

# Autonomous Robots

## Disambiguation of Human Intent Through Control Space Selection

--Manuscript Draft--

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<b>Abstract:</b>	<p>Assistive shared-control robots have the potential to transform the lives of millions of people afflicted with severe motor impairments as a result of spinal cord or brain injuries. The effectiveness and usefulness of shared-control robots is closely related to their ability to infer the user's needs and intentions and is often a limiting factor for providing appropriate assistance quickly, confidently and accurately. The contributions of this paper are three-fold: first, we propose a goal disambiguation algorithm which enhances the intent inference and assistive capabilities of a shared-control assistive robotic arm. Second, we introduce a novel intent inference algorithm that works in conjunction with the disambiguation scheme, inspired by dynamic field theory in which the time evolution of the probability distribution over goals is specified as a dynamical system. Third, we present a pilot human subject study to evaluate the efficacy of the disambiguation system. This study was performed with eight subjects. Our results suggest that (a) the disambiguation system has a greater utility value as the control interface becomes more limited and the task becomes more complex, (b) subjects demonstrated a diverse range of disambiguation request behavior with a greater concentration in the earlier parts of the trial and (c) there are no differences in the onset of robot assistance between different mode switching paradigms across tasks or across interfaces.</p>	
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4 This is pdfTeX, Version 3.14159265-2.6-1.40.16 (TeX Live 2015/W32TeX)
5 (preloaded format=pdflatex 2016.4.4)  1 DEC 2017 23:57
6 entering extended mode
7   restricted \writel8 enabled.
8   %&-line parsing enabled.
9 **./gopinathargallauro2017_2.tex
10 (./gopinathargallauro2017_2.tex
11 LaTeX2e <2016/03/31>
12 Babel <3.9q> and hyphenation patterns for 81 language(s) loaded.
13 (c:/TeXLive/2015/texmf-dist/tex/latex/base/fix-cm.sty
14 Package: fix-cm 2015/01/14 v1.1t fixes to LaTeX
15 (c:/TeXLive/2015/texmf-dist/tex/latex/base/tslenc.def
16 File: tslenc.def 2001/06/05 v3.0e (jkk/car/fm) Standard LaTeX file
17 )) (./svjour3.cls
18 Document Class: svjour3 2007/05/08 v3.2
19 LaTeX document class for Springer journals
20 (c:/TeXLive/2015/texmf-dist/tex/latex/base/fleqn.clo
21 File: fleqn.clo 2015/03/31 v1.1i Standard LaTeX option (flush left
22 equations)
23 \mathindent=\dimen102
24 Applying: [2015/01/01] Make \[ robust on input line 50.
25 LaTeX Info: Redefining \[ on input line 51.
26 Already applied: [0000/00/00] Make \[ robust on input line 62.
27 Applying: [2015/01/01] Make \] robust on input line 74.
28 LaTeX Info: Redefining \] on input line 75.
29 Already applied: [0000/00/00] Make \] robust on input line 83.
30 )
31 Class Springer-SVJour3 Info: extra/valid Springer sub-package (-> *.clo)
32 (Springer-SVJour3) not found in option list of \documentclass
33 (Springer-SVJour3) - autoactivating "global" style.
34 (./svglov3.clo
35 File: svglov3.clo 2009/12/18 v3.2 style option for standardised journals
36 SVJour Class option: svglov3.clo for standardised journals
37 )
38 LaTeX Font Info: Redefining math symbol \Gamma on input line 147.
39 LaTeX Font Info: Redefining math symbol \Delta on input line 148.
40 LaTeX Font Info: Redefining math symbol \Theta on input line 149.
41 LaTeX Font Info: Redefining math symbol \Lambda on input line 150.
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44 LaTeX Font Info: Redefining math symbol \Sigma on input line 153.
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46 LaTeX Font Info: Redefining math symbol \Phi on input line 155.
