THE EIGHTH WHITE HOUSE PAPERS

Graduate Research in the Cognitive and Computing Sciences at Sussex

editors:

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Graduate Research in the Cognitive and Computing Sciences at Sussex

CSRP 390

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A. Jonathan Howell & Joseph A. Wood

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Preface

Ea ar s n , C G ra uat stu nts av b n t n at uss n v rs t s on r n ntr , t t Hous , o at at t Is o orns n ar Ha war s H at v tis v ra a s stu nts ar v n t opportun t to v pr s ntat ons on t r wor

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uat s arc n t Co n t v Co put n c nc s at uss n v rs t o uss oo
o Co n t v Co put n n s Br ton K s ar ap C

From Genotype to Neural Network through Hierarchical Organisation

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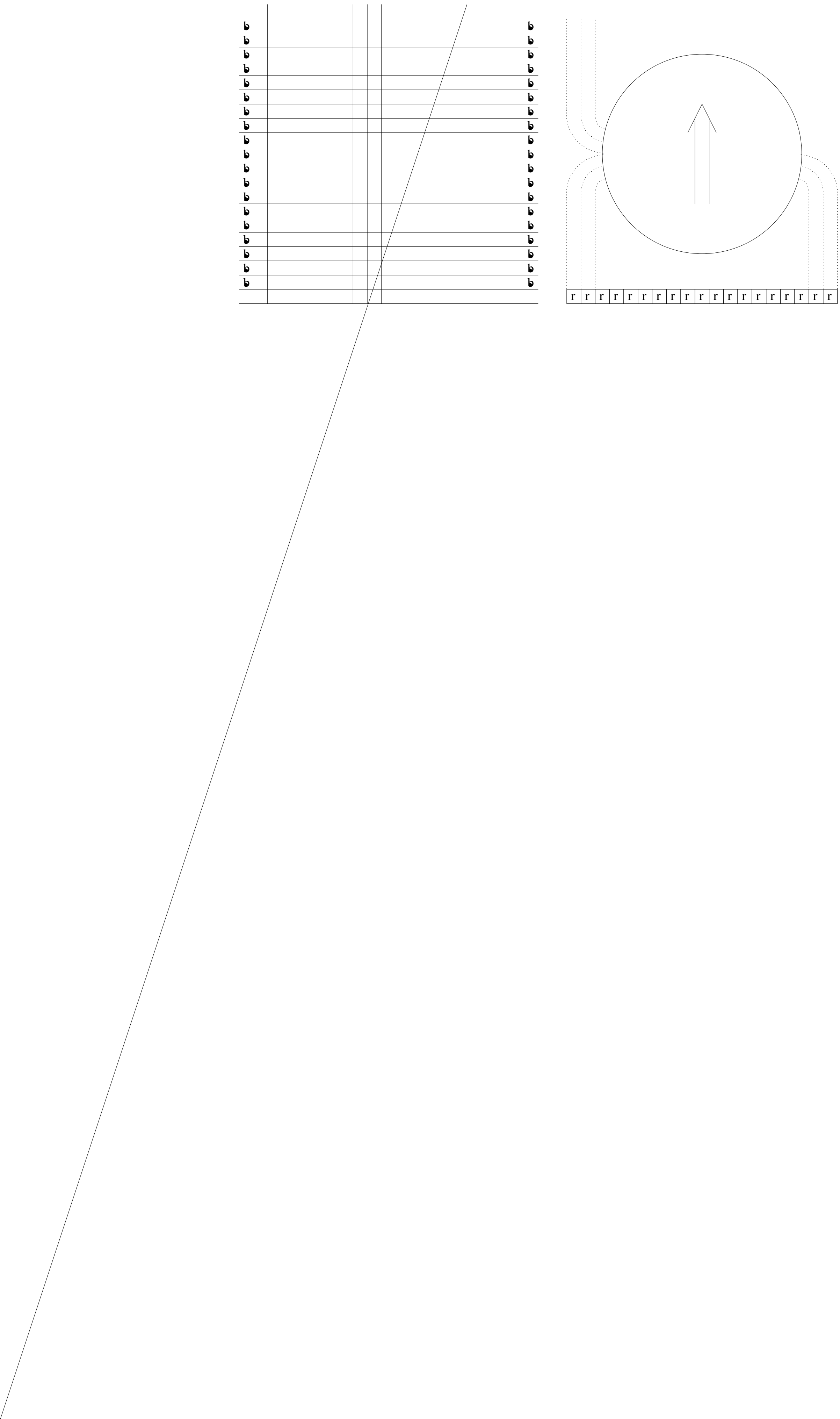
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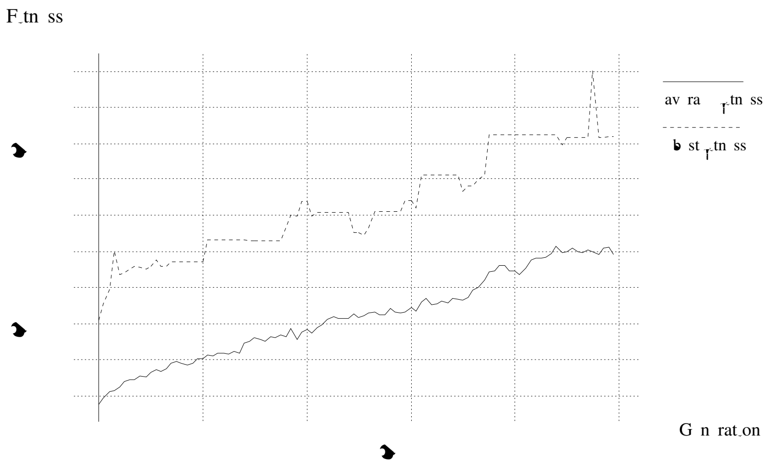
- It an ov to a n . bour.n prov. t at t .s .s pt
- It an onn t to anot r n ur.t . t r .s on .n .ts . .at n . bour oo I bot n ur.t s b on to t sa n uron, t at o . a a s to a r urr nt onn t.on
- It an onn t to a r t.na nt or to a otor un.t . .t .s n t to on
- It an r a.n .

