

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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$$\begin{array}{c}
 \frac{G, (w, w); \Theta \vdash w : Y}{G; \Theta \vdash w : Y} \quad \text{I_RL} \qquad \frac{w_1 G w_2 \quad w_2 G w_3}{G, (w_1, w_3); \Theta \vdash w : Y} \quad \text{I_TS} \\
 \\
 \frac{}{G; w : Y \vdash w : Y} \quad \text{I_ID} \qquad \frac{G; \Theta \vdash w : Y}{G; \Theta, w : X \vdash w : Y} \quad \text{I_wk} \\
 \\
 \frac{G; \Theta, w : X, w : X \vdash w : Y}{G; \Theta, w : X \vdash w : Y} \quad \text{I_CR} \qquad \frac{w_1 G w_2}{G; \Theta, w_1 : X, w_2 : X \vdash w : Y} \quad \text{I_ML} \\
 \\
 \frac{w_2 G w_1}{G; \Theta \vdash w_2 : Y} \quad \text{I_MR} \qquad \frac{G; \Theta \vdash w : Y}{G; \Theta, w : \top \vdash w : Y} \quad \text{I_TL} \qquad \frac{}{G; \Theta \vdash w : \top} \quad \text{I_tR} \\
 \\
 \frac{G; \Theta, w_1 : X, w_1 : Y \vdash w_2 : Z}{G; \Theta, w_1 : X \times Y \vdash w_2 : Z} \quad \text{I_AL} \qquad \frac{G; \Theta_1 \vdash w : X \quad G; \Theta_2 \vdash w : Y}{G; \Theta_1, \Theta_2 \vdash w : X \times Y} \quad \text{I_AR} \\
 \\
 \frac{w_1 G w_2}{G; \Theta_2 \vdash w_2 : X} \quad \frac{G; \Theta_1, w_2 : Y \vdash w : Z}{G; \Theta_1, \Theta_2, w_1 : X \rightarrow Y \vdash w : Z} \quad \text{I_iL} \\
 \\
 \frac{w_2 \notin |G|, |\Theta|}{G, (w_1, w_2); \Theta, w_2 : X \vdash w_2 : Y} \quad \text{I_iR} \\
 \\
 \frac{G; \Theta_2 \vdash w : X \quad G; \Theta_1, w : X \vdash w : Z}{G; \Theta_1, \Theta_2 \vdash w : Z} \quad \text{I_cut}
 \end{array}$$

■ **Figure 1** Intuitionistic Fragment of L

$$\begin{array}{c}
\frac{G, (w, w); w : S \vdash_C \Psi}{G; w : S \vdash_C \Psi} \quad C_{\text{RL}} \qquad \frac{w_1 G w_2 \quad w_2 G w_3}{G, (w_1, w_3); w : S \vdash_C \Psi} \quad C_{\text{TS}} \\
\\
\frac{}{G; w : S \vdash_C w : S} \quad C_{\text{ID}} \qquad \frac{G; w : S \vdash_C \Psi}{G; w : S \vdash_C w : T, \Psi} \quad C_{\text{WK}} \\
\\
\frac{G; w : S \vdash_C w : T, w : T, \Psi}{G; w : S \vdash_C w : T, \Psi} \quad C_{\text{CR}} \qquad \frac{w_1 G w_2}{G; w_2 : S \vdash_C \Psi} \quad C_{\text{ML}} \\
\\
\frac{w_2 G w_1}{G; w : S \vdash_C w_2 : T, w_1 : T, \Psi} \quad C_{\text{MR}} \qquad \frac{}{G; w : \perp \vdash_C \Psi} \quad C_{\text{FL}} \\
\\
\frac{G; w : S \vdash_C \Psi}{G; w : S \vdash_C w : \perp, \Psi} \quad C_{\text{FR}} \qquad \frac{G; w : S \vdash_C \Psi_1 \quad G; w : T \vdash_C \Psi_2}{G; w : S + T \vdash_C \Psi_1, \Psi_2} \quad C_{\text{DL}} \\
\\
\frac{G; w : R \vdash_C w : S, w : T, \Psi}{G; w : R \vdash_C w : S + T, \Psi} \quad C_{\text{DR}} \qquad \frac{w_2 \notin |G|, |\Psi|}{G, (w_2, w_1); w_2 : S \vdash_C w_2 : T, \Psi} \quad C_{\text{sL}} \\
\\
\frac{w_2 G w_1}{G; w : R \vdash_C w_2 : S, \Psi_2} \quad \frac{G; w_2 : T \vdash_C \Psi_1}{G; w : R \vdash_C w_1 : S - T, \Psi_1, \Psi_2} \quad C_{\text{sR}} \\
\\
\frac{G; w : S \vdash_C w : T, \Psi_2 \quad G; w : T \vdash_C \Psi_1}{G; w : S \vdash_C \Psi_1, \Psi_2} \quad C_{\text{CUT}}
\end{array}$$

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

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

■ **Figure 3** Inference Rules for L