47 LaTeX Font Info: Redefining math symbol \Psi on input line 156.
48 LaTeX Font Info: Redefining math symbol \Omega on input line 157.
49 \logodepth=\dimen103
50 \headerboxheight=\dimen104
51 \betweenumberspace=\dimen105
52 \aftertext=\dimen106
53 \headlineindent=\dimen107
54 \c@inst=\count79
55 \c@auth=\count80
56 \instindent=\dimen108
57 \authrun=\box26
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4 \authorrunning=\toks14
5 \titrun=\box27
6 \titlerunning=\toks15
7 \combirun=\box28
8 \c@lastpage=\count81
9 \rubricwidth=\dimen109
10 \c@section=\count82
11 \c@subsection=\count83
12 \c@subsubsection=\count84
13 \c@paragraph=\count85
14 \c@subparagraph=\count86
15 \spthmsep=\dimen110
16 \c@theorem=\count87
17 \c@case=\count88
18 \c@conjecture=\count89
19 \c@corollary=\count90
20 \c@definition=\count91
21 \c@example=\count92
22 \c@exercise=\count93
23 \c@lemma=\count94
24 \c@note=\count95
25 \c@problem=\count96
26 \c@property=\count97
27 \c@proposition=\count98
28 \c@question=\count99
29 \c@solution=\count100
30 \c@remark=\count101
31 \c@figure=\count102
32 \c@table=\count103
33 \abovecaptionskip=\skip41
34 \belowcaptionskip=\skip42
35 \figcapgap=\dimen111
36 \tabcapgap=\dimen112
37 \figgap=\dimen113
38 \bibindent=\dimen114
39 \@tempcntc=\count104
40 ) (c:/TeXLive/2015/texmf-dist/tex/latex/natbib/natbib.sty
41 Package: natbib 2010/09/13 8.31b (PWD, AO)
42 \bibhang=\skip43
43 \bibsep=\skip44
44 LaTeX Info: Redefining \cite on input line 694.
45 \c@NAT@ctr=\count105
46 ) (c:/TeXLive/2015/texmf-dist/tex/latex/graphics/graphicx.sty
47 Package: graphicx 2014/10/28 v1.0g Enhanced LaTeX Graphics (DPC,SPQR)
48 (c:/TeXLive/2015/texmf-dist/tex/latex/graphics/keyval.sty
49 Package: keyval 2014/10/28 v1.15 key=value parser (DPC)
50 \KV@toks@=\toks16
51 ) (c:/TeXLive/2015/texmf-dist/tex/latex/graphics/graphics.sty
52 Package: graphics 2016/01/03 v1.0q Standard LaTeX Graphics (DPC,SPQR)
53 (c:/TeXLive/2015/texmf-dist/tex/latex/graphics/trig.sty
54 Package: trig 2016/01/03 v1.10 sin cos tan (DPC)
55 ) (c:/TeXLive/2015/texmf-dist/tex/latex/latexconfig/graphics.cfg
56 File: graphics.cfg 2010/04/23 v1.9 graphics configuration of TeX Live
57 )
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4 Package graphics Info: Driver file: pdftex.def on input line 95.
5 (c:/TeXLive/2015/texmf-dist/tex/latex/pdftex-def/pdftex.def
6 File: pdftex.def 2011/05/27 v0.06d Graphics/color for pdfTeX
7 (c:/TeXLive/2015/texmf-dist/tex/generic/oberdiek/infwarerr.sty
8 Package: infwarerr 2010/04/08 v1.3 Providing info/warning/error messages
9 (HO)
10 ) (c:/TeXLive/2015/texmf-dist/tex/generic/oberdiek/ltxcmds.sty
11 Package: ltxcmds 2011/11/09 v1.22 LaTeX kernel commands for general use
12 (HO)
13 )
14 \Gread@gobject=\count106
15 ))
16 \Gin@req@height=\dimen115
17 \Gin@req@width=\dimen116
18 ) (c:/TeXLive/2015/texmf-dist/tex/latex/amsfonts/amssymb.sty
19 Package: amssymb 2013/01/14 v3.01 AMS font symbols
20 (c:/TeXLive/2015/texmf-dist/tex/latex/amsfonts/amsfonts.sty
21 Package: amsfonts 2013/01/14 v3.01 Basic AMSFonts support
22 \@emptytoks=\toks17
23 \symAMSa=\mathgroup4
24 \symAMSb=\mathgroup5
25 LaTeX Font Info: Overwriting math alphabet '\mathfrak' in version
26 'bold'
27 (Font)
28 U/euf/m/n --> U/euf/b/n on input line 106.
29 )) (c:/TeXLive/2015/texmf-dist/tex/latex/amsmath/amsmath.sty
30 Package: amsmath 2016/03/10 v2.15b AMS math features
31 \@mathmargin=\skip45
32 For additional information on amsmath, use the '?' option.
33 (c:/TeXLive/2015/texmf-dist/tex/latex/amsmath/amstext.sty
34 Package: amstext 2000/06/29 v2.01 AMS text
35 (c:/TeXLive/2015/texmf-dist/tex/latex/amsmath/amsgen.sty
36 File: amsgen.sty 1999/11/30 v2.0 generic functions
37 \@emptytoks=\toks18
38 \ex@=\dimen117
39 )) (c:/TeXLive/2015/texmf-dist/tex/latex/amsmath/amsbsy.sty
40 Package: amsbsy 1999/11/29 v1.2d Bold Symbols
41 \pmbraise@=\dimen118
42 ) (c:/TeXLive/2015/texmf-dist/tex/latex/amsmath/amsopn.sty
43 Package: amsopn 2016/03/08 v2.02 operator names
44 )
45 \inf@bad=\count107
46 LaTeX Info: Redefining \frac on input line 199.
47 \uproot@=\count108
48 \leftroot@=\count109
49 LaTeX Info: Redefining \overline on input line 297.
50 \classnum@=\count110
51 \DOTSCASE@=\count111
52 LaTeX Info: Redefining \ldots on input line 394.
53 LaTeX Info: Redefining \dots on input line 397.
54 LaTeX Info: Redefining \cdots on input line 518.
55 \Mathstrutbox@=\box29
56 \strutbox@=\box30
57 \big@size=\dimen119
58 LaTeX Font Info: Redefining font encoding OML on input line 634.
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4 LaTeX Font Info: Redefining font encoding OMS on input line 635.
5
6 Package amsmath Warning: Unable to redefine math accent \vec.
7
8 \macc@depth=\count112
9 \c@MaxMatrixCols=\count113
10 \dotsspace@=\muskip10
11 \c@parentequation=\count114
12 \dspbrk@lvl=\count115
13 \tag@help=\toks19
14 \row@=\count116
15 \column@=\count117
16 \maxfields@=\count118
17 \andhelp@=\toks20
18 \eqnshift@=\dimen120
19 \alignsep@=\dimen121
20 \tagshift@=\dimen122
21 \tagwidth@=\dimen123
22 \totwidth@=\dimen124
23 \lineht@=\dimen125
24 \@envbody=\toks21
25 \multlinegap=\skip46
26 \multlinetaggap=\skip47
27 \mathdisplay@stack=\toks22
28 LaTeX Info: Redefining \[ on input line 2739.
29 LaTeX Info: Redefining \] on input line 2740.
30 ) (c:/TeXLive/2015/texmf-dist/tex/latex/base/latexsym.sty
31 Package: latexsym 1998/08/17 v2.2e Standard LaTeX package (lasy symbols)
32 \symlasy=\mathgroup6
33 LaTeX Font Info: Overwriting symbol font `lasy' in version `bold'
34 (Font) U/lasy/m/n --> U/lasy/b/n on input line 52.
