Representation of Java bytecode instructions in CoJaq

op code	Mnemonic and arguments	CoJaq translation	Supported in semantics?
50	aaload	I_Heap (HI_Get (Op_getarray AIKRef))	✓
83	aastore	I_Heap (HI_Put (Op_putarray AIKRef))	✓
1	aconst_null	I_Frame (FI_Stackop (SI_Const KRef (VRef null)))	✓
25	aload *var*	I_Frame (FI_Var (VI_Load KRef *var*))	✓
42	aload_0	I_Frame (FI_Var (VI_Load KRef var0))	✓
43	aload_1	I_Frame (FI_Var (VI_Load KRef var1))	✓
44	aload_2	I_Frame (FI_Var (VI_Load KRef var2))	✓
45	aload_3	I_Frame (FI_Var (VI_Load KRef var3))	✓
189	anewarray *tn*	I_Heap (HI_New (Op_newarray_ref *rt*))	✓
176	areturn	I_Return (Some KRef)	✓
190	arraylength	I_Heap (HI_Get Op_arr_length)	✓
58	astore *var*	I_Frame (FI_Var (VI_Store KRef *var*))	✓
75	astore_0	I_Frame (FI_Var (VI_Store KRef var0))	✓
76	astore_1	I_Frame (FI_Var (VI_Store KRef var1))	✓
77	astore_2	I_Frame (FI_Var (VI_Store KRef var2))	✓
78	astore_3	I_Frame (FI_Var (VI_Store KRef var3))	✓
191	athrow	I_Throw	✓
51	baload	I_Heap (HI_Get (Op_getarray AIKByteBool))	✓
84	bastore	I_Heap (HI_Put (Op_putarray AIKByteBool))	✓
16	bipush *i*	I_Frame (FI_Stackop (SI_Const KInt (VInt (INum.const *i*))))	✓
52	caload	I_Heap (HI_Get (Op_getarray AIKChar))	✓
85	castore	I_Heap (HI_Put (Op_putarray AIKChar))	✓
192	checkcast *tn*	I_Heap (HI_Get (Op_checkcast *rt*))	✓
144	d2f	I_Frame (FI_Stackop (SI_Cast KDouble CastOp_f))	✓
142	d2i	I_Frame (FI_Stackop (SI_Cast KDouble CastOp_i))	✓
143	d2l	I_Frame (FI_Stackop (SI_Cast KDouble CastOp_l))	✓
99	dadd	I_Frame (FI_Stackop (SI_Binop KDouble BinOp_add))	✓
49	daload	I_Heap (HI_Get (Op_getarray AIKDouble))	✓*
82	dastore	I_Heap (HI_Put (Op_putarray AIKDouble))	✓*
152	dcmpg	I_Frame (FI_Stackop (SI_Cmpi KDouble CmpiOp_cmpg))	✓
151	dcmpl	I_Frame (FI_Stackop (SI_Cmpi KDouble CmpiOp_cmpl))	✓

op code	Mnemonic and arguments	CoJaq translation	Supported in semantics?
