THE EIGHTH WHITE HOUSE PAPERS
Graduate Research in the Cognitive and Computing Sciences at Sussex

editors:

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Preface

Ea ar s n C G ra uat stu nts av n t n at uss n v rs t s on r n
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o Co n t v Co put n n s Br ton K s ar ap r C

From Genotype to Neural Network through Hierarchical Organisation

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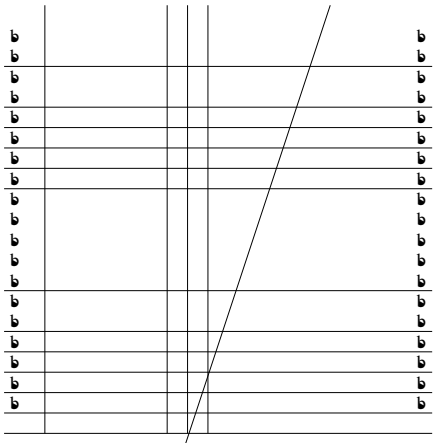
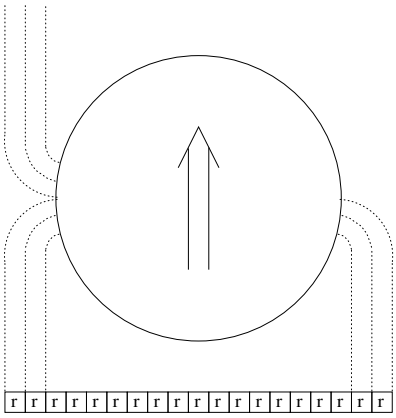


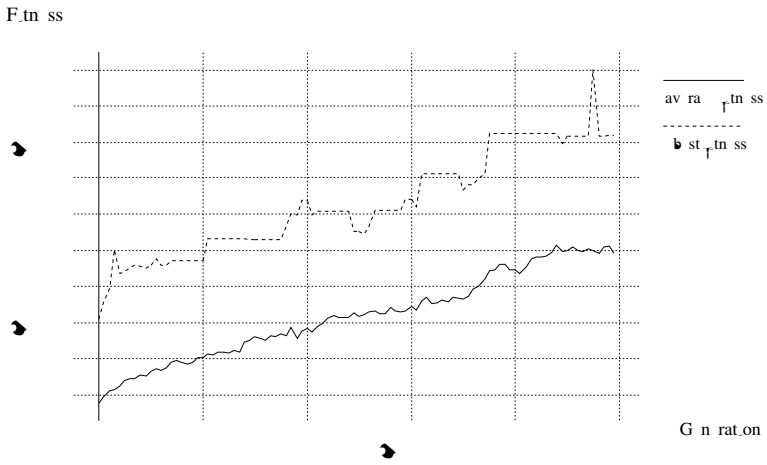


In addition to providing neurites with the ability to grow, growth cones also have the ability to:

- Interact with the environment
- Move towards or away from certain molecules
- Interact with other neurites, either making synaptic connections or causing them to withdraw
- Interact with glial cells and other types of cells
- Respond to electrical fields

The Causes of Neurite Behaviour

The behaviour of neurites when presented with a particular stimulus is determined by both the nature of the stimulus and the internal state of the neurite. For example, a neurite may be attracted towards a particular molecule at one point in its development, but repelled by the same molecule at a later point in its development. Two factors are responsible for the ability of neurites to behave differently when presented with the same stimulus: the presence of receptors for the stimulus on the growth cone and the internal signalling mechanisms that are activated when the receptors are stimulated. Neurites can only respond to molecules in the environment if they have the appropriate receptors on their growth cones. Neurites can also change the way they respond to a particular molecule by changing the internal signalling mechanisms that are activated when the receptor is stimulated. For example, a neurite may be attracted towards a particular molecule because the receptor for that molecule is coupled to internal signalling mechanisms that cause the growth cone to move towards the source of the molecule. However, if the internal signalling mechanisms are changed, the same receptor may cause the growth cone to move away from the source of the molecule.