35 ) (c:/TeXLive/2015/texmf-dist/tex/latex/float/float.sty
36 Package: float 2001/11/08 v1.3d Float enhancements (AL)
37 \c@float@type=\count119
38 \float@exts=\toks23
39 \float@box=\box31
40 \@float@everytoks=\toks24
41 \@floatcapt=\box32
42 ) (c:/TeXLive/2015/texmf-dist/tex/latex/graphics/epsfig.sty
43 Package: epsfig 1999/02/16 v1.7a (e)psfig emulation (SPQR)
44 \epsfxsize=\dimen126
45 \epsfysize=\dimen127
46 ) (c:/TeXLive/2015/texmf-dist/tex/latex/subfigure/subfigure.sty
47 Package: subfigure 2002/03/15 v2.1.5 subfigure package
48 \subfigtopskip=\skip48
49 \subfigcapskip=\skip49
50 \subfigcaptopadj=\dimen128
51 \subfigbottomskip=\skip50
52 \subfigcapmargin=\dimen129
53 \subfiglabelskip=\skip51
54 \c@subfigure=\count120
55 \c@lofdepth=\count121
56 \c@subtable=\count122
57 \c@lotdepth=\count123
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*****
* Local config file subfigure.cfg used *
*****
(c:/TeXLive/2015/texmf-dist/tex/latex/subfigure/subfigure.cfg)
\subfig@top=\skip52
\subfig@bottom=\skip53
) (c:/TeXLive/2015/texmf-dist/tex/latex/mathtools/mathtools.sty
Package: mathtools 2015/11/12 v1.18 mathematical typesetting tools
(c:/TeXLive/2015/texmf-dist/tex/latex/tools/calc.sty
Package: calc 2014/10/28 v4.3 Infix arithmetic (KKT,FJ)
\calc@Acount=\count124
\calc@Bcount=\count125
\calc@Adimen=\dimen130
\calc@Bdimen=\dimen131
\calc@Askip=\skip54
\calc@Bskip=\skip55
LaTeX Info: Redefining \setlength on input line 80.
LaTeX Info: Redefining \addtolength on input line 81.
\calc@Ccount=\count126
\calc@Cskip=\skip56
) (c:/TeXLive/2015/texmf-dist/tex/latex/mathtools/mhsetup.sty
Package: mhsetup 2010/01/21 v1.2a programming setup (MH)
)
LaTeX Info: Thecontrolsequence`\'isalreadyrobust on input line 129.
LaTeX Info: Thecontrolsequence`\)'isalreadyrobust on input line 129.
LaTeX Info: Thecontrolsequence`\['isalreadyrobust on input line 129.
LaTeX Info: Thecontrolsequence`\]'isalreadyrobust on input line 129.
\g_MT_multlinerow_int=\count127
\l_MT_multwidth_dim=\dimen132
\origjot=\skip57
\l_MT_shortvdotswithinadjustabove_dim=\dimen133
\l_MT_shortvdotswithinadjustbelow_dim=\dimen134
\l_MT_above_intertext_sep=\dimen135
\l_MT_below_intertext_sep=\dimen136
\l_MT_above_shortintertext_sep=\dimen137
\l_MT_below_shortintertext_sep=\dimen138
) (c:/TeXLive/2015/texmf-dist/tex/latex/bbm-macros/bbm.sty
Package: bbm 1999/03/15 V 1.2 provides fonts for set symbols - TH
LaTeX Font Info: Overwriting math alphabet '\mathbbm' in version
'bold'
(Font) U/bbm/m/n --> U/bbm/bx/n on input line 33.
LaTeX Font Info: Overwriting math alphabet '\mathbbmss' in version
'bold'
(Font) U/bbmss/m/n --> U/bbmss/bx/n on input line 35.
) (c:/TeXLive/2015/texmf-dist/tex/latex/lipsum/lipsum.sty
Package: lipsum 2014/07/27 v1.3 150 paragraphs of Lorem Ipsum dummy text
\c@lips@count=\count128
) (c:/TeXLive/2015/texmf-dist/tex/latex/adjustbox/adjustbox.sty
Package: adjustbox 2012/05/21 v1.0 Adjusting TeX boxes (trim, clip, ...)
(c:/TeXLive/2015/texmf-dist/tex/latex/xkeyval/xkeyval.sty
Package: xkeyval 2014/12/03 v2.7a package option processing (HA)
(c:/TeXLive/2015/texmf-dist/tex/generic/xkeyval/xkeyval.tex
(c:/TeXLive/2015/texmf-dist/tex/generic/xkeyval/xkvutils.tex

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4 \XKV@toks=\toks25
5 \XKV@tempa@toks=\toks26
6 )
7 \XKV@depth=\count129
8 File: xkeyval.tex 2014/12/03 v2.7a key=value parser (HA)
9 )) (c:/TeXLive/2015/texmf-dist/tex/latex/adjustbox/adjcalc.sty
10 Package: adjcalc 2012/05/16 v1.1 Provides advanced setlength with
11 multiple back
12 -ends (calc, etex, pgfmath)
13 ) (c:/TeXLive/2015/texmf-dist/tex/latex/adjustbox/trimclip.sty
14 Package: trimclip 2012/05/16 v1.0 Trim and clip general TeX material
15 (c:/TeXLive/2015/texmf-dist/tex/latex/collectbox/collectbox.sty
16 Package: collectbox 2012/05/17 v0.4b Collect macro arguments as boxes
17 \collectedbox=\box33
18 )