14	dconst_0	I_Frame (FI_Stackop (SI_Const KDouble (VDouble (DNum.zero))))	✓
15	dconst_1	I_Frame (FI_Stackop (SI_Const KDouble (VDouble (DNum.one))))	✓
111	ddiv	I_Frame (FI_Stackop (SI_Binop KDouble BinOp_div))	✓
24	dload *var*	I_Frame (FI_Var (VI_Load KDouble *var*))	✓
38	dload_0	I_Frame (FI_Var (VI_Load KDouble var0))	✓
39	dload_1	I_Frame (FI_Var (VI_Load KDouble var1))	✓
40	dload_2	I_Frame (FI_Var (VI_Load KDouble var2))	✓
41	dload_3	I_Frame (FI_Var (VI_Load KDouble var3))	✓
107	dmul	I_Frame (FI_Stackop (SI_Binop KDouble BinOp_mul))	✓
119	dneg	I_Frame (FI_Stackop (SI_Unop KDouble UnOp_neg))	✓
115	drem	I_Frame (FI_Stackop (SI_Binop KDouble BinOp_rem))	✓
175	dreturn	I_Return (Some KDouble)	✓
57	dstore	I_Frame (FI_Var (VI_Store KDouble *var*))	✓
71	dstore_0	I_Frame (FI_Var (VI_Store KDouble var0))	✓
72	dstore_1	I_Frame (FI_Var (VI_Store KDouble var1))	✓
73	dstore_2	I_Frame (FI_Var (VI_Store KDouble var2))	✓
74	dstore_3	I_Frame (FI_Var (VI_Store KDouble var3))	✓
103	dsub	I_Frame (FI_Stackop (SI_Binop KDouble BinOp_sub))	✓
89	dup	I_Frame (FI_Stackop (SI_Generic Op_dup))	✓
90	dup_x1	I_Frame (FI_Stackop (SI_Generic Op_dup_x1))	✓
91	dup_x2	I_Frame (FI_Stackop (SI_Generic Op_dup_x2))	✓
92	dup2	I_Frame (FI_Stackop (SI_Generic Op_dup2))	✓
93	dup2_x1	I_Frame (FI_Stackop (SI_Generic Op_dup2_x1))	✓
94	dup2_x2	I_Frame (FI_Stackop (SI_Generic Op_dup2_x2))	✓
141	f2d	I_Frame (FI_Stackop (SI_Cast KFloat CastOp_d))	✓
139	f2i	I_Frame (FI_Stackop (SI_Cast KFloat CastOp_i))	✓
140	f2l	I_Frame (FI_Stackop (SI_Cast KFloat CastOp_d))	✓
98	fadd	I_Frame (FI_Stackop (SI_Binop KFloat BinOp_add))	✓
48	faload	I_Heap (HI_Get (Op_getarray AIKFloat))	✓
81	fastore	I_Heap (HI_Put (Op_putarray AIKFloat))	✓
150	fcmpg	I_Frame (FI_Stackop (SI_Cmpi KFloat CmpiOp_cmpg))	✓
149	fcmpl	I_Frame (FI_Stackop (SI_Cmpi KFloat CmpiOp_cmpl))	✓
11	fconst_0	I_Frame (FI_Stackop (SI_Const KFloat (VFloat (FNum.zero))))	✓
12	fconst_1	I_Frame (FI_Stackop (SI_Const KFloat (VFloat (FNum.one))))	✓

op code	Mnemonic and arguments	CoJaq translation	Supported in semantics?
13	fconst_2	I_Frame (FI_Stackop (SI_Const KFloat (VFloat (FNum.two))))	✓
110	fdiv	I_Frame (FI_Stackop (SI_Binop KFloat BinOp_div))	✓
23	fload var	I_Frame (FI_Var (VI_Load KFloat var))	✓
34	fload_0	I_Frame (FI_Var (VI_Load KFloat var0))	✓
35	fload_1	I_Frame (FI_Var (VI_Load KFloat var1))	✓
36	fload_2	I_Frame (FI_Var (VI_Load KFloat var2))	✓
37	fload_3	I_Frame (FI_Var (VI_Load KFloat var3))	✓
106	fmul	I_Frame (FI_Stackop (SI_Binop KFloat BinOp_mul))	✓
118	fneg	I_Frame (FI_Stackop (SI_Unop KFloat UnOp_neg))	✓
114	frem	I_Frame (FI_Stackop (SI_Binop KFloat BinOp_rem))	✓
174	freturn	I_Return (Some KFloat)	✓
56	fstore *var*	I_Frame (FI_Var (VI_Store KFloat *var*))	✓
67	fstore_0	I_Frame (FI_Var (VI_Store KFloat var0))	✓