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References

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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 0 c J*

References

In A Jonat an How -- Jos p A oo s E t t Hous ap rs Gra
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o Co n t v Co put n n s Br ton K s ar ap r C

Automatic Debugging of Multiple-Function Programs

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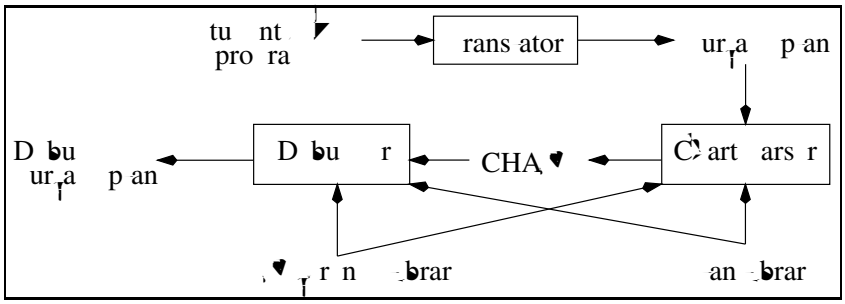
Abstract s pap r r ports on an nt nt bu n s st bas on t p an a u us or a s at rs or auto at a t t n an orr t n s ant rrors n nov stu nt pro ra s wr tt n n Its o put r p ntat on s a E I Y p a n t ov ra stru tur o t s st an v an ov rv w o t a opt t n qu or bu n s n un t on pro ra s a so s uss t approa 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 I Y 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 I Y 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 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 I Y

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 Y 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

When a new activation record is created in EMILY, transfers the control to the parser activation record which is used as an input prompt for the parser to parse the sentence to be given to the function in the parser's current activation record. The parser parses the sentence and returns the control to the parser which checks whether the function to be activated is present in the current activation record. If it is present, then the parser activates the function and starts executing the instructions in the function. Otherwise EMILY continues executing the instructions in the current activation record.

5.4 Dealing with a Wrong Function Call

If the task of the activation record at the top of the runtime stack is to execute the function call, then it checks whether the function to be executed is present in the current activation record. If it is not present, then it sends a message to the parser activation record to find out which function is to be executed. The parser activation record then sends a message to the tutor activation record which in turn sends a message to the user. Having noticed that the first process was not executing successfully, EMILY asks the user whether the parser has parsed the sentence correctly or not. If the user replies in the negative, then the parser activation record is asked to find out the function to be executed. The parser activation record sends a message to the tutor activation record which in turn sends a message to the user asking him to specify the function to be executed. The user specifies the function to be executed. The parser activation record then sends a message to the tutor activation record which in turn sends a message to the user asking him to specify the function to be executed. The user specifies the function to be executed.

6 Experimenting with EMILY

We have tested EMILY on a number of programs. In order to test the way we have taken a corpus of student programs which were written to solve the problem of finding an Italian noun that is to be assigned an appropriate article according to the first letter of the following Italian noun that is to be assigned an appropriate article according to the first letter of the following noun. The programs were written by students who took an introductory course in computer programming at the University of Pune. The students were asked to write the programs in the form of a function which takes a noun as its parameter and returns the appropriate article as the result. The function was then tested on a number of nouns. The results were as follows:

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 Y 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 Y 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 Y 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

ar s a D u t 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 pta b t o at an b app to r a onsu r so twar app at ons pro b s r su t n n t tw n b n nts o as o us or t n us 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*

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In A Jonat an How Jos p A oo s E t t Hous ap rs Gra
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o Co n t v Co put n n s Br ton K s ar ap r 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

For instance, in natural language assistant applications, users often make implicit assumptions about the context in which a natural language system is supposed to operate—assumptions that rarely get communicated explicitly.

Winston's table

Large-scale statistical models of translation have recently grown increasingly sophisticated, incorporating syntactic structure into statistical alignment models. Many of these models are forced to make drastic independence assumptions in order to maintain computational tractability.

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

A F E 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 nt 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 R.

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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*
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In A Jonat an How Jos p A oo s E t t Hous ap rs Gra
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o Co n t v Co put n n s Br ton K s ar ap r C

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

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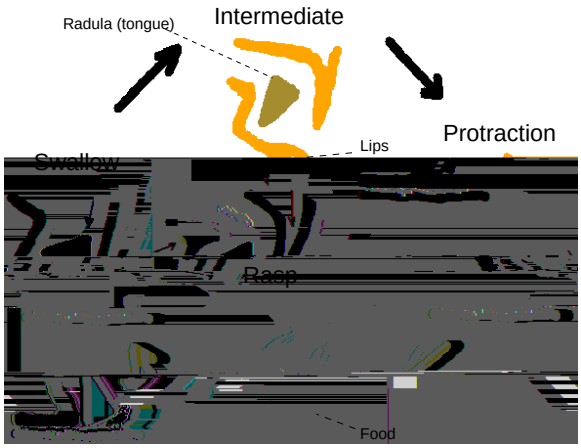
1 Introduction