19 \tc@llx=\dimen139
20 \tc@lly=\dimen140
21 \tc@urx=\dimen141
22 \tc@ury=\dimen142
23 Package trimclip Info: Using driver 'tc-pdftex.def'.
24 (c:/TeXLive/2015/texmf-dist/tex/latex/adjustbox/tc-pdftex.def
25 File: tc-pdftex.def 2012/05/13 v1.0 Clipping driver for pdftex
26 ))
27 \adjbox@Width=\dimen143
28 \adjbox@Height=\dimen144
29 \adjbox@Depth=\dimen145
30 \adjbox@Totalheight=\dimen146
31 (c:/TeXLive/2015/texmf-dist/tex/latex/ifoddpage/ifoddpage.sty
32 Package: ifoddpage 2011/09/13 v1.0 Conditionals for odd/even page
33 detection
34 \c@checkoddpage=\count130
35 ) (c:/TeXLive/2015/texmf-dist/tex/latex/varwidth/varwidth.sty
36 Package: varwidth 2009/03/30 ver 0.92; Variable-width minipages
37 \@vwid@box=\box34
38 \sift@deathcycles=\count131
39 \@vwid@loff=\dimen147
40 \@vwid@roff=\dimen148
41 )) (c:/TeXLive/2015/texmf-dist/tex/generic/ulem/ulem.sty
42 \UL@box=\box35
43 \UL@hyphenbox=\box36
44 \UL@skip=\skip58
45 \UL@hook=\toks27
46 \UL@height=\dimen149
47 \UL@pe=\count132
48 \UL@pixel=\dimen150
49 \ULC@box=\box37
50 Package: ulem 2012/05/18
51 \ULdepth=\dimen151
52 ) (c:/TeXLive/2015/texmf-dist/tex/latex/wrapfig/wrapfig.sty
53 \wrapoverhang=\dimen152
54 \WF@size=\dimen153
55 \c@WF@wrappedlines=\count133
56 \WF@box=\box38
57 \WF@everypar=\toks28
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4 Package: wrapfig 2003/01/31 v 3.6
5 ) (c:/TeXLive/2015/texmf-dist/tex/latex/multirow/multirow.sty
6 \bigstrutjot=\dimen154
7 ) (c:/TeXLive/2015/texmf-dist/tex/latex/preprint/balance.sty
8 Package: balance 1999/02/23 4.3 (PWD)
9 \oldvsize=\dimen155
10 ) (c:/TeXLive/2015/texmf-dist/tex/latex/graphics/color.sty
11 Package: color 2016/01/03 v1.1b Standard LaTeX Color (DPC)
12 (c:/TeXLive/2015/texmf-dist/tex/latex/latexconfig/color.cfg
13 File: color.cfg 2007/01/18 v1.5 color configuration of teTeX/TeXLive
14 )
15 Package color Info: Driver file: pdftex.def on input line 143.
16 ) (c:/TeXLive/2015/texmf-dist/tex/latex/url/url.sty
17 \Urlmuskip=\muskip11
18 Package: url 2013/09/16 ver 3.4 Verb mode for urls, etc.
19 ) (c:/TeXLive/2015/texmf-dist/tex/latex/microtype/microtype.sty
20 Package: microtype 2013/05/23 v2.5a Micro-typographical refinements (RS)
21 \MT@toks=\toks29
22 \MT@count=\count134
23 LaTeX Info: Redefining \textls on input line 766.
24 \MT@outer@kern=\dimen156
25 LaTeX Info: Redefining \textmicrotypecontext on input line 1285.
26 \MT@listname@count=\count135
27 (c:/TeXLive/2015/texmf-dist/tex/latex/microtype/microtype-pdftex.def
28 File: microtype-pdftex.def 2013/05/23 v2.5a Definitions specific to
29 pdftex (RS)
30
31
32 LaTeX Info: Redefining \lsstyle on input line 915.
33 LaTeX Info: Redefining \lslig on input line 915.
34 \MT@outer@space=\skip59
35 )
36 Package microtype Info: Loading configuration file microtype.cfg.
37 (c:/TeXLive/2015/texmf-dist/tex/latex/microtype/microtype.cfg
38 File: microtype.cfg 2013/05/23 v2.5a microtype main configuration file
39 (RS)
40 ! Extra \else.
41 \XKV@wh@list ...r \expandafter \XKV@wh@list \else
42                                     \def #3{#6}\expandafter
43 \e...
44 1.64    }
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46
47 I'm ignoring this; it doesn't match any \if.
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49 ! Extra \else.
50 \XKV@wh@list ...r \expandafter \XKV@wh@list \else
51                                     \def #3{#6}\expandafter
52 \e...
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56 I'm ignoring this; it doesn't match any \if.
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5                                     \def #3{#6}\expandafter
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7 1.64      }
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19 ! Extra \else.
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21                                     \def #3{#6}\expandafter
22 \e...
23 1.64      }
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25 I'm ignoring this; it doesn't match any \if.
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27 ! Extra \else.
28 \XKV@wh@list ...r \expandafter \XKV@wh@list \else
29                                     \def #3{#6}\expandafter
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31 1.71      }
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33 I'm ignoring this; it doesn't match any \if.
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36 \XKV@wh@list ...r \expandafter \XKV@wh@list \else
37                                     \def #3{#6}\expandafter
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39 1.71      }
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43 ! Extra \else.
44 \XKV@wh@list ...r \expandafter \XKV@wh@list \else
45                                     \def #3{#6}\expandafter
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51 ! Extra \else.
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53                                     \def #3{#6}\expandafter
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8 1.71 }
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10 I'm ignoring this; it doesn't match any \if.
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12 ! Extra \else.
13 \XKV@wh@list ...r \expandafter \XKV@wh@list \else
14 \def #3{#6}\expandafter
15 \e...
16 1.81 }
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18 I'm ignoring this; it doesn't match any \if.
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20 ! Extra \else.
21 \XKV@wh@list ...r \expandafter \XKV@wh@list \else
22 \def #3{#6}\expandafter
23 \e...
24 1.81 }
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26 I'm ignoring this; it doesn't match any \if.
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28 ! Extra \else.
29 \XKV@wh@list ...r \expandafter \XKV@wh@list \else
30 \def #3{#6}\expandafter
31 \e...
32 1.81 }
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34 I'm ignoring this; it doesn't match any \if.
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36 ! Extra \else.
37 \XKV@wh@list ...r \expandafter \XKV@wh@list \else
38 \def #3{#6}\expandafter
39 \e...
40 1.81 }
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42 I'm ignoring this; it doesn't match any \if.
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44 ! Extra \else.
45 \XKV@wh@list ...r \expandafter \XKV@wh@list \else
46 \def #3{#6}\expandafter
47 \e...