68	fstore_1	I_Frame (FI_Var (VI_Store KFloat var1))	✓
69	fstore_2	I_Frame (FI_Var (VI_Store KFloat var2))	✓
70	fstore_3	I_Frame (FI_Var (VI_Store KFloat var3))	✓
102	fsub	I_Frame (FI_Stackop (SI_Binop KFloat BinOp_sub))	✓
180	getfield *cn fn*	I_Heap (HI_Get (Op_getfield *k cn fn*))	✓
178	getstatic *cn fn*	I_Heap (HI_Get (Op_getstatic *k cn fn*))	✓
167	goto *off*	I_Frame (FI_Cond (CI_Goto *off*))	✓
200	goto_w *off*	I_Frame (FI_Cond (CI_Goto *off*))	✓
145	i2b	I_Frame (FI_Stackop (SI_Cast KInt CastOp_b))	✓
146	i2c	I_Frame (FI_Stackop (SI_Cast KInt CastOp_c))	✓
135	i2d	I_Frame (FI_Stackop (SI_Cast KInt CastOp_d))	✓
134	i2f	I_Frame (FI_Stackop (SI_Cast KInt CastOp_f))	✓
133	i2l	I_Frame (FI_Stackop (SI_Cast KInt CastOp_l))	✓
147	i2s	I_Frame (FI_Stackop (SI_Cast KInt CastOp_s))	✓
96	iadd	I_Frame (FI_Stackop (SI_Binop KInt BinOp_add))	✓
46	iaload	I_Heap (HI_Get (Op_getarray AIKInt))	✓
126	iand	I_Frame (FI_Stackop (SI_Binop KInt BinOp_and))	✓
79	iastore	I_Heap (HI_Put (Op_putarray AIKInt))	✓
3	iconst_0	I_Frame (FI_Stackop (SI_Const KInt (VInt (INum.zero))))	✓
4	iconst_1	I_Frame (FI_Stackop (SI_Const KInt (VInt (INum.one))))	✓
5	iconst_2	I_Frame (FI_Stackop (SI_Const KInt (VInt (INum.const 2))))	✓
6	iconst_3	I_Frame (FI_Stackop (SI_Const KInt (VInt (INum.const 3))))	✓
7	iconst_4	I_Frame (FI_Stackop (SI_Const KInt (VInt (INum.const 4))))	✓

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8	iconst_5	I_Frame (FI_Stackop (SI_Const KInt (VInt (INum.const 5))))	✓
2	iconst_m1	I_Frame (FI_Stackop (SI_Const KInt (VInt (INum.minus_one))))	✓
108	idiv	I_Frame (FI_Stackop (SI_Binop KInt BinOp_div))	✓
165	if_acmpeq *off*	I_Frame (FI_Cond (CI_Cmp KRef CmpOp_eq *off*))	✓
166	if_acmpne *off*	I_Frame (FI_Cond (CI_Cmp KRef CmpOp_ne *off*))	✓
159	if_icmpeq *off*	I_Frame (FI_Cond (CI_Cmp KInt CmpOp_eq *off*))	✓
162	if_icmpge *off*	I_Frame (FI_Cond (CI_Cmp KInt CmpOp_ge *off*))	✓
163	if_icmpgt *off*	I_Frame (FI_Cond (CI_Cmp KInt CmpOp_gt *off*))	✓
164	if_icmple *off*	I_Frame (FI_Cond (CI_Cmp KInt CmpOp_le *off*))	✓
161	if_icmplt *off*	I_Frame (FI_Cond (CI_Cmp KInt CmpOp_lt *off*))	✓
160	if_icmpne *off*	I_Frame (FI_Cond (CI_Cmp KInt CmpOp_ne *off*))	✓
153	ifeq *off*	I_Frame (FI_Cond (CI_If KInt CmpOp_eq *off*))	✓
156	ifge *off*	I_Frame (FI_Cond (CI_If KInt CmpOp_ge *off*))	✓
157	ifgt *off*	I_Frame (FI_Cond (CI_If KInt CmpOp_gt *off*))	✓
158	ifle *off*	I_Frame (FI_Cond (CI_If KInt CmpOp_le *off*))	✓
155	iflt *off*	I_Frame (FI_Cond (CI_If KInt CmpOp_lt *off*))	✓
154	ifne *off*	I_Frame (FI_Cond (CI_If KInt CmpOp_ne *off*))	✓
199	ifnonnull *off*	I_Frame (FI_Cond (CI_If KRef CmpOp_ne *off*))	✓
198	ifnull *off*	I_Frame (FI_Cond (CI_If Kref CmpOp_eq *off*))	✓
132	iinc *var c*	I_Frame (FI_Var (VI_Inc *var c*))	✓
21	iload *var*	I_Frame (FI_Var (VI_Load KInt *var*))	✓
26	iload_0	I_Frame (FI_Var (VI_Load KInt var0))	✓