The Causes of Neurite Behaviour

. b av.our a n ur.t w. p r or at a part. u ar t. .s t r su t o bot .ts not p w . .s t sa or a t n ur.t o t at n t, .ts urr nt n . bour oo an .ts .stor .n a n ur.t s t at .nt ra t av t sa not p, on t two ast a tors ar r spons.b or t .r r n .n b av.our .stor o a n ur.t .s .at b t an .n .nt rna stat s w . t.v prov. t n ur.t w.t so .n o or .nt rna stat o a n ur.t .s t on un t.on o t r arra s o b.nar nts, a o w . .s ara t r.s b t .n o v nts t at aus s .t to an .ts stat a t s ow st o t s arra s t .n a r .st r or r .st r It .s on up at at .v.s.on



F ur

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t at t prop rt s o v op nt w ar portant or our purpos st ro a t an s s w a t t wa n or at on ows n t s st It s t r or portant to av a a u o b t to t n o n or at on an but a so to t wa t s n or at on s str but an an up at a ross t s st

References

B r Ga a r J Evo v n na a n ura n twor s or a apt v b av our *A apt v b av or*

C D Harv I Husban s E p orat ons n vo ut onar robot s *A apt v b av or*

D a rt F B r owar an vo vab o o v op nt or autono ous a nt s nt s s In Broo s a s E s *Art c a L I* pp

Fran s n on J B an s C Fro ns t v s on to robot v s on *osop ca transact ons B o o ca sc nc s*

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Husban s Harv I C D r G us o n t a or t s or t v op nt o s nsor otor ontro s st s In *roc n s o t rst con r nc Fro p rc pt on to act on*

Kau an *or ns o or r* or n v rs t r ss

Kau an v n owar s a n ra t or o a apt v wa s on ru an s ap s *Journa o t or t ca b o o y*

Ko aba an J r J D v op nt arn n an vo ut on n an ats In *Fro p rc p t on to act on*

a nar t J *Evo ut on an t t ory o a s* Ca br n v rs t r ss

r G C D rot an b av our n na a s ar u nts or t o vo ut on o pursu t vas on ta t s In C D Husban s r J son E s *Fro an a*

In A Jonat an How Jos p A oo s 5 *E t t Hous ap rs Gra uat s arc n t Co n t v Co put n c nc s at uss x* n v rs t o uss oo o Co n t v Co put n n s Br ton K s ar ap r C

In u t.v t or an s ou a w t t arn on pts t urr nt nt rta n n u t s s ar t t K s prob s run t a an b nt on K s ar o t n t ou t o as prob s to b an su ss u b so or o onstru t v n u t on A DCI an A HCI ar t ar an ontrov rs a a p s ow a t ou p a n C p r or s v r ba n t s prob s t s opt on a ows a ar b tt r r su t s u n an ap

Attr but onstru t on an stru t on ar t rn o w at s a onstru t v n u t on In on stru t v n u t on a t t on va uat on o pon nt ass ss t qua t o t urr nt attr but s an an b on t r b so ow ana s n t ata a on or b a n us o a s t v non onstru t v arn r as C s t on rout n s t r s r pt on part o t pro ss t o o op ran s s t o pr v ous attr but s an op rators op rat ons a on t s t op ran s t at w a n w at tr but s to t tra n n s t A t ona w an prov t s t on o u o a stru t on pro ur w r b so roun or onstru t attr but s t at ar ons r rr vant ar nat r s a var t o a t rnat v t o s bot or t t t on va uat on an t s t on rout n s as t r ar r nt s st s o onstru t v n u t on s Kra r or a ass at on o s st s ar prov w t a or t op rators F I GE a a o a a o Hauss r pot s s n rat b a s t v arn r s ass ss b t t t on va uat on an t s t to t s tor s p t tas o oos n t a quat op ran s on t bas s on t s t v arn r out put In r nt or sop st at onstru t v n u t on s st s su as CI F a r n r a a non a or t op rator or onstru t n n w attr but s s pr s nt A s t o op rators s t n app w n v r t an b app an t popu at on o n rat attr but s s t n ass ss b t t t on va uat on o u s a ows t s st to s t w op rator s n or a arn n prob In a s st CI F a r s r pt on st p an nvo v r nt op rators a ow n t ma pot s s to b r pr s nt w t a r at r r n ss s st a s to n s bot t pot s s to b on In b o nv

References

In A Jonat an How Jos p A oo s E t t Hous ap rs Gra uat s arc n t Co n t v Co put n c nc s at uss n v rs t o uss oo o Co n t v Co put n n s Br ton K s ar ap C

Automatic Debugging of Multiple-Function Programs

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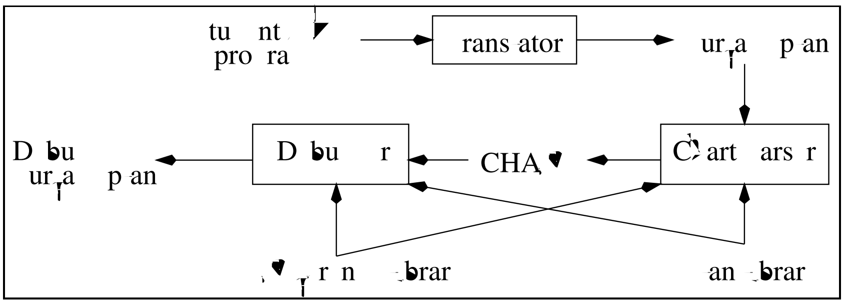
Abstract s pap r r ports on an nt nt bu n s st bas on t p an a u us or a s at rs or auto at a t t n an orr t n s ant rrors n nov stu nt pro ra s wr tt n n Its o put r p ntat on s a E IY p a n t ov ra stru tur o t s st an v an ov rv w o t a opt t n qu or bu n s n un t on pro ra s a so s uss t approa t at us to bu pro ra s w t u t p un t ons F na utur r s ar wor s po nt out

1 Introduction

s pap r r ports on an nt nt bu n s st bas on t p an a u us or a s at rs or auto at a t t n an orr t n s ant rrors n nov stu nt pro ra s wr tt n n Its o put r p ntat on s a E IY p a n t ov ra stru tur o t s st an v an ov rv w o t a opt t n qu or bu n s n un t on pro ra s a so s uss t approa t at us to bu pro ra s w t u t p un t ons F na utur r s ar wor s po nt out

2 The Overall Structure of EMILY

E IY ons sts o t r o u s an two now bas s s ar t trans at on o u trans ator t pro ra un rstan n o u t art pars r t bu t on o u bu r t p an brar an t r r n brar F ur s ows t ov ra stru tur o t s st trans at on o u s r spons b or trans at n a stu nt pro ra nto ts qu va nt sur a p an r pr s nta t on