48 1.81 }
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50 I'm ignoring this; it doesn't match any \if.
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52 ! Extra \else.
53 \XKV@wh@list ...r \expandafter \XKV@wh@list \else
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55 \e...
56 1.86 }
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6 ! Extra \else.
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8 \def #3{#6}\expandafter
9 \e...
10 1.86 }
11
12 I'm ignoring this; it doesn't match any \if.
13
14 ! Extra \else.
15 \XKV@wh@list ...r \expandafter \XKV@wh@list \else
16 \def #3{#6}\expandafter
17 \e...
18 1.86 }
19
20 I'm ignoring this; it doesn't match any \if.
21
22 ! Extra \else.
23 \XKV@wh@list ...r \expandafter \XKV@wh@list \else
24 \def #3{#6}\expandafter
25 \e...
26 1.86 }
27
28 I'm ignoring this; it doesn't match any \if.
29
30 ! Extra \else.
31 \XKV@wh@list ...r \expandafter \XKV@wh@list \else
32 \def #3{#6}\expandafter
33 \e...
34 1.86 }
35
36 I'm ignoring this; it doesn't match any \if.
37
38 ! Extra \else.
39 \XKV@wh@list ...r \expandafter \XKV@wh@list \else
40 \def #3{#6}\expandafter
41 \e...
42 1.89 { font = */*/*/*/* }
43
44 I'm ignoring this; it doesn't match any \if.
45
46 ! Extra \else.
47 \XKV@wh@list ...r \expandafter \XKV@wh@list \else
48 \def #3{#6}\expandafter
49 \e...
50 1.89 { font = */*/*/*/* }
51
52 I'm ignoring this; it doesn't match any \if.
53
54 ! Extra \else.
55 \XKV@wh@list ...r \expandafter \XKV@wh@list \else
56 \def #3{#6}\expandafter
57 \e...
58
59
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64
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```

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1
2
3
4 1.89 { font = */*/*/*/ }
5
6 I'm ignoring this; it doesn't match any \if.
7
8 ! Extra \else.
9 \XKV@wh@list ...r \expandafter \XKV@wh@list \else
10 \def #3{#6}\expandafter
11 \e...
12 1.89 { font = */*/*/*/ }
13
14 I'm ignoring this; it doesn't match any \if.
15
16 ! Extra \else.
17 \XKV@wh@list ...r \expandafter \XKV@wh@list \else
18 \def #3{#6}\expandafter
19 \e...
20 1.89 { font = */*/*/*/ }
21
22 I'm ignoring this; it doesn't match any \if.
23
24
25 )) (c:/TeXLive/2015/texmf-dist/tex/latex/algorithms/algorithm.sty
26 Package: algorithm 2009/08/24 v0.1 Document Style `algorithm' - floating
27 enviro
28 nment
29 (c:/TeXLive/2015/texmf-dist/tex/latex/base/ifthen.sty
30 Package: ifthen 2014/09/29 v1.1c Standard LaTeX ifthen package (DPC)
31 )
32 \@float@every@algorithm=\toks30
33 \c@algorithm=\count136
34 ) (c:/TeXLive/2015/texmf-dist/tex/latex/algorithms/algorithmic.sty
35 Package: algorithmic 2009/08/24 v0.1 Document Style `algorithmic'
36 \c@ALC@unique=\count137
37 \c@ALC@line=\count138
38 \c@ALC@rem=\count139
39 \c@ALC@depth=\count140
40 \ALC@tlm=\skip60
41 \algorithmicindent=\skip61
42 ) (c:/TeXLive/2015/texmf-dist/tex/latex/breqn/breqn.sty
43 (c:/TeXLive/2015/texmf-
44 dist/tex/latex/l3kernel/expl3.sty
45 Package: expl3 2016/03/28 v6468 L3 programming layer (loader)
46 (c:/TeXLive/2015/texmf-dist/tex/latex/l3kernel/expl3-code.tex
47 Package: expl3 2016/03/28 v6468 L3 programming layer (code)
48 L3 Module: l3bootstrap 2016/02/12 v6412 L3 Bootstrap code
49 L3 Module: l3names 2016/03/11 v6433 L3 Namespace for primitives
50 L3 Module: l3basics 2015/11/22 v6315 L3 Basic definitions
51 L3 Module: l3expan 2015/09/10 v5983 L3 Argument expansion
52 L3 Module: l3ttl 2016/03/26 v6465 L3 Token lists
53 L3 Module: l3str 2016/03/24 v6441 L3 Strings
54 L3 Module: l3seq 2015/08/05 v5777 L3 Sequences and stacks
55 L3 Module: l3int 2016/03/24 v6441 L3 Integers
56 \c_max_int=\count141
57 \l_tmpa_int=\count142
58 \l_tmpb_int=\count143
59
60
61
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```
1
2
3
4 \g_tmpa_int=\count144
5 \g_tmpb_int=\count145
6 L3 Module: l3quark 2015/08/17 v5855 L3 Quarks
7 L3 Module: l3prg 2015/11/01 v6216 L3 Control structures
8 \g__prg_map_int=\count146
9 L3 Module: l3clist 2015/09/02 v5901 L3 Comma separated lists
10 L3 Module: l3token 2016/03/26 v6465 L3 Experimental token manipulation
11 L3 Module: l3prop 2016/01/05 v6366 L3 Property lists
12 L3 Module: l3msg 2016/03/26 v6464 L3 Messages
13 L3 Module: l3file 2016/03/25 v6458 L3 File and I/O operations
14 \l_iow_line_count_int=\count147
15 \l_iow_target_count_int=\count148
16 \l_iow_current_line_int=\count149
17 \l_iow_current_word_int=\count150
18 \l_iow_current_indentation_int=\count151