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

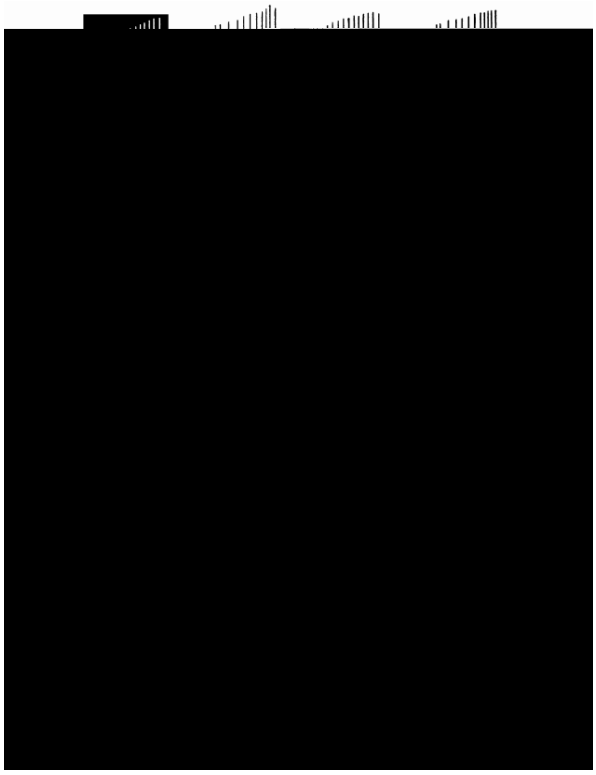
Ly na a s a brows n rb vor t at s on sub r a a n s or oat n v tat on Dur n n t bu a ass pr or s a st r ot p s r s o r t ov nts as p t nt artoon s own n n ur s s r p at or un r s o s as t an a ov s ov r t oo substrat t p a ov n ts a ro s to s ov nts w r su t n oo b n s oop nto t out an swa ow a b v up 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 anb 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 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

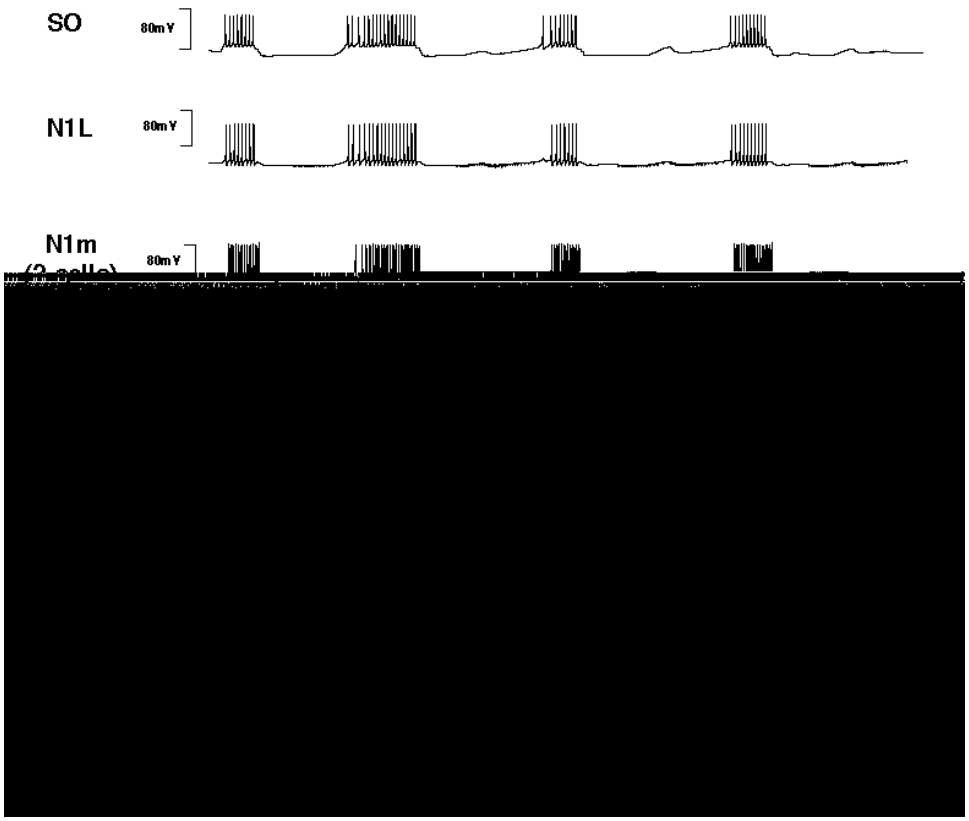
3 Electrophysiology

C bo s n *Ly na a* ar t p a ar an r a nt nb 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 rn 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 v rs_t o u ar prop rt_ s _n 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 arrows For a p rst tra to t s at o s ow os _ator o u ator arrows _n _at a s naps s w