F ur ov ra stru tur o E IY

pro ra un rstan n o u a pts t sur a p an o

or t wron un t on s a b sta w assu t wron a un t on s a so w r s n t pro ra an s orr t In t s pap r w on s uss t s two as s nt on t pro ra at t n o t s pap r w s an a p w r t *s_vow* un t on ts s orr t an a so s orr t a so w r s n t un t on but t s n orr t a n t un t on *asc_* t rst a s orr t but t s on a as t wron ar u nt

5.1 Identifying a Call to a Function

Dur n t bu n pro ss w n v r E IY tr s to bu t urr nt a t v un t on CAF or t urr nt a t v oa CAG t rst s w t r t CAG s a tua p nt b t CAF or

5.3 The Activation of the New Call

n a n w a to a un t on s n rat t n E IY trans rs t s a n t or at o t p an a u us as an nput rap or t art pars r to pars s nta s t a un t on to b n n pan an ts sur a p an s pars a t at w n v r t art pars r pars s an nts o t nput rap w s n ro o sur a p an t s w t r t s a a to anot r un t on or not I t s s t as t n t pars r ta s t sur a p an o t a un t on an pars s t at A t r t art pars r as m s t n t urr nt a t v oa w E IY was bu n t pro ra or w b n rat an t n t art I t s r su ts n t n rat on o t v oa t at w start t bu n w t t n t pro ss r urs v unw n s an t bu n pro ss t r nat s ot rw s E IY ont nu s t bu n pro ss r urs v

5.4 Dealing with a Wrong Function Call

I t tas o t a un t on s r nt ro t urr nt a t v oa CAG an t p an r pr s nt n ts tas as ov r t un t on t n t s ans t at t urr nt a to t un t on s wron t stu nt a a r nt un t on In t s as E IY ts t orr spon n a an r ov s ro t art a p ans u or part a nstant at t at av b n ntro u b t s a n t o par s t CAG w t t nown tas s o un t ons to m out w o t p nts t sa tas as t CAG I t m s su a un t on t n t n rat s a n w a to t at un t on w s ou b a Hav n on t at t r st o pro ss w ont nu as s r b abov It s wort str ss n t at w n E IY o at s t bu t r pa rs t as w r pa r s on at t sur a p an v an E IY o s not on rn ts w t t p a o a asp t o su r pa rs at s pr s nt n t r pa rs to stu nts an tutor n t s t to t tutor n o u o an I t at w p o E IY as ts o a n p rt o u

6 Experimenting with EMILY

av b n t st n E IY on r a stu nt pro ra s In or r to o t s w av ta n a orpus o stu nt pro ra s s pro ra s w r wr tt n to so v t prob o a n a m t art to an Ita an noun at s t tas s to ta a v n Ita an noun t r n ts n an a an appropr at m t art to t ront o t noun r ar r nt ru s or sp n a t p o n r r ar a so pt on nouns to t s ru s an t s ar prov or t stu nts s pro ra s ar wr tt n b stu nts w o too an un t ona pro ra n ours n autu n as t r rst ass n nt ns tst st

8 A sample program

```
val masc_fem_exc_list = [
("ambiente",      true),  ("mano",          false),
("animale",       true),  ("bestiame",      true),
("piazzale",      true),  ("brioche",       false),
("comunista",     true),  ("sale",          true),
("sole",          true),  ("totale",        true),
("carne",         false), ("chiave",        false),
("mare",          true),  ("radio",         false),
("mese",          true),  ("pane",          true),
("nome",          true),  ("turista",       true),
("paese",         true),  ("fine",          false),
("legge",         false), ("ponte",         true),
("piede",         true),  ("camice",        true),
("moto",          false), ("automobile",    false),
("biro",          false), ("alce",          true),
("programma",     true),  ("crisi",         false),
("stazione",      false) ];

fun is_vowel char = member char (explode "aeiou");

fun  fem_def string = if is_vowel(hd(explode string)) then
                            "l'"^string
                      else "la "^string;

fun masc_def string = if is_vowel(hd(explode string)) then
                            "l'"^string
                        else
                       if "s" = hd(explode string) andalso
                            not(is_vowel string) then
                                            "lo "^string
                       else if "z" = hd(explode string) then
                            "lo "^string
                       else "il "^string;

exception Unknown_gender
fun sgender x = case last(explode x) of "o" => true
                | "a" => false

                | _   => raise Unknown_gender;

exception Unknown_word
fun except (word,x) = if (mem x (word,true)) then true
                   else if (mem x (word,false)) then false
                   else raise Unknown_word;

fun ggender (noun,excptlist)
    = except(noun,excptlist) handle ? => sgender noun;
```

```
fun gender  noun = ggender (noun,masc_fem_exc_list);

fun singdef noun = if gender(noun) then masc_def(noun)
                                        else fem_def(noun);

singdef "banca";
```

9 Summary

In t s pap r w s t t ov ra stru tur o our nt nt bu n s st or stu nt pro ra s br s uss ts bu n approa or s n un t on an u t p un t on pro ra s s uss ow E IY t ts a a w t a wron ar u nt an a wron a to a un t on an ow t n s su bu s

ar p r nt n w t E IY s apab t s on r a stu nts pro ra s In t s r ar w av n u a sa p o su pro ra s w r a pro ra ons sts o at ast t un t ons n at t utur wor w r w ar o n to n ra t a opt bu n approa o E IY to a w t ot r as s w a o ur w n bu n u t p un t on pro ra s

3.3 Incorporation of alternating learning modes

Kar o t A rans or n a part a stru tur bra n nto a r at v n *B av ora an Bra n c nc s* 4

ar s a D u tz A onn t on st o o t v op nt o s r at on In

In A Jonat an How Jos p A oo s E t t Hous ap rs Gra uat s arc n t Co n t v Co put n c nc s at uss n v rs t o uss oo o Co n t v Co put n n s Br ton K s ar ap r C

An Application of Artificial Intelligence Techniques to a Consumer Software Product

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Abstract An p ntat on s s uss w r t app at on o Art

6 Conclusions

I op to av s own t at t n qu s ro AL w as p r aps b n wan n n ts a ptab t o at an b app to r a onsu r so twar app at ons prob s r su t n n t tw n b n ts o as o us or t n us r an b tt r qua t an a nta nab t o o b t v op nt o pan

References

A In *Co nt ro o Int ract v D v op nt Env ron nt*

Bor an Int rnat ona In *B*

In A Jonat an How Jos p A oo s E t t Hous ap rs Gra uat s arc n t Co n t v Co put n c nc s at uss n v rs t o uss oo o Co n t v Co put n n s Br ton K s ar ap C

