Semantics for Conditional Literals via the SM Operate

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Conditional Literal Semantics

- Introduction
- 2 Conditional Logic Programs
- Conditional Programs via the SM Operator
- 4 Conditional Programs via In nitary Propositional Logic
- Connecting Semantics for Conditional Literals

Motivation

Program Veri cation

Running Example

Introduction

- 2 Conditional Logic Programs
- Conditional Programs via the SM Operator
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For a signature = (O; F; P) of a rst-order language:

O is the set of object constants;

F is the set of function symbols (non-zero arity);

P is the set of predicate constants;

G is the set of all ground terms constructed from and F of

For a program :

= (O; F; P), where O, F, and P contain all the object constants, function symbols, and predicate constants occurring in G denotes $G_{O;F;P}$.

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Global vs. Local Variables

A variable isglobal in a conditional literalH : L if it occurs in H but not in L;

All other variables occurring in a conditional literal almecal

All variables are global in basic literals;

A variable is global in a rule if it is global in at least one rule literal.

Example

In rule

```
:- not asg(V;I): color(I); vtx(V):
```

with conditional literal

```
not asg(V;I): color(I);
```

V is a global variable, whereasis local.

z

For a ruleR with global variablesz:

for a conditional literalH : L occurring in the body of R with local variablesx, $_{z}(H : L)$ is 8x ($_{z}(L) ! _{z}(H)$);

for a conditional literalH : L occurring in the head oR with local variablesx, $_{z}(H : L)$ is 9x ($_{z}(L) ! _{z}(H)) ^{::} _{z}(L)$:

(R) is the formula8z($_z(B_1)^{\wedge} _z(B_n ! _z(B$

Conditional Literal Translation

Transformation applied to the conditional literal

```
not asgV;I) : color(I)
```

produces formula

8i(color(i) !: asg(v;i))

()

8vi (vtx(v) ^ color(i)) ! asg(v;i) _: asg(v;i) 8v (8i(color(i) !: asg(v;i)) ^ vtx(v)) !? 8vij (asg(v;i) ^ asg(v;j) ^ i 6 j ^ vtx(v) ^ color(i) ^ color(j)) !? 8viw (asg(v;i) ^ asg(w;i) ^ vtx(v;w) ^ color(i) ^ edg(v;w)) !?

Semantics via the SM operator

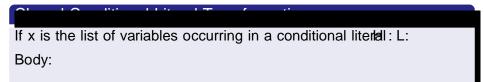
An interpretation is ap-stable model f a rst-order sentence when it is a model of SM [F]. For a conditional logic program and a Herbrand interpretation over the signature Q; F; P), I is an answer set of when I is a P-stable model of ().

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Conditional Programs via In nitary Propositional Logic

Traditional Characterization of Conditional Literals:

- (i) Syntactic reduction to IPL formulas;
- (ii) Semantics de ned by IPL stable model semantics



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Rules to Closed Rules

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$$(R) = f (r) j r 2 inst_G (R)g^{\uparrow}$$
:

Similarly,

$$() = f (R) w.r.t. G j R 2 g^{:}$$

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Connecting Semantics for Conditional Literals

We have presented our translation, which producesnonground rst-order formulas from logic programs.

We have reviewed translation, which produces in nitary propositional formulas from logic programs.

We use a previously established result to show that \mathbf{P} he stable models of () coincide with the stable models of ().

gr(?) = ?;gr(A) = A for a ground atomA; $gr(t_1 = t_2)$ is > if t_1 is identical to t_2 , and? otherwise, for ground termst₁:t₂: If $F = G _ ::: _ H$, then $gr(F) = gr(G) _ _ gr(H)$; If $F = G^{:}$ H, then $gr(F) = gr(G)^{-1}$ for gr(H); If F = G ! H, then gr(F) = gr(G) ! gr(H); If F = 9xG(x), then gr(F) = fgr(G(u)) j u 2 $G^{x}g_{-}$; If F = 8xG(x), then gr(F) = fgr(G(u)) j u 2 $G^{x}q^{\wedge}$.

Take rule R to be :- not asg(V;I) : color(I); vtx(V): The grounding of (R) replaces global variables:

Take closed ruler to be :- not asg(1;1) : color(1); vtx(1): Then,(r) = $(color(1)!: asg(1;1))^{(color(g)!: asg(1;g))} ^{vtx(1)!?}$

 $(8i(color(i) !: asg(1;i)) ^ vtx(1)) !?$

is equivalent to

 $(color(1) !: asg(1; 1)) \land (color(g) !: asg(1; g)) \land vtx(1) !?$

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Conclusion



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