F_ur o -- patt rn a t_v_t r_v n b t̀ ow s _-ator -- 4 nA o_f s_ u at urr nt _n t_on to t̀ -- t̀ rou ̀out t̀ _s tra r_v s a patt rn s_ _ar to t̀ at as s n _n _so at pr parat_ons

an arb_trar nu b r o_f sp _nab- vo ta p n nt on u tan s urons ar -n w_t̀ o -- ̀ _a-an - tr_ a-s naps s ost s napt_ pot nt_a s s ar o -- b t̀ so ut_on o_f a s on or r _rr r nt_a- quat_on an ar p n nt on t̀ urat_on o_f t̀ pr s napt_ sp_ ̀ approa ̀ ̀as b n to start w_t̀ a _n_ a- o -o_f t̀ patt rn_n n twor_ an a o p- _t_ on -at a t_ ̀ r sp _n b_op̀ s_ a-prop rt_ s ar un nown_ t̀ ov ra-- _rr_n ̀ara t r_st_ s o_f t̀ --̀av b n r pro u us_n a o b_nat_on o_f appropr_at vo ta p n nt on u tan s As w_t̀ t̀ _rr_n ̀ara t r_st_ s_ s pro u _ro t̀ ̀ _a-s naps s̀av b n o -- to at ̀ ata_ro _ntra -u ar r or_n s ̀ urr nt o -r pro u s t̀ obs rv p̀ s_o o _a- ata on a n twor -v - output_ro t̀ o -s̀own_n _n ur _ _n u _n p r_ nta- obs rvat_ons su ̀ as t̀ patt rn r_v_n ab_-t o_f t̀ -s an patt rn rapprop rt_rn nt u

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

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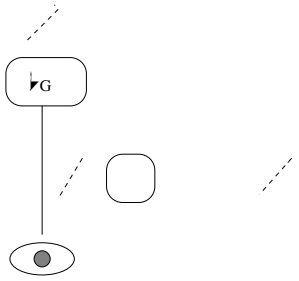
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E E	Corr at burst n a t v t b ns on p r sona o un at on
E	F rst r t na a ons r a t G Dur n n t two w s t r s ons rab ov r ap ost s n A an A ar b no u ar r an p
E	Fun t ona s napt trans ss on b tw n an on a on an G n uron atz p
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References

B a or C Coop 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 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* C pp

E n o n t v op nt o t at at ra n u at nu us w t bb an arn n r p C oo o Co n t v an Co put n n s uss n v rs t

Ga a pontan ous I pu s A t v t o at t na Gan on C s n r nata *c nc*

Ga ar a A a r n s n t r nn rvat on o t o ns opt t tu b r n rat n opt n rv br s *Exp r nta Bra n s arc*

ur Garra t E o A E p r nta n u v sua pro t ons nto au tor
t a a us an ort *c nc*

on r a s ur C n r r n p s o ort a n twor or an at on In a
n r E s *urob o o yo ocort x* pp

In A Jonat an How -- Jos p A oo s E t t Hous ap rs Gra

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 b 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 ab 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 b r o n s s a un ts s ou v p r or an an a so a v at t prob 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 b r o n s to t r w t s t on usab 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 4

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 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

Bru *co n s n Fac s* awr n Er bau Asso at s

Bru Youn A n rstan n a r o n t on *Br t s Journa o syc o o y*

Dau an J G Co p t s r t D abor trans or s b n ura n twor s or a ana s s an o pr ss on *IEEE ransact ons on Acoust cs p c an na roc ss n*

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 n as a n o opt

References

Dav_s_ t nstrup_ In orporat_n prob sp _n now _nto n t_ a or_ s

In A Jonat an How Jos p A oo s E t t Hous ap rs Gra
uat s arc nt Co nt 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