Multimedia interfaces and anaphora resolution

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Abstract n wa to tr to ov r o t n u t s nvo v n anap ora r so ut on w n s n n natura an ua nt r a s s to bu a apab t or ontro b t us r nto t nt r a us r an t us ass ss w t r t nt r a s nt rpr t n anap or r r n s orr t u t a t no o o rs n w poss b t s to nt rat su ontro b v n t us r ba o o r n b tw n t urr nt nput an t on o n s ours A t r a n ra s uss on o att rs on rn n t nt rat on o v sua an s ours n or a t on t pap r w pr s nt two st n att pts to us u t a t n qu s as s r b abov It w t n s uss part u ar t orn asp ts o anap ora r so ut on w t b

For .nstan , .n natura an ua ass.st rap . s v ra p. tur s an b asso .at w.t a s.n s n t n , b aus pr supos.t.ons ar a a t o .n natura an ua us a onta.n r .s pr suppos .n t s nt n b ow

w.n .s on t tab

ar , a s st or opt. a ara t r r o n.t.on an b n .n t . ro s nta t. now stru tur .nto stat.st. a o s r.v ro part o sp trans.t.on probab. .t. s .s an b urt r v op .nto s st s w . ar ab to u ana s t stru an po nt to a r pro u t on o a r s o an as qu st ons su as t on b ow w t t appropr at r spons

o s s
a onna

AFE C a so prov s a o u to v ba to t us r o t o r n oun b tw n t urr nt nput s nt n an t on o n s ours us r an t us nt r r sun rstan n s o ur s atur a prov nva uab n as t r r nt o an anap or pronoun s nt n n orr t

3 Two suggestions

n n u t prob w t n t ont t o anap ora r so ut on s nt n r r nts w ar un s o s ours u un s var n n t but t ar not un r qu nt qu t on anap or t p a us or t s n o r r n ar t onstrat v s t s an t at a t ou t p rsona pronoun t s p o or t s or o anap or r r n at t s A s st wou av n t a to t r n w t r t r r nt s an ob t pr ss b a noun p ras or a s ours un s a b a a ot as r t us r s p t to us a po nt n v to nt ob ts r rr to n v r no po nt n o urs t r r nt s not an ob t but a s ours un

wo n u t s p rs st ow v r rst on s t at t us r a o as ona not po nt to an t n n t s r n n sp t o t a t t at t r r nt nt n s an ob t s t b ov r o b a n a pro ur w wou n rat a natura an ua ssa w n v r t onstrat v pronouns ar us w t out asso at on to po nt n s on s o ours to nt t pr s s ours un r rr to on t t p o anap ora s as rta n A ba o u wou av to r on u pro ss pr n s ours n or at on to n rat a r r nt an at It wou b o t n n ssar to pr s nt su ar s onta n n t st o pr n s ours as r so ut on opt ons to t us r F ba or t s or o anap ora n u t a nt r a s ar an s urt r r s ar

s on prob ar o o at ons onta n n anap ors su as t at s t or t at s r t It s o t n as r to pro ss su r r n s as un ts an t s s rta n tru n t as o t rst on w r s parat r r nts or t at an t ar rar t orr t answ r A st o su o o at ons w t t p a pro ur s or r so ut on a b r at a t r appropr at r a an ua orpus nv st at ons u st wou a so p t s st a w t t un o s ours anap ora t p s uss abov

4 Conclusion

a o o un at n s st n r n s on rn n s ours pro ss n to t us r a o a on wa to as t bur n o anap ora r so ut on n natura an ua un rstan n s st s It s portant to not ow v r t at t s bur n annot b s p s t to t us r as s or r r spons b t B or t a v nt o u t a s st s t s wou b qua to r tu

K v tt s on pro ss n an natura an ua pro ss n tor a *Art c a Int nc v w*

a J G ap ro C Int nt u t a nt r a t no o In *Int nt s r Int r ac s* A son s

ua a n An nv st at on nto t o on s ant s o an ua an v s on *Art c a Int nc v w*

u van J r Intro u t on In

In A Jonathan How Joseph A oo s E t t Hous ap rs Gra uat s arc n t Co n t v Co put n c nc s at uss n v rs t o uss oo o Co n t v Co put n n s Br ton K s ar apr C

Reconstruction of the neuronal network underlying feeding behaviour in the pond snail *Lymnaea stagnalis*

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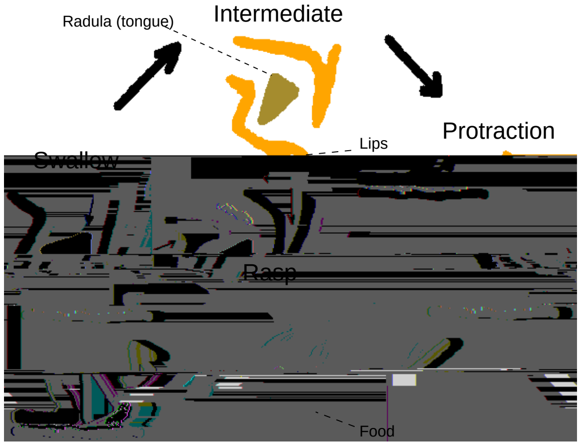
1 Introduction

patt rn n rat n n ura r u tr un r n r t n b av our n t pon sna *Ly na a sta na s* s an a an at or t n uro t o o a stu o an nt r b o o a n ura n twor I a us n o put r o n to arn or about t ans s un r n t n rat on o t s r t b av our s wor s ta n p a n o aborat on w t anot r approa n w t r u t s b n r onstru t n u tur nab n t a nat on o s napt an u ar prop rt s n ontro on t ons wor on bot pro ts s bas on pr v ous nt ns v anato a trop s o o a an b av oura stu s or a r v w s B n a n an E ot t t s o b nat on o o ab orat n pro ts w w o os r to un rstan n t s r u t ow t un t ons as a w o an ow ts a t v t s o u at to pro u obs rvab b av our n t an a s s ort pap r p a ns t approa