27	iload_1	I_Frame (FI_Var (VI_Load KInt var1))	✓
28	iload_2	I_Frame (FI_Var (VI_Load KInt var2))	✓
29	iload_3	I_Frame (FI_Var (VI_Load KInt var3))	✓
104	imul	I_Frame (FI_Stackop (SI_Binop KInt BinOp_mul))	✓
116	ineg	I_Frame (FI_Stackop (SI_Unop KInt UnOp_neg))	✓
193	instanceof *tn*	I_Heap (HI_Get (Op_instanceof *rt*))	✓
185	invokeinterface *m*	I_Invoke InvokeInterface *cn msig*	✓
183	invokespecial *m*	I_Invoke InvokeSpecial *cn msig*	✓
184	invokestatic *m*	I_Invoke InvokeStatic *cn msig*	✓
182	invokevirtual *m*	I_Invoke InvokeVirtual *cn msig*	✓
128	ior	I_Frame (FI_Stackop (SI_Binop KInt BinOp_or))	✓
112	irem	I_Frame (FI_Stackop (SI_Binop KInt BinOp_rem))	✓

op code	Mnemonic and arguments	CoJaq translation	Supported in semantics?
172	ireturn	I_Return (Some KInt)	✓
120	ishl	I_Frame (FI_Stackop (SI_Binop KInt BinOp_shl))	✓
122	ishr	I_Frame (FI_Stackop (SI_Binop KInt BinOp_shr))	✓
54	istore *var*	I_Frame (FI_Var (VI_Store KInt *var*))	✓
59	istore_0	I_Frame (FI_Var (VI_Store KInt var0))	✓
60	istore_1	I_Frame (FI_Var (VI_Store KInt var1))	✓
61	istore_2	I_Frame (FI_Var (VI_Store KInt var2))	✓
62	istore_3	I_Frame (FI_Var (VI_Store KInt var3))	✓
100	isub	I_Frame (FI_Stackop (SI_Binop KInt BinOp_sub))	✓
124	iushr	I_Frame (FI_Stackop (SI_Binop KInt BinOp_ushr))	✓
130	ixor	I_Frame (FI_Stackop (SI_Binop KInt BinOp_xor))	✓
168	jsr *off*	I_Frame (FI_Jsr *off*)	✓
201	jsr_w *off*	I_Frame (FI_Jsr *off*)	✓
138	l2d	I_Frame (FI_Stackop (SI_Cast KLong CastOp_d))	✓
137	l2f	I_Frame (FI_Stackop (SI_Cast KLong CastOp_f))	✓
136	l2i	I_Frame (FI_Stackop (SI_Cast KLong CastOp_i))	✓
97	ladd	I_Frame (FI_Stackop (SI_Binop KLong BinOp_add))	✓
47	laload	I_Heap (HI_Get (Op_getarray AIKLong))	✓*
127	land	I_Frame (FI_Stackop (SI_Binop KLong BinOp_and))	✓
80	lastore	I_Heap (HI_Put (Op_putarray AIKLong))	✓*
148	lcmp	I_Frame (FI_Stackop (SI_Cmpi KLong CmpiOp_cmpl))	✓
9	lconst_0	I_Frame (FI_Stackop (SI_Const KLong (VLong (LNum.zero))))	✓
10	lconst_1	I_Frame (FI_Stackop (SI_Const KLong (VLong (LNum.one))))	✓
18	ldc *const*	I_Frame (FI_Stackop (SI_Const *k v*))	✓**
19	ldc_w *const*	I_Frame (FI_Stackop (SI_Const *k v*))	✓**
20	ldc2_w *const*	I_Frame (FI_Stackop (SI_Const *k v*))	✓**
109	ldiv	I_Frame (FI_Stackop (SI_Binop KLong BinOp_div))	✓
22	lload *var*	I_Frame (FI_Var (VI_Load KLong *var*))	✓
30	lload_0	I_Frame (FI_Var (VI_Load KLong var0))	✓
31	lload_1	I_Frame (FI_Var (VI_Load KLong var1))	✓
32	lload_2	I_Frame (FI_Var (VI_Load KLong var2))	✓
33	lload_3	I_Frame (FI_Var (VI_Load KLong var3))	✓
105	lmul	I_Frame (FI_Stackop (SI_Binop KLong BinOp_mul))	✓
117	lneg	I_Frame (FI_Stackop (SI_Unop KLong UnOp_neg))	✓
171	lookupswitch *def n pairs*	I_Frame (FI_Cond (CI_Lookupswitch *def pairs*))	✓

op code	Mnemonic and arguments	CoJaq translation	Supported in semantics?
