

Comonadic Matter Meets Monadic Anti-Matter: An Adjoint Model of Bi-Intuitionistic Logic

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Abstract

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1 Introduction

TODO [?]

References



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$$\begin{array}{c}
 \frac{G, (w, w); \Theta \vdash w : Y}{G; \Theta \vdash w : Y} \text{I_RL} \qquad \frac{\frac{w_1 G w_2 \quad w_2 G w_3}{G, (w_1, w_3); \Theta \vdash w : Y}}{G; \Theta \vdash w : Y} \text{I_TS} \\
 \\
 \frac{}{G; \Theta, w : Y \vdash w : Y} \text{I_ID} \qquad \frac{\frac{w_1 G w_2}{G; \Theta, w_1 : X, w_2 : X \vdash w : Y}}{G; \Theta, w_1 : X \vdash w : Y} \text{I_ML} \\
 \\
 \frac{\frac{w_2 G w_1}{G; \Theta \vdash w_2 : Y}}{G; \Theta \vdash w_1 : Y} \text{I_MR} \qquad \frac{G; \Theta \vdash w : Y}{G; \Theta, w : \top \vdash w : Y} \text{I_TL} \qquad \frac{}{G; \Theta \vdash w : \top} \text{I_TR} \\
 \\
 \frac{G; \Theta, w_1 : X, w_1 : Y \vdash w_2 : Z}{G; \Theta, w_1 : X \wedge Y \vdash w_2 : Z} \text{I_AL} \qquad \frac{G; \Theta \vdash w : X \quad G; \Theta \vdash w : Y}{G; \Theta \vdash w : X \wedge Y} \text{I_AR} \\
 \\
 \frac{\frac{w_1 G w_2}{G; \Theta \vdash w_2 : X} \quad G; \Theta, w_2 : Y \vdash w : Z}{G; \Theta, w_1 : X \rightarrow Y \vdash w : Z} \text{I_IL} \\
 \\
 \frac{\frac{w_2 \notin |G|, |\Theta|}{G, (w_1, w_2); \Theta, w_2 : X \vdash w_2 : Y}}{G; \Theta \vdash w_1 : X \rightarrow Y} \text{I_IR} \qquad \frac{G; \Theta \vdash w : X \quad G; \Theta, w : X \vdash w : Z}{G; \Theta \vdash w : Z} \text{I_CUT}
 \end{array}$$

■ **Figure 1** Intuitionistic Fragment of L

$$\begin{array}{c}
\frac{G, (w, w); w : S \vdash_C \Psi}{G; w : S \vdash_C \Psi} \quad \text{C_RL} \qquad \frac{w_1 G w_2 \quad w_2 G w_3}{G, (w_1, w_3); w : S \vdash_C \Psi} \quad \text{C_TS} \\
\\
\frac{}{G; w : S \vdash_C w : S, \Psi} \quad \text{C_ID} \qquad \frac{w_1 G w_2}{G; w_2 : S \vdash_C \Psi} \quad \text{C_ML} \\
\\
\frac{w_2 G w_1}{G; w : S \vdash_C w_2 : T, w_1 : T, \Psi} \quad \text{C_MR} \qquad \frac{}{G; w : \perp \vdash_C \Psi} \quad \text{C_fL} \\
\\
\frac{G; w : S \vdash_C \Psi}{G; w : S \vdash_C w : \perp, \Psi} \quad \text{C_fR} \qquad \frac{G; w : S \vdash_C \Psi \quad G; w : T \vdash_C \Psi}{G; w : S \vee T \vdash_C \Psi} \quad \text{C_dL} \\
\\
\frac{G; w : R \vdash_C w : S, w : T, \Psi}{G; w : R \vdash_C w : S \vee T, \Psi} \quad \text{C_dR} \qquad \frac{w_2 \notin |G|, |\Psi|}{G, (w_2, w_1); w_2 : S \vdash_C w_2 : T, \Psi} \quad \text{C_sL} \\
\\
\frac{w_2 G w_1}{G; w : R \vdash_C w_2 : S, \Psi} \quad \frac{G; w_2 : T \vdash_C \Psi}{G; w : R \vdash_C w_1 : S - T, \Psi} \quad \text{C_sR} \\
\\
\frac{G; w : S \vdash_C w : T, \Psi \quad G; w : T \vdash_C \Psi}{G; w : S \vdash_C \Psi} \quad \text{C_cut}
\end{array}$$

■ **Figure 2** Co-intuitionistic Fragment of L

$$\begin{array}{c}
 \frac{G, (w, w); \Gamma \vdash_L \Delta}{G; \Gamma \vdash_L \Delta} \text{RL} \qquad \frac{w_1 G w_2 \quad w_2 G w_3}{G, (w_1, w_3); \Gamma \vdash_L \Delta} \text{TS} \\
 \\
 \frac{G; \Gamma \vdash_L w : A, \Delta \quad G; \Gamma, w : A \vdash_L \Delta}{G; \Gamma \vdash_L \Delta} \text{CUT} \qquad \frac{}{G; \Gamma, w : A \vdash_L w : A, \Delta} \text{ID} \\
 \\
 \frac{w_1 G w_2}{G; \Gamma, w_1 : A, w_2 : A \vdash_L \Delta} \text{ML} \qquad \frac{w_2 G w_1}{G; \Gamma \vdash_L w_2 : A, w_1 : A, \Delta} \text{MR} \\
 \\
 \frac{G; \Gamma \vdash_L \Delta}{G; \Gamma, w : \top \vdash_L \Delta} \text{TL} \qquad \frac{}{G; \Gamma \vdash_L w : \top, \Delta} \text{TR} \qquad \frac{}{G; \Gamma, w : \perp \vdash_L \Delta} \text{FL} \\
 \\
 \frac{G; \Gamma \vdash_L \Delta}{G; \Gamma \vdash_L w : \perp, \Delta} \text{FR} \qquad \frac{G; \Gamma, w : A, w : B \vdash_L \Delta}{G; \Gamma, w : A \wedge B \vdash_L \Delta} \text{AL} \\
 \\
 \frac{G; \Gamma \vdash_L w : A, \Delta \quad G; \Gamma \vdash_L w : B, \Delta}{G; \Gamma \vdash_L w : A \wedge B, \Delta} \text{AR} \\
 \\
 \frac{G; \Gamma, w : A \vdash_L \Delta \quad G; \Gamma, w : B \vdash_L \Delta}{G; \Gamma, w : A \vee B \vdash_L \Delta} \text{DL} \qquad \frac{G; \Gamma \vdash_L w : A, w : B, \Delta}{G; \Gamma \vdash_L w : A \vee B, \Delta} \text{DR} \\
 \\
 \frac{w_1 G w_2}{G; \Gamma \vdash_L w_2 : A, \Delta \quad G; \Gamma, w_2 : B \vdash_L \Delta} \text{IL} \qquad \frac{w_2 \notin |G|, |\Gamma|, |\Delta|}{G, (w_1, w_2); \Gamma, w_2 : A \vdash_L w_2 : B, \Delta} \text{IR} \\
 \\
 \frac{w_2 \notin |G|, |\Gamma|, |\Delta|}{G, (w_2, w_1); \Gamma, w_2 : A \vdash_L w_2 : B, \Delta} \text{SL} \qquad \frac{w_2 G w_1}{G; \Gamma \vdash_L w_2 : A, \Delta \quad G; \Gamma, w_2 : B \vdash_L \Delta} \text{SR} \\
 \\
 \frac{}{G; \Gamma, w_1 : A - B \vdash_L \Delta} \text{S} \qquad \frac{}{G; \Gamma \vdash_L w_1 : A - B, \Delta} \text{S}
 \end{array}$$

■ **Figure 3** Inference Rules for L