2 Feeding Behaviour

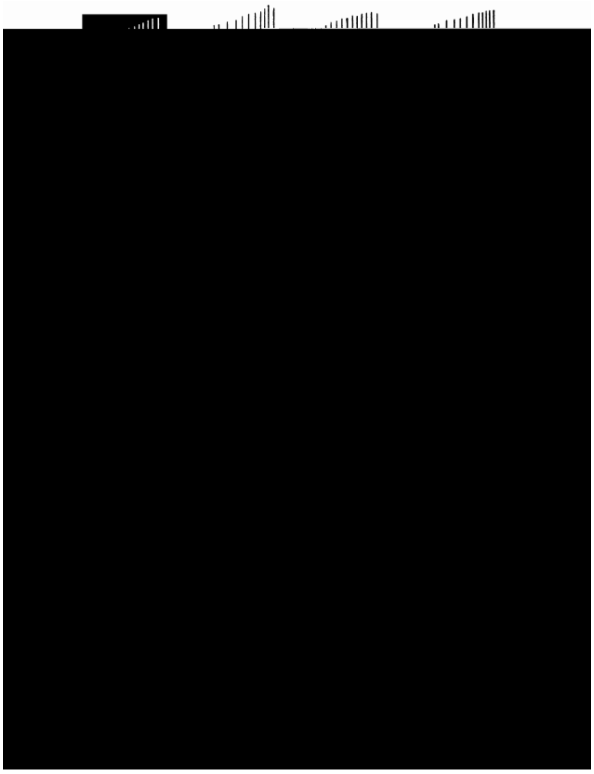
Ly na a s a brows n rb vor t at s on sub r a a n s or oat n v tat on Dur n n t bu a ass p r or s a st r ot p s r s o r t ov nts as p t n t artoon s own n ur s s r p at or un r s o s as t an a ov s ov r t oo substrat t p a ov n ts a ro s to s ov nts w r su t n oo b n s oop nto t out an swa ow a b v up nto our a n p as s t r a t v an on ur n w t us u atur s at r st *In v vo* a s t p a s on s n urat on t r a t v p as s o t r t an b su ar s as o ows An n



F ur Cartoon ross s t on p t n t bu a ass ov nts n t t r a t v b av oura p as s p us t nt r at r st p as **KEY:** ar arrows n at t s qu n o t b av oura s a arrows n at ov nts o t bu a ass s artoon s on ant as a s p r pr s ntat on an as su b s t ns v b av oura wor un r n t pro t

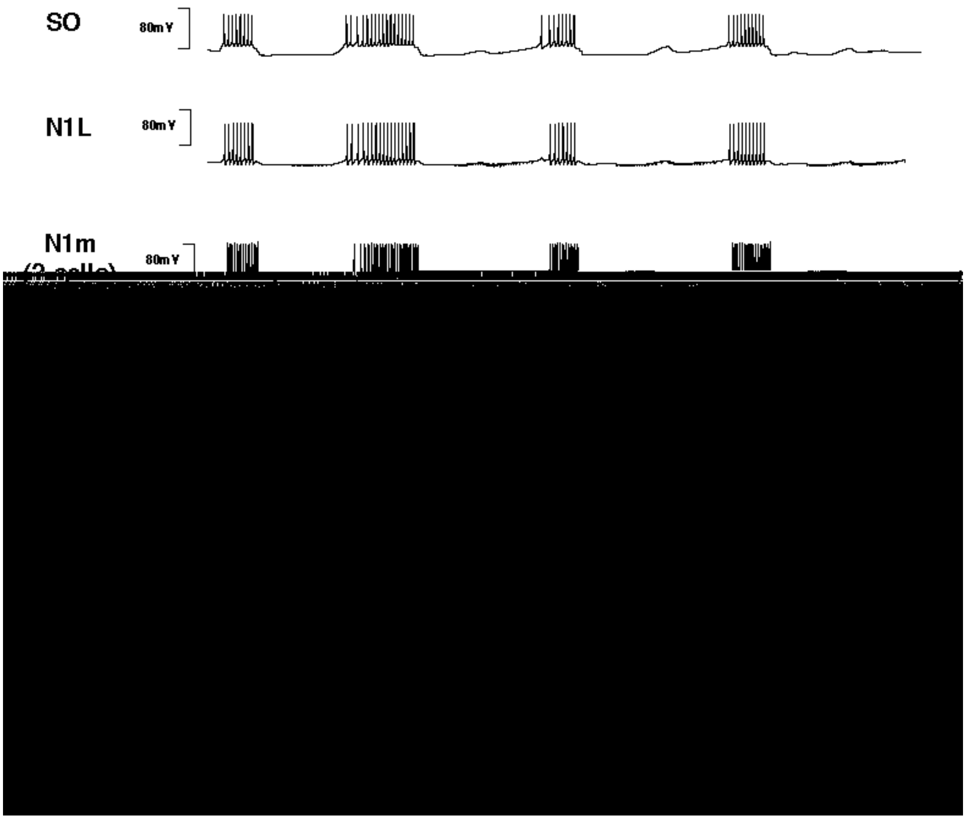
3 Electrophysiology

C bo s n *Ly na a* ar t p a ar an r a nt mb ro on an a to t n t u to r u ar o our n an pos t on n t an a In a t on t nu b r o s nvo v n t s r u t s r at v s a s a ts av a t poss b to at or s n ar a t s nvo v t r s napt onn t v t an r n ara t r st s n r n t n b av our s an os ator r u t o nt rn urons w n rat s t r t patt rn r v n t a t vat on o t oton urons r t output app ars to b a o t v prop rt o t n twor rat r t an u to t a t on o a s n pa a r In a t on t s a



F_ ur C G a t_v_t su ar _a ra

_s _n ur onstru t ro an pa_r _ntra u ar r or _n s_ ustrat s t _v rs_t o u ar prop rt_ s _n t C G n twor **KEY:** n a _n _a r nt s onn t_v_t _s _n _at pr s napt_ _s _t an _ts s napt_ onn t_ons s own b arrows For a p t _rst tra to b t _s t at o t s ow os _ator o u ator arrows _n _at _a s naps s w_t t



F. ur o patt rn a t.v.t r.v n b t ow s . ator nA o s. u at urr nt .n t.on to t t rou out t .s tra r.v s a patt rn s. . ar to t at as s n .n .so at pr parat.ons

an arb.trar nu b r o sp .nb vo ta p n nt on u tan s urons ar .n w.t o a an tr. a s naps s ost s napt. pot nt.a s s ar o b t so ut.on o a s on or r r nt.a quat.on an ar p n nt on t urat.on o t pr s napt. sp. approa as b n to start w.t a .n. a o o t patt rn.n n twor an a o p .t on at a t. r sp .n b.op s. a prop rt. s ar un nown t ov ra .n ara t r.st. s o t av b n r pro u us.n a o b.nat.on o appropr.at vo ta p n nt on u tan s As w.t t .n ara t r.st. s s pro u ro t . a s naps s av b n o to at ata ro ntra u ar r or .n s urr nt o r pro u s t obs rv p s.o o . a ata on a n twor v output ro t o s own .n .n ur .n u .n p r. nta obs rvat.ons su as t patt rn r.v.n ab. .t o t s an patt rn rapprop rt.rn nt u