129	lor	I_Frame (FI_Stackop (SI_Binop KLong BinOp_or))	✓
113	lrem	I_Frame (FI_Stackop (SI_Binop KLong BinOp_rem))	✓
173	lreturn	I_Return (Some KLong)	✓
121	lshl	I_Frame (FI_Stackop (SI_Binop KLong BinOp_shl))	✓
123	lshr	I_Frame (FI_Stackop (SI_Binop KLong BinOp_shr))	✓
55	lstore *var*	I_Frame (FI_Var (VI_Store KLong *var*))	✓
63	lstore_0	I_Frame (FI_Var (VI_Store KLong var0))	✓
64	lstore_1	I_Frame (FI_Var (VI_Store KLong var1))	✓
65	lstore_2	I_Frame (FI_Var (VI_Store KLong var2))	✓
66	lstore_3	I_Frame (FI_Var (VI_Store KLong var3))	✓
101	lsub	I_Frame (FI_Stackop (SI_Binop KLong BinOp_sub))	✓
125	lushr	I_Frame (FI_Stackop (SI_Binop KLong BinOp_ushr))	✓
131	lxor	I_Frame (FI_Stackop (SI_Binop KLong BinOp_xor))	✓
194	monitorenter	I_Heap (HI_Monitor Op_Lock)	✓
195	monitorexit	I_Heap (HI_Monitor Op_Unlock)	✓
197	multianewarray *cn dim*	I_Heap (HI_New (Op_newmultiarray *cn dim*))	✓
187	new *cn*	I_Heap (HI_New (Op_object cn))	✓
188	newarray *tn*	I_Heap (HI_New (Op_newarray *rt*))	✓
0	nop	I_Frame (FI_Stackop (SI_Generic Op_nop))	✓
87	pop	I_Frame (FI_Stackop (SI_Generic Op_pop))	✓
88	pop2	I_Frame (FI_Stackop (SI_Generic Op_pop2))	✓
181	putfield	I_Heap (HI_Put (Op_putfield *k cn fn*))	✓
179	putstatic	I_Heap (HI_Put (Op_putstatic *k cn fn*))	✓
169	ret *var*	I_Frame (FI_Ret *var*)	✓
177	return	I_Return None	✓
53	saload	I_Heap (HI_Get (Op_getarray AIKShort))	✓
86	sastore	I_Heap (HI_Put (Op_putarray AIKShort))	✓
17	sipush *i*	I_Frame (FI_Stackop (SI_Const KInt (VInt (INum.const *i*))))	✓
95	swap	I_Frame (FI_Stackop (SI_Generic Op_swap))	✓
170	tableswitch *def low high offsets*	I_Frame (FI_Cond (CI_Tableswitch *low def offsets*))	✓

* – without word tearing

** – representing ldc in CoJaq requires resolving relevant symbols and may require creating (or specifying with axioms) appropriate values on the heap