19 L3 Module: l3skip 2016/01/05 v6366 L3 Dimensions and skips
20 \c_zero_dim=\dimen157
21 \c_max_dim=\dimen158
22 \l_tmpa_dim=\dimen159
23 \l_tmpb_dim=\dimen160
24 \g_tmpa_dim=\dimen161
25 \g_tmpb_dim=\dimen162
26 \c_zero_skip=\skip62
27 \c_max_skip=\skip63
28 \l_tmpa_skip=\skip64
29 \l_tmpb_skip=\skip65
30 \g_tmpa_skip=\skip66
31 \g_tmpb_skip=\skip67
32 \c_zero_muskip=\muskip12
33 \c_max_muskip=\muskip13
34 \l_tmpa_muskip=\muskip14
35 \l_tmpb_muskip=\muskip15
36 \g_tmpa_muskip=\muskip16
37 \g_tmpb_muskip=\muskip17
38 L3 Module: l3keys 2015/11/17 v6284 L3 Key-value interfaces
39 \g__keyval_level_int=\count152
40 \l_keys_choice_int=\count153
41 L3 Module: l3fp 2016/03/26 v6465 L3 Floating points
42 \c__fp_leading_shift_int=\count154
43 \c__fp_middle_shift_int=\count155
44 \c__fp_trailing_shift_int=\count156
45 \c__fp_big_leading_shift_int=\count157
46 \c__fp_big_middle_shift_int=\count158
47 \c__fp_big_trailing_shift_int=\count159
48 \c__fp_Bigg_leading_shift_int=\count160
49 \c__fp_Bigg_middle_shift_int=\count161
50 \c__fp_Bigg_trailing_shift_int=\count162
51 L3 Module: l3box 2015/08/09 v5822 L3 Experimental boxes
52 \c_empty_box=\box39
53 \l_tmpa_box=\box40
54 \l_tmpb_box=\box41
55 \g_tmpa_box=\box42
56 \g_tmpb_box=\box43
57 L3 Module: l3coffins 2016/03/24 v6440 L3 Coffin code layer
58
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1
2
3
4 \l__coffin_internal_box=\box44
5 \l__coffin_internal_dim=\dimen163
6 \l__coffin_offset_x_dim=\dimen164
7 \l__coffin_offset_y_dim=\dimen165
8 \l__coffin_x_dim=\dimen166
9 \l__coffin_y_dim=\dimen167
10 \l__coffin_x_prime_dim=\dimen168
11 \l__coffin_y_prime_dim=\dimen169
12 \c_empty_coffin=\box45
13 \l__coffin_aligned_coffin=\box46
14 \l__coffin_aligned_internal_coffin=\box47
15 \l_tmpa_coffin=\box48
16 \l_tmpb_coffin=\box49
17 \l__coffin_display_coffin=\box50
18 \l__coffin_display_coord_coffin=\box51
19 \l__coffin_display_pole_coffin=\box52
20 \l__coffin_display_offset_dim=\dimen170
21 \l__coffin_display_x_dim=\dimen171
22 \l__coffin_display_y_dim=\dimen172
23
24 L3 Module: l3color 2014/08/23 v5354 L3 Experimental color support
25 L3 Module: l3sys 2015/09/25 v6087 L3 Experimental system/runtime
26 functions
27 L3 Module: l3candidates 2016/03/25 v6456 L3 Experimental additions to
28 l3kernel
29 \l__box_top_dim=\dimen173
30 \l__box_bottom_dim=\dimen174
31 \l__box_left_dim=\dimen175
32 \l__box_right_dim=\dimen176
33 \l__box_top_new_dim=\dimen177
34 \l__box_bottom_new_dim=\dimen178
35 \l__box_left_new_dim=\dimen179
36 \l__box_right_new_dim=\dimen180
37 \l__box_internal_box=\box53
38 \l__coffin_bounding_shift_dim=\dimen181
39 \l__coffin_left_corner_dim=\dimen182
40 \l__coffin_right_corner_dim=\dimen183
41 \l__coffin_bottom_corner_dim=\dimen184
42 \l__coffin_top_corner_dim=\dimen185
43 \l__coffin_scaled_total_height_dim=\dimen186
44 \l__coffin_scaled_width_dim=\dimen187
45
46 L3 Module: l3luatex 2016/03/26 v6465 L3 Experimental LuaTeX-specific
47 functions
48 ) (c:/TeXLive/2015/texmf-dist/tex/latex/l3kernel/l3pdfmode.def
49 File: l3pdfmode.def 2016/03/26 v6465 L3 Experimental driver: PDF mode
50 \l__driver_color_stack_int=\count163
51 ))
52 Package: breqn 2015/08/11 v0.98d Breaking equations
53 (c:/TeXLive/2015/texmf-dist/tex/latex/breqn/flexisym.sty
54 Package: flexisym 2015/08/11 v0.98d Make math characters macros
55 LaTeX Info: Redefining \textprime on input line 299.
56 LaTeX Info: Redefining \not on input line 357.
57 (c:/TeXLive/2015/texmf-dist/tex/latex/breqn/cmbase.sym
58 File: cmbase.sym 2007/12/19 v0.92
59 LaTeX Info: Redefining \hbar on input line 324.
60
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LaTeX Info: Redefining \surd on input line 326.
LaTeX Info: Redefining \angle on input line 334.
LaTeX Info: Redefining \neq on input line 335.
LaTeX Info: Redefining \mapsto on input line 336.
LaTeX Info: Redefining \cong on input line 337.
LaTeX Info: Redefining \notin on input line 340.
LaTeX Info: Redefining \rightleftharpoons on input line 341.
LaTeX Info: Redefining \doteq on input line 342.
LaTeX Info: Redefining \hookrightarrow on input line 343.
LaTeX Info: Redefining \hookleftarrow on input line 344.
LaTeX Info: Redefining \bowtie on input line 345.
LaTeX Info: Redefining \models on input line 346.
LaTeX Info: Redefining \Longrightarrow on input line 347.
LaTeX Info: Redefining \longrightarrow on input line 348.
LaTeX Info: Redefining \Longleftarrow on input line 349.
LaTeX Info: Redefining \longleftarrow on input line 350.