In A Jonat an How Jos p A oo s E t t Hous ap rs Gra uat s arc n t Co n t v Co put n c nc s at uss n v rs t o uss oo o Co n t v Co put n n s Br ton K s ar ap r C

The Role of Neural Activity in the Development of the Cat Visual System

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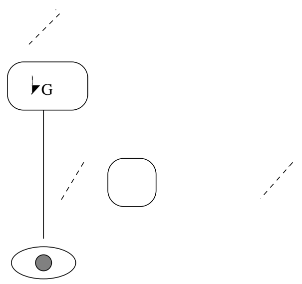
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References

B a or, C., Coop r, G D v op nt o t bra n p n s on t v sua nv ron nt *atur*,

E n An ov rv w o ot on pro ss n n a a an v sua s st s In Bour r, n, o pson, A E s, *v nt t Hous ap rs Gra uat s arc n t Co n t v an Co put n c nc s at uss x*, C , , pp

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on r a sbur C n r r n p s o ort a n twor or an zat on In a n r E s *urob o o y o ocort x* pp

BF n twor s ou p r or w t out rror ov r a ran o v w or ntat ons or s a atas ts an t at p r or an was nvar ant to ar ran s o o s ts an s a s How v r or ar atas ts p r or an was u ow r an t tra n n was u s ow r as t n twor a to op w t an or n un ts In t s stu w a r ss t ssu o s a n up r or an s n our BF n twor s nto s a r a r o n t on un ts

ar a opt n t a o a un ts or r o n s n a ar a s ro t wor o Bru Youn Bru as t s a us u wa o v op n a o u ar s a a ar t tur r or an sat on s to a ow ast s a n twor s tra n w t a p s o v ws o t p rson to r o n s s a un ts s ou v p r or an an a so a v at t pro o a n n w ata to an st n tra n n twor ar us t var ous v ws o t p rson to r o n s to t r w t s t on usa v ws o ot r p op as t n at v v n or t n twor ur a un ts av ust outputs orr spon n to s or no s ons or t n v ua s s n ontrast w t E an t a w o not us su n at v v n n t r stu r st o t pap r out n s our approa an pr s nts r su ts to s ow t at t s

Fu ta s o a un t n twor s an s ar strat ar v n n How Bu ton

Type I and II Data Tests

t p I p rson ata a onv nt ona arran BF n twor a v n ra sat on w t tra n n o t nvar ant ata at a our r so ut ons an or tra n n at × an × s t r n n p r or an tw n t r so ut ons to t × ata s t n us or at r t sts n twor atta n a p a p r or an o w t tra n n w t t o s t var an ata an or t s var an ata s s ow t at t BF n twor a nta n ts p r or an w t var at on n t a ata

References

A a r sp o so ut ons to t ss n atur prob n v s on In Hanson J Cowan J D G s C E s A vanc s n ura In or at on roc ss n yst s o or an Kau ann

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E an s D Y s urun Y arn n t

2 Outline of the work

p p rout n rat on pro ss s m as a n o opt

References

Dav s   t nstrup   In orporat n prob   sp n now   nto n t a or t s

In A Jonat an How Jos p A oo s E t t Hous ap rs Gra uat s arc n t Co n t v Co put n c nc s at uss n v rs t o uss oo o Co n t v Co put n n s Br ton K s ar ap C

Whole Cognizers, Phenomenology, and Artificial Life*

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Abstract v w t at o n t on ust b r pr s ntat ona s a ons qu n o t Cart s an assu pt on t at t nta an t at r a ar un a nta oppos to a ot r I w ta n an bo to or a un t rat r t an a un on o n t v s n b o s qu t r nt ro w at t s usua ta n to b Co putat ona t or n u st s an n uros n ar r p a as or o n t v s n s b p no no o art n a an t o o

1 Introduction

Co n t v s n as b n s ap b ana t p osop an t o put r tap or w as to t o nan o su t s an not ons as rat ona t an ua r pr s ntat on un t ona s an o putat on I wou to a a as or a o n t v s n w ts ts b s ap b a p no no o a p osop an b o o C ntra not ons t n b o p r n bo nt t o o vo ut on an na s An t art n a ontr but ons ar to b p t ro A not ro AI

1.1 Representationalism is Cartesian

Cart s an s starts b oppos n t n to t wor t su

3 Merleau-Ponty, Embodiment, and Experience

3.1 The Mind-Body Unity

r s no n bo prob n an bo ar not two utua us v nt t s w av to b brou t to t r Cart s an s , but ar two asp ts o a s n un t ot n s t r pur sub t v or pur ob t v , pt as an a abstra t on un t not un on o bo an n p s t pr s n o t nta n t bo an t at o t bo n t nta n s not an nt t so w r *n* t bo , but t *s* t bo r au ont a n . sp a s o t bo sub t , a b n n t wor w anon ous , or pr p rsona p tur o r a t v r wor s ro a rta n po nt o v w r s nt rsub t v t t ou w s bas on an ab t o ta n up so on s s s tuat on

3.3 Taking Experience Seriously

E bo nt s n ta n s r ous or an or t s a s rta n w t n A How v r t s not n ra appr at t at t ta n s r ous o bo nt *r qu r s* t ta n s r ous o p r n a t t at n an bo ar on o s not on an t at w n to r o n z t bo ar not s ut up w t n t boun ar s o t s n ar op n to an v n nt rtw n w t t wor , w s w t an app n t at an nstru nt a a r or v n a ar b o s a tru t ns on o t p no na bo an s s o t nta ar to b oun not on ns t o n r s

os n n I *tran Fa ar an For ott n* nta Boo s w Yor

ts Jo nston *oots o n n* p n v rs t r ss a p a

ts Jo nston at s t to a n or w a ra n s not a o anus r pt

van G r at t o n t on not o putat on C In ana n v rs t

D rr J *M taCo n t v Mo s o L arn n an Instruct ona yst s D s n* In Foun at ons an Front rs n Instru t ona o put n st s nn H an Jon s E s

G Harr son *A apt n Instruct on to t tu nt s Capab t s* In Journa o Art n a E u at on n E u at on o pp Asso at on or t A van nt o Co put n n E u at on r ss