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

The reason no one before has been able to solve the problem of the relation between mind and body is that they have always tried to think of Cartesian man as a composite of two aspects or two elements, both of which are substantive or pure objects. Except as an abstraction, the unity of mind and body is destroyed. The presence of the mind in the body is the presence of the subject in a situation. The mind is not an entity, but a process, the process of unification of the body and the world, or the anonymous or impersonal

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 t bo

ar not s ut up w n t boun ar s o s n ar op n to an v n nt rtw n w t wor
w s w t an app n t at an nstru nt a a or v n a ar o s a tru t ns on o
p no na o an s o nta ar to b oun not on ns o n r s

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_bn r oub r an E E s Harvar n v rs t r ss Ca br 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 r 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 b 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 55 *at to st n or n Mus c* w A r an brar w Yor

G rnt 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 on on

p n 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 s
Co n t v roc ss s n r t n EA ub s rs

sb 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 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

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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
ra 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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a a r	
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4 Discussion

In this study, raw data were interpreted statistically without any an prior assumptions about the data sets, with the exception of assigning an a priori interpretation to the below-chance results shown above to the previous work at hand. However

In A Jonat an How -- Jos p A oo, s , 5 E t t Hous ap rs Gra
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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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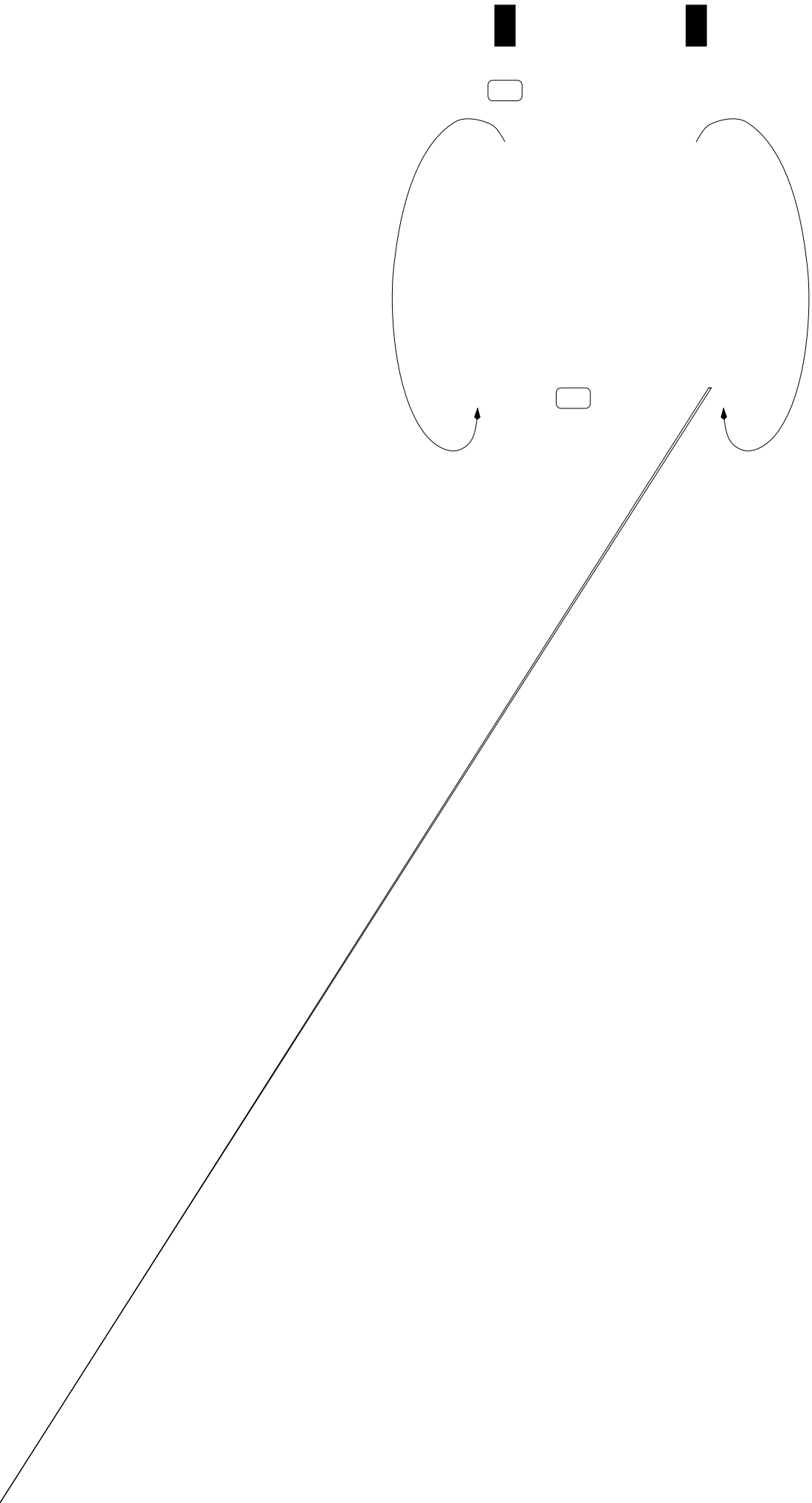

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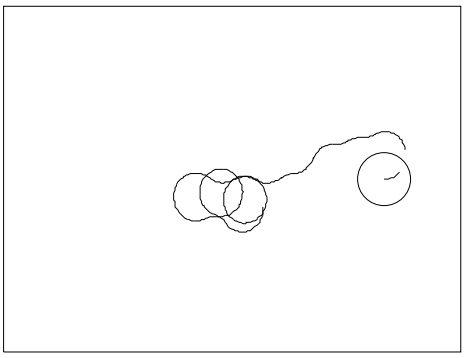

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o Co n t v Co put n n s Br ton K s ar ap r C

Showtree, the Next Generation

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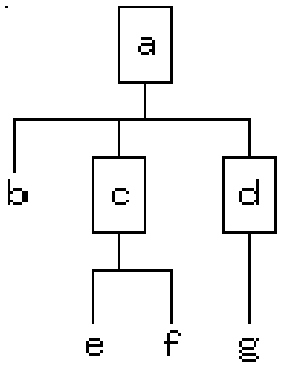
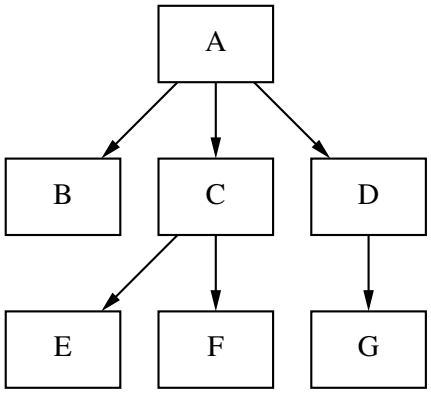
Abstract owtr s prov b op o or sp a n tr s but t as rta n p t tat ons s pap r propos s an a t rnat v Dott w s or n ra t an owtr an p r ts nt ra t v rap a an pu at on v a X w n ows Hav n s own t at Dott as w r tat ons t an owtr w a n t pra t a prob s o us n Dott ro op o

1 Introduction

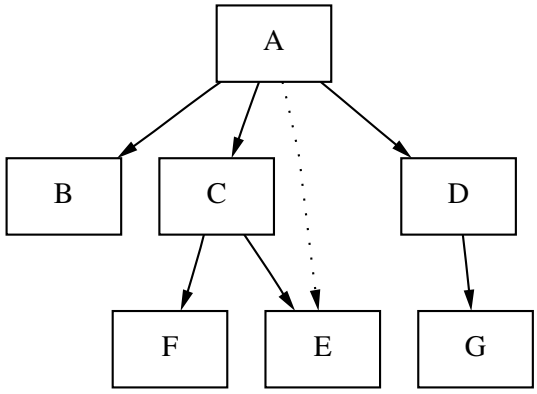
at at a a rap $\mathcal{G}(\mathcal{N},\mathcal{E})$ s m as a s t o no s ($\mathcal{N}$) an a s t o s ($\mathcal{E}$) o n n no s to t r o s an s a av a t ona prop rt s an su a rap s a a ab or o our rap It o ows ro t s t at a rap s ust a s t o r at ons ps w a b an pu at at at a How v r rap s a so t n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

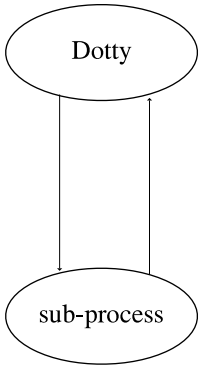
F_ ur s ows t sa tr as F_ ur n Dott ot_ t at a n t ott *AE_* s F_ ur _r su ts n a rap Dott an st_ sp a_ but t s no on r a tr an annot b sp a b owtr

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



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