LaTeX Info: Redefining \longmapsto on input line 351.
LaTeX Info: Redefining \longlefttrightarrow on input line 352.
LaTeX Info: Redefining \Longlefttrightarrow on input line 353.
LaTeX Info: Redefining \cdots on input line 357.
LaTeX Info: Redefining \vdots on input line 360.
LaTeX Info: Redefining \ddots on input line 365.
) (c:/TeXLive/2015/texmf-dist/tex/latex/breqn/mathstyle.sty
Package: mathstyle 2015/08/11 v0.98d Tracking mathstyle implicitly
LaTeX Info: Redefining \displaystyle on input line 93.
LaTeX Info: Redefining \textstyle on input line 95.
LaTeX Info: Redefining \scriptstyle on input line 97.
LaTeX Info: Redefining \scriptscriptstyle on input line 99.
LaTeX Info: Redefining \genfrac on input line 145.
))
\inf@bad=\count164
\maxint=\count165
\listwidth=\dimen188
\eqnumsep=\dimen189
\eqmargin=\dimen190
\eqlinespacing=\skip68
\eqlineskip=\skip69
\eqlineskiplimit=\dimen191
\eqbinoffset=\muskip18
\eqdelimoffset=\muskip19
\eqindentstep=\dimen192
\eqstyle=\toks31
\eqbreakdepth=\count166
\eqinterlinepenalty=\count167
\intereqpenalty=\count168
\intereqskip=\skip70
\prerelpenalty=\count169
\prebinoppenalty=\count170
\Dmedmuskip=\muskip20
\Dthickmuskip=\muskip21
\eqleftskip=\skip71
\eqrightskip=\skip72
\eq@vspan=\skip73
\eq@binoffset=\muskip22

```



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1
2
3
4 \EQ@box=\box54
5 \EQ@copy=\box55
6 \EQ@numbox=\box56
7 \eq@wdNum=\dimen193
8 \GRP@numbox=\box57
9 \grp@wdNum=\dimen194
10 \eq@lines=\count171
11 \eq@curline=\count172
12 \eq@badness=\count173
13 \EQ@vims=\count174
14 \eq@dp=\dimen195
15 \eq@wdL=\dimen196
16 \eq@wdT=\dimen197
17 \eq@wdMin=\dimen198
18 \grp@wdL=\dimen199
19 \grp@wdR=\dimen256
20 \grp@wdT=\dimen257
21 \eq@wdRmax=\dimen258
22 \eq@firstht=\dimen259
23 \eq@wdCond=\dimen260
24 \eq@indentstep=\dimen261
25 \eq@linewidth=\dimen262
26 \grp@linewidth=\dimen263
27 \eq@hshift=\dimen264
28 \eq@given@sidespace=\dimen265
29 \eq@final@linecount=\count175
30 \eq@wdR=\dimen266
31 \EQ@continue=\toks32
32 \lr@level=\count176
33 \GRP@queue=\toks33
34 \GRP@box=\box58
35 \GRP@wholebox=\box59
36 \darraycolsep=\skip74
37 \cur@row=\count177
38 \cur@col=\count178
39 \conditionsep=\skip75
40 ) (c:/TeXLive/2015/texmf-dist/tex/latex/footmisc/footmisc.sty
41 Package: footmisc 2011/06/06 v5.5b a miscellany of footnote facilities
42 \FN@temptoken=\toks34
43 \footnotemargin=\dimen267
44 \c@pp@next@reset=\count179
45 Package footmisc Info: Declaring symbol style bringhurst on input line
46 855.
47 Package footmisc Info: Declaring symbol style chicago on input line 863.
48 Package footmisc Info: Declaring symbol style wiley on input line 872.
49 Package footmisc Info: Declaring symbol style lampport-robust on input
50 line 883.
51
52 Package footmisc Info: Declaring symbol style lampport* on input line 903.
53 Package footmisc Info: Declaring symbol style lampport*-robust on input
54 line 924
55 .
56 ) (./gopinathargallauro2017_2.aux)
57 \openout1 = `gopinathargallauro2017_2.aux'.
58
59
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1
2
3
4
5 LaTeX Font Info: Checking defaults for OML/cmm/m/it on input line 51.
6 LaTeX Font Info: ... okay on input line 51.
7 LaTeX Font Info: Checking defaults for T1/cmr/m/n on input line 51.
8 LaTeX Font Info: ... okay on input line 51.
9 LaTeX Font Info: Checking defaults for OT1/cmr/m/n on input line 51.
10 LaTeX Font Info: ... okay on input line 51.
11 LaTeX Font Info: Checking defaults for OMS/cmsy/m/n on input line 51.
12 LaTeX Font Info: ... okay on input line 51.
13 LaTeX Font Info: Checking defaults for OMX/cmex/m/n on input line 51.
14 LaTeX Font Info: ... okay on input line 51.
15 LaTeX Font Info: Checking defaults for U/cmr/m/n on input line 51.
16 LaTeX Font Info: ... okay on input line 51.
17 LaTeX Font Info: Checking defaults for TS1/cmr/m/n on input line 51.
18 LaTeX Font Info: ... okay on input line 51.
19
20 (c:/TeXLive/2015/texmf-dist/tex/context/base/supp-pdf.mkii
21 [Loading MPS to PDF converter (version 2006.09.02).]