Go st n I *G n t c Grap a r pr s ntat on or t vo ut on o proc ura now* In D an an J Brown E s Int nt utor n st s w Yor A a r ss

aur ar D *t n n n v rs ty ac n a ra wor or t us o ucat ona t c no o y* out on on

nn son D C r st ns n D an ar I *M nn sota A apt v Instruct ona yst An Int nt CBI syst* In Journa o Co put r Bas Instru t on pp

ots *M n n oc ty D v op nt o H r syc o o ca roc ss s* Co Jo n t n r r n r ou r an E E s Harvar n v rs t r ss Ca r ass

In A Jonat an How Jos p A oo s E t t Hous ap rs Gra uat s arc n t Co n t v Co put n c nc s at uss n v rs t o uss oo o Co n t v Co put n n s Br ton K s ar ap C

Creativity in Writing

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1 Introduction

oa o t s r s ar s to stab s a o putat ona o o t r at v pro ss n arts n t r s o En a an t v stat s n part u ar n t n o wr t n En a stat an s r b as a stat n w t art st s nvo v nt ns n t pro u t on o at r a r at to s r tas to bu a p o us to wr t a stor t u pro u t on o at r a s u b ta t onstra nts u tura ba roun or t us o a sp n st or t n qu us a t ou v r bo an p r n su stat s n t as o art sts so o t s ta t onstra nts ar t r su t o ars o p r n t v op nt o rta n s s an t tra n n n sp n ar as w a ow t to pro u wor s o art w ar n u t to a n b n pro u b t a an t v stat an b s r b as a stat w r t art st ana s s an or va uat s s r wor a so t art st b rat p or s an trans or s a on ptua spa Bo n Dur n t s stat t r or art sts ar p b p t an ta t now su as us t or wr t n t n qu s t w t av arn ur n t r tra n n an p r n as art sts

2 Hypothesis and Research Questions

3 Antecedents

r p a o a prob so v n as t u o t ou t G

Cop an , A *at to st n or n Mus c* w A r an .brar , w Yor

G rnt r. D *Mus n t Mac n* Fourt Estat , on on

Hart , J, Brant wa t , A ps o o st as wor s t a qu st onna r stu o t wr t n strat s o pro u t v br t s ps o o sts *H r E ucat on*

t , F *r t n an t r t r* EA ub s r on on

p n r a n o a po In G s n E , *Cr at v roc ss* n v rs t o Ca orn a r ss B r

ason C p n t ou ts on t wr t n pro ss In Gr , E t nb r , E E s , *Co n t v roc ss s n r t n* EA ub s rs

s r , *Cr at v ty B yon t yt o n us* H Fr an an Co pan

, arr n A *ory o L t ratur* r t on Harv st w Yor

In A Jonat an How Jos p A oo s 5 *E t t Hous ap rs Gra uat s arc n t Co n t v Co put n c nc s at uss x* n v rs t o uss oo o Co n t v Co put n n s Br ton K s ar ap r C t b st no o a t no s t at ou poss b av b n r vant to t or r no s a s to a n ra sat on about p rt ts an n or at on r tr va s st s t at n or r to t r n ow a ss b a no or o u nt s ou b t s n ssar to ant pat a t r u stan s n w a us r w want to or n to a ss t no or o u nt As r van s asur n t r s o a us r s n or at on n t s ans t at t o at on o a no n a p rt t or t n n o a

In a o b n n or at on r tr va an p rt t s st a o t o u nts s ou av an n or at on ont nt r pr s ntat on How v r t s not n ssar t as t at a t o u nts w b or an s nto a p rt t stru tur or t at t r w b on on p rt t stru tur In a ass v p rt t s st t s un t at an aut or w av a n o pass n now o t o t on o o u nts so t at w n t aut or r at s a n w no t r s a uarant t at t no w b n to a ot r asso at no s an v v rsa at s or to app n s t at t aut or w nt t ost appropr at p a to o at t no v n t aut or s now o so o a topo o a

C ass	o orr t	a s us
a GH		D H I
a a r		D I
a		D G
GH a r		H K
v r tu ours		B E J
v r pato as		E A
bra n tu ours		B C G

ab II C ass n at on r su ts w n orr at atapo nt va u s ro t ab p a r ons w r us n t s r nant pro ra

C ass	o orr t
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GH a r	

4 Discussion

In t s stu t raw ata w r nt rpr t stat st a w t out a n an pr or u nts about t ata s ts w t t pt on o ass or n n t n w r t r su ts nt rpr t w t b o a now r su ts s own abov to t r w t pr v ous wor at t a How s

In A Jonat an How Jos p A oo s E t t *Hous ap rs Gra uat s arc n t Co n t v Co put n c nc s at uss x* n v rs t o uss oo o Co n t v Co put n n s Br ton K s ar ap r C

An Evolved Dynamical Electronic Robot Control System

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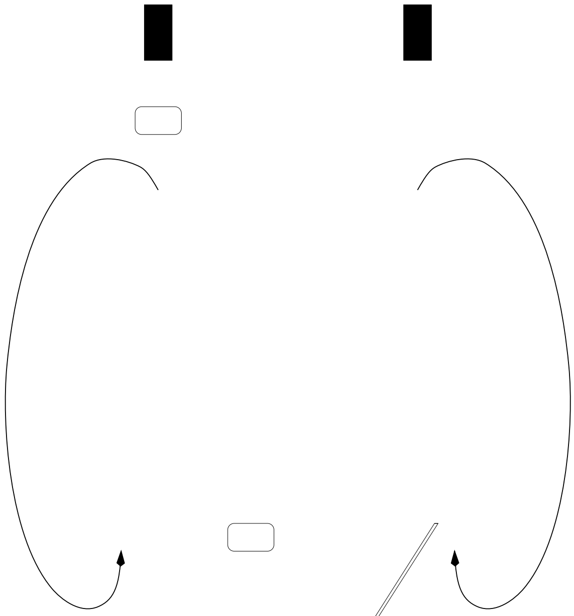

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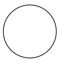

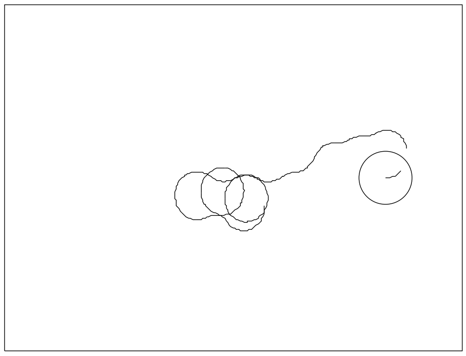

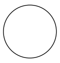

t v n ss o t s approa str n t ns ar r proposa s t at vo vab ar war ust s a ra a r t n n o t natur o tron s st s an onstra nts on t na s an p s a or an sat on o t r u t an b str pp awa r v a n t tru pow r o t un r n ar war

vo v ontro r b ts a rta n a ount o to ran to au ts n t A p art o t s ar s s ro t na s o vo v n popu at ons un r rta n r u stan s an s t sub t o on o n r s ar Evo v s st s an b as u as ss s ns t v to au ts t an qu va nt s st s arr v at b non vo ut onar ans

