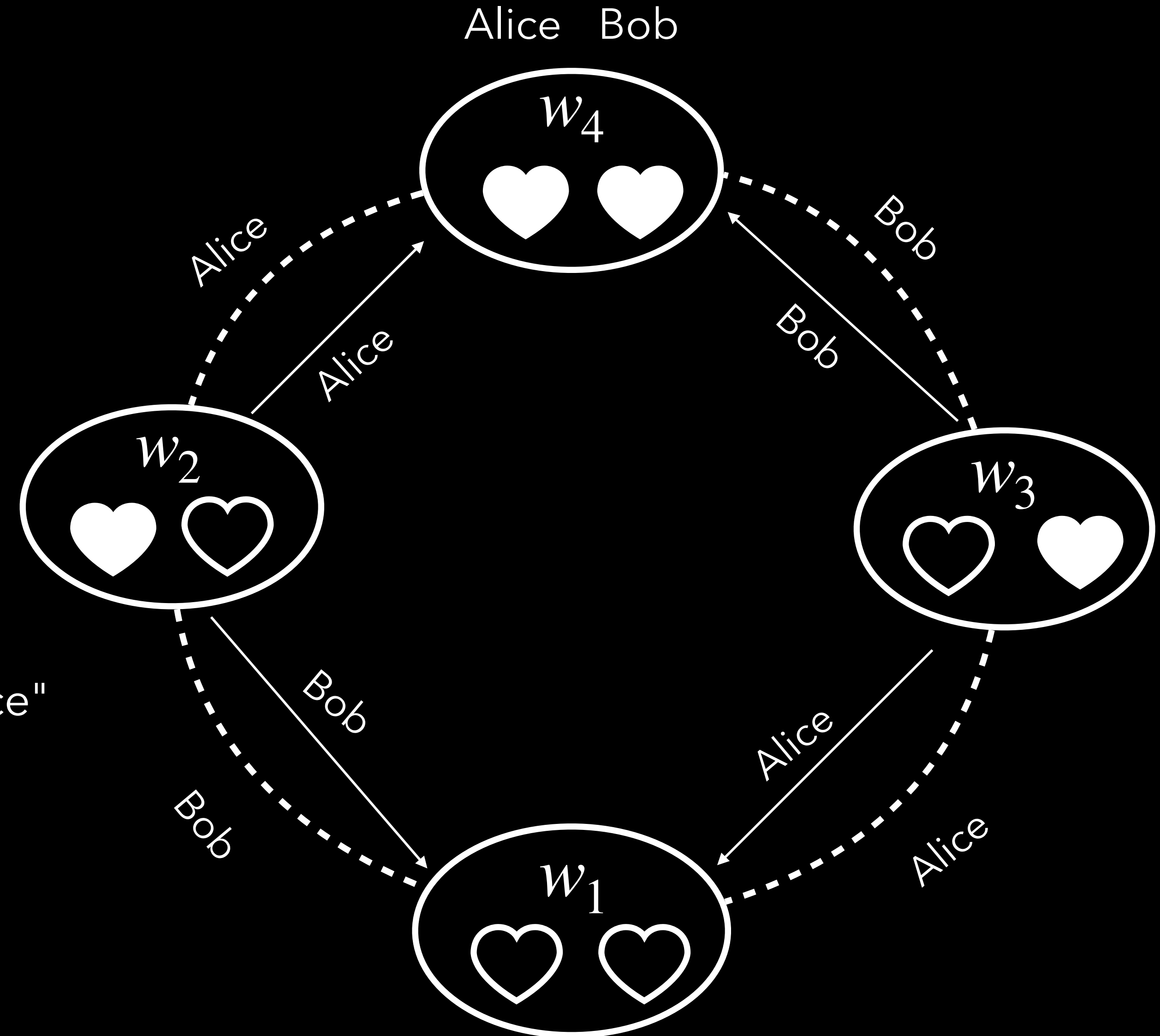
# Alice and Bob: Epistemic Model with Preferences

# Alice and Bob: Desires



$w_2 \vDash D_{\text{Alice}}$"Bob likes Alice"

$w_2 \vDash K_{\text{Alice}} D_{\text{Alice}}$"Bob likes Alice"

$w_3 \nvDash D_{\text{Alice}}$"Bob likes Alice"

$w_4 \vDash D_{\text{Bob}}$"Alice likes Bob" $\wedge D_{\text{Alice}}$"Bob likes Alice"

https://xkcd.com/177/

# Eve: Epistemic Model with Preferences

# Eve: Desires
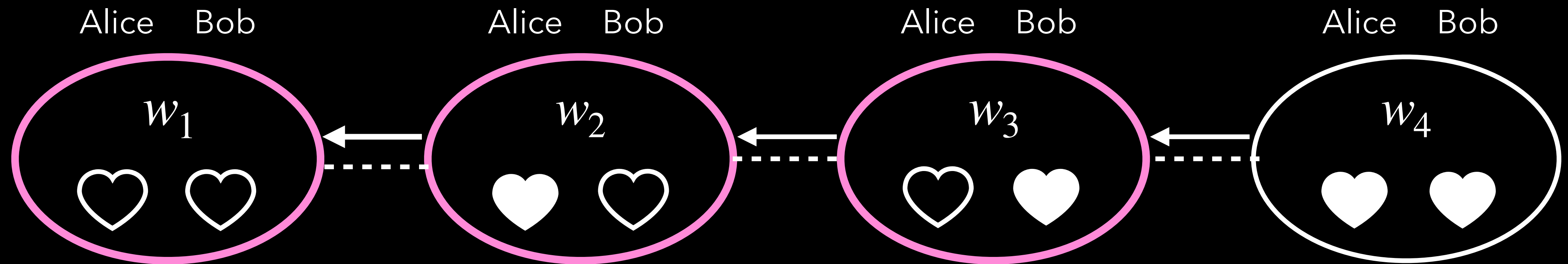


$w \vDash D_{\textbf{Eve}}$**"At least one of Bob and Alice is not in love with the other" for** $w \in \{w_1, w_2, w_3, w_4\}$

# Eve: Desires



$w \vDash D_{\mathsf{Eve}}$"At least one of Bob and Alice is not in love with the other" for $w \in \{w_1, w_2, w_3, w_4\}$

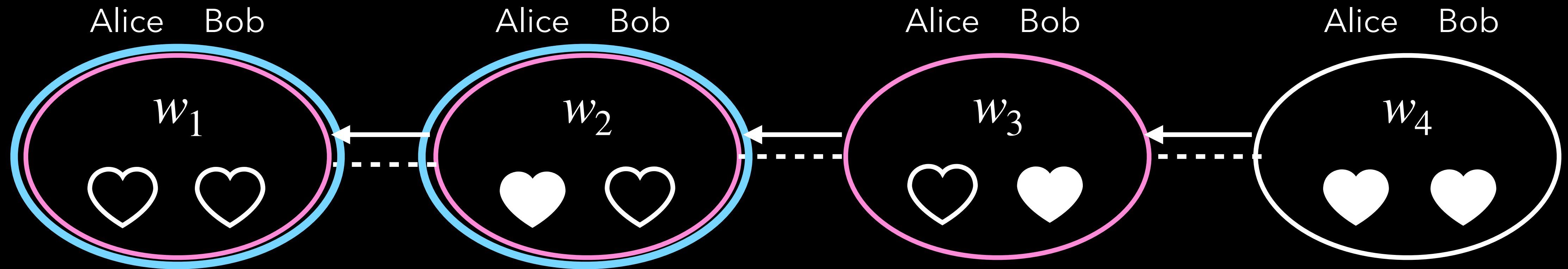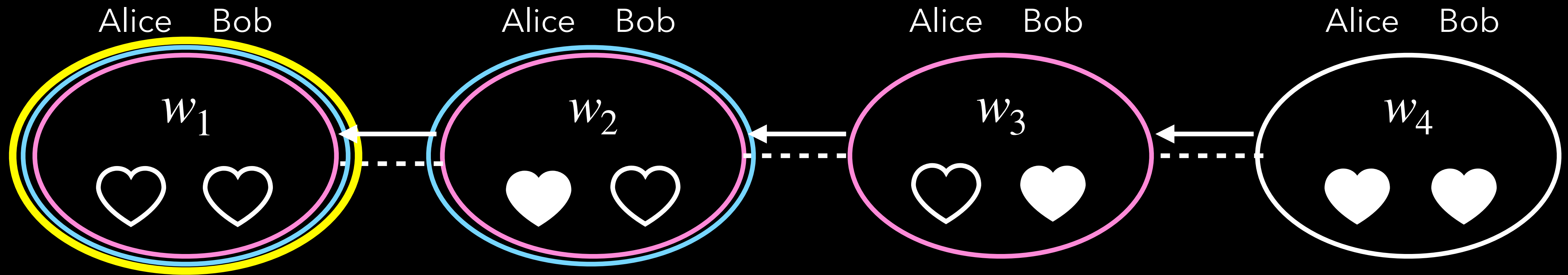$w \vDash D_{\mathbf{Eve}}$**"Bob is not in love with Alice" for** $w \in \{w_1, w_2, w_3, w_4\}$
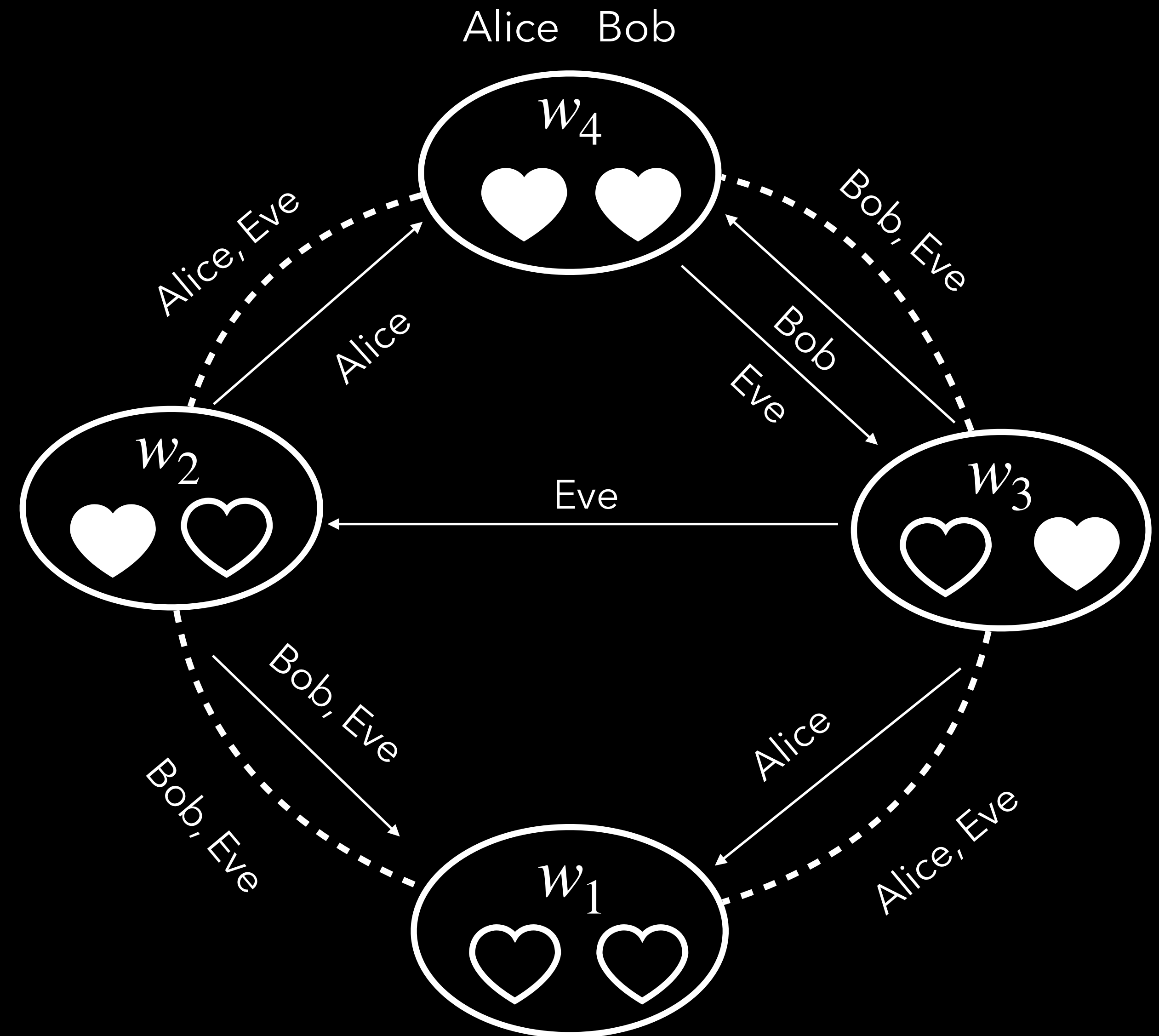
# Eve: Desires



$w \vDash D_{\mathsf{Eve}}$"At least one of Bob and Alice is not in love with the other" for $w \in \{w_1, w_2, w_3, w_4\}$

$w \vDash D_{\mathsf{Eve}}$"Bob is not in love with Alice" for $w \in \{w_1, w_2, w_3, w_4\}$

$w \vDash D_{\mathbf{Eve}}$**"Bob and Alice are not in love with each other" for** $w \in \{w_1, w_2, w_3, w_4\}$

# Everybody…

$w \Vdash D_{\mathsf{Eve}} D_{\mathsf{Bob}} D_{\mathsf{Alice}}$"Bob does not like Alice",
for $w \in \{w_1, w_2, w_3, w_4\}$.

# Model Limitations

Single-agent second-order desires cannot be expressed through the logical system.

An agent cannot have contradicting desires.

Thank you!

# Acknowledgements