22 \scratchcounter=\count180
23 \scratchdimen=\dimen268
24 \scratchbox=\box60
25 \nofMPsegments=\count181
26 \nofMParguments=\count182
27 \everyMPshowfont=\toks35
28 \MPscratchCnt=\count183
29 \MPscratchDim=\dimen269
30 \MPnumerator=\count184
31 \makeMPintoPDFobject=\count185
32 \everyMPtoPDFconversion=\toks36
33 ) (c:/TeXLive/2015/texmf-dist/tex/generic/oberdiek/pdftexcmds.sty
34 Package: pdftexcmds 2011/11/29 v0.20 Utility functions of pdfTeX for
35 LuaTeX (HO
36 )
37 (c:/TeXLive/2015/texmf-dist/tex/generic/oberdiek/ifluatex.sty
38 Package: ifluatex 2010/03/01 v1.3 Provides the ifluatex switch (HO)
39 Package ifluatex Info: LuaTeX not detected.
40 ) (c:/TeXLive/2015/texmf-dist/tex/generic/oberdiek/ifpdf.sty
41 Package: ifpdf 2011/01/30 v2.3 Provides the ifpdf switch (HO)
42 Package ifpdf Info: pdfTeX in PDF mode is detected.
43 )
44 Package pdftexcmds Info: LuaTeX not detected.
45 Package pdftexcmds Info: \pdf@primitive is available.
46 Package pdftexcmds Info: \pdf@ifprimitive is available.
47 Package pdftexcmds Info: \pdfdraftmode found.
48 ) (c:/TeXLive/2015/texmf-dist/tex/latex/oberdiek/epstopdf-base.sty
49 Package: epstopdf-base 2010/02/09 v2.5 Base part for package epstopdf
50 (c:/TeXLive/2015/texmf-dist/tex/latex/oberdiek/grfext.sty
51 Package: grfext 2010/08/19 v1.1 Manage graphics extensions (HO)
52 (c:/TeXLive/2015/texmf-dist/tex/generic/oberdiek/kvdefinekeys.sty
53 Package: kvdefinekeys 2011/04/07 v1.3 Define keys (HO)
54 )) (c:/TeXLive/2015/texmf-dist/tex/latex/oberdiek/kvoptions.sty
55 Package: kvoptions 2011/06/30 v3.11 Key value format for package options
56 (HO)
57 (c:/TeXLive/2015/texmf-dist/tex/generic/oberdiek/kvsetkeys.sty
58 Package: kvsetkeys 2012/04/25 v1.16 Key value parser (HO)
59
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(c:/TeXLive/2015/texmf-dist/tex/generic/oberdiek/etexcmds.sty
Package: etexcmds 2011/02/16 v1.5 Avoid name clashes with e-TeX commands
(HO)
Package etexcmds Info: Could not find \expanded.
(etexcmds)          That can mean that you are not using pdfTeX 1.50
or
(etexcmds)          that some package has redefined \expanded.
(etexcmds)          In the latter case, load this package earlier.
)))
Package grfext Info: Graphics extension search list:
(grfext)
[.png,.pdf,.jpg,.mps,.jpeg,.jbig2,.jb2,.PNG,.PDF,.JPG,.JPE
G,.JBIG2,.JB2,.eps]
(grfext)          \AppendGraphicsExtensions on input line 452.
(c:/TeXLive/2015/texmf-dist/tex/latex/latexconfig/epstopdf-sys.cfg
File: epstopdf-sys.cfg 2010/07/13 v1.3 Configuration of (r)epstopdf for
TeX Liv
e
))
LaTeX Info: Redefining \microtypecontext on input line 51.
Package microtype Info: Generating PDF output.
Package microtype Info: Character protrusion enabled (level 2).
Package microtype Info: Using default protrusion set `alltext'.
Package microtype Info: Automatic font expansion enabled (level 2),
(microtype)          stretch: 20, shrink: 20, step: 1, non-selected.
Package microtype Info: Using default expansion set `basictext'.
Package microtype Info: No adjustment of tracking.
Package microtype Info: No adjustment of interword spacing.
Package microtype Info: No adjustment of character kerning.
(c:/TeXLive/2015/texmf-dist/tex/latex/microtype/mt-cmr.cfg
File: mt-cmr.cfg 2013/05/19 v2.2 microtype config. file: Computer Modern
Roman
(RS)
)
LaTeX Font Info:      Try loading font information for U+msa on input line
85.
(c:/TeXLive/2015/texmf-dist/tex/latex/amsfonts/umsa.fd
File: umsa.fd 2013/01/14 v3.01 AMS symbols A
) (c:/TeXLive/2015/texmf-dist/tex/latex/microtype/mt-msa.cfg
File: mt-msa.cfg 2006/02/04 v1.1 microtype config. file: AMS symbols (a)
(RS)
)
LaTeX Font Info:      Try loading font information for U+msb on input line
85.
(c:/TeXLive/2015/texmf-dist/tex/latex/amsfonts/umsb.fd
File: umsb.fd 2013/01/14 v3.01 AMS symbols B
) (c:/TeXLive/2015/texmf-dist/tex/latex/microtype/mt-msb.cfg
File: mt-msb.cfg 2005/06/01 v1.0 microtype config. file: AMS symbols (b)
(RS)
)
LaTeX Font Info:      Font shape `U/lasy/b/n' in size <7> not available
(Font)          Font shape `U/lasy/m/n' tried instead on input line
85.
LaTeX Font Info:      Font shape `U/lasy/b/n' in size <5> not available

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1
2
3
4 (Font) Font shape `U/lasy/m/n' tried instead on input line
5 85.
6 LaTeX Font Info: Calculating math sizes for size <8.5> on input line
7 85.
8 Package epstopdf Info: Source file: <Fig1.eps>
9 (epstopdf) date: 2017-12-01 23:56:51
10 (epstopdf) size: 3011293 bytes
11 (epstopdf) Output file: <Fig1-eps-converted-to.pdf>
12 (epstopdf) date: 2017-12-01 23:57:11
13 (epstopdf) size: 1698620 bytes
14 (epstopdf) Command: <repstopdf --outfile=Fig1-eps-converted-
15 to.pdf
16 Fig1.eps>
17 (epstopdf) \includegraphics on input line 100.
18 Package epstopdf Info: Output file is already uptodate.
19 <Fig1-eps-converted-to.pdf, id=1, 1659.19875pt x 1281.78876pt>
20 File: Fig1-eps-converted-to.pdf Graphic file (type pdf)
21 <use Fig1-eps-converted-to.pdf>
22 Package pdftex.def