Closing

s pap r as a to v an as ov rv w o so o t as o vo vab ar war How v r t r ar p ssu s to b pon r an ar prob s to b ta at a sta s o t s r s ar t s un art t rr tor ontro s st s r b abov was t rst v r vo v ar war robot ontro r v rt ss t r s t r a prosp t o b n ab to pro u pow r u n w n s o tron s st s b art a vo ut on t at annot b pro u b u an s n

Acknowledgements

s r s ar s un b a s o ars p ro t oo o Co n t v an Co put n n s or

In A Jonat an How Jos p A oo s E t t Hous ap rs Gra uat s arc n t Co n t v Co put n c nc s at uss n v rs t o uss oo o Co n t v Co put n n s Br ton K s ar ap C

Showtree, the Next Generation

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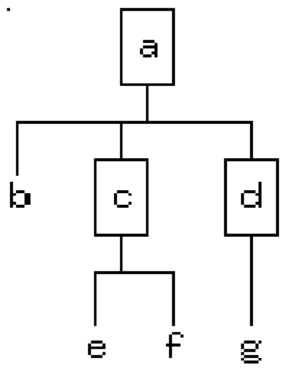
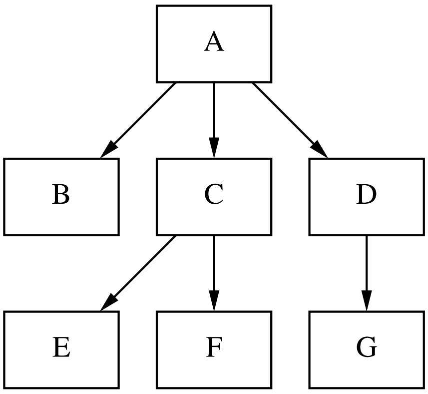
Abstract owtr s prov b op o or sp a n tr s but t as rta n p t tat ons s pap r propos s an a t rnat v Dott w s or n ra t an owtr an p r ts nt ra t v rap a an pu at on v a X w n ows Hav n s own t at Dott as w r tat ons t an owtr w a n t pra t a prob s o us n Dott ro op o

1 Introduction

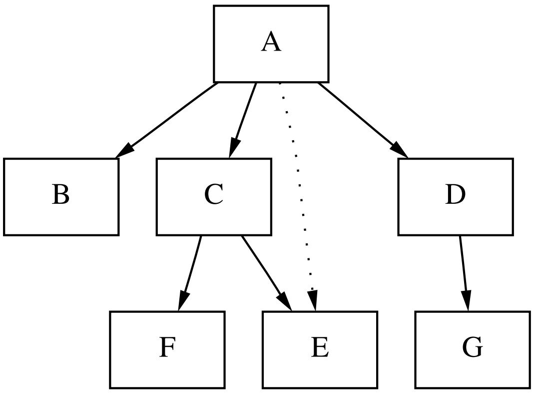
at at a a rap $\mathcal{G}(\mathcal{N},\mathcal{E})$ s m as a s t o no s ($\mathcal{N}$) an a s t o s ($\mathcal{E}$) o n n no s to t r o s an s a av a t ona prop rt s an su a rap s a a ab or o our rap It o ows ro t s t at a rap s ust a s t o r at ons ps w a b an pu at at a How v r rap s a so t n to o ur r qu nt n s n An a p t av no s o p op w t ssp p t p a



F ur owtr sa p tr



F ur Dott sa p tr



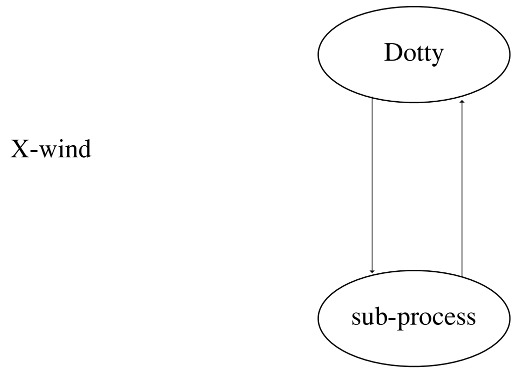
F ur Dott a tr

F ur s ows t sa tr as F ur n Dott ot t at a n t ott *AE* s F ur r su ts n a rap Dott an st sp a but t s no on r a tr an annot b sp a b owtr

B or s uss n Dott n or ta t s wort po nt n out t at t tat ons nt n n owtr o not app s n

- Dott an pro u output n ost r pt w s as sp a on an r nt v s s or a p o as
- Dott s pro ra ab an an b a to r spon to ous s
- Dott s not t to tr s as F ur s ows
- An arb trar rap annot b r pr s nt on a p o pap r w t out n ross n s Dott tr s to r u n ross n s

As supp b A Dott s n a t a rap v sua sat on o a o n o s p a


X-wind
Dotty
sub-process

3.1 Commands to Dotty

```
define showtree_to_dotty ( list ) -> name ;
;;; This procedure takes input in the form of
;;; showtree, and converts it to a series of
;;; output statements, that model the input to
;;; dotty. Preamble and postamble are ignored.

;;; list is the input list
;;; name is named head of the list
    lvars list, name ;

;;; declare head and tail of list
;;; and loop iterator
    lvars _hd, _tl, item ;

;;; if input is just an element, use this as the name
    if atom ( list ) then
        list -> name ;
    else

;;; split the list into head and tail
        dest ( list ) -> _tl -> _hd ;

;;;     if head is an element, then
        if atom ( _hd ) then
;;;         name the head as given
            _hd -> name ;
        else
;;;         generate a new node for the unnamed element
            gensym ( "void" ) -> name ;
;;;         and use the list as the list's tail
            list -> _tl ;
        endif ;

        for item in _tl do
;;;         find the name of the element, and print it
            lvars name2 = showtree_to_dotty ( item ) ;
            printf ( '%P -> %P\n', [% name, name2 %] ) ;
        endfor ;

    endif ;

enddefine ;
```

F ur Bas A or t owtr nput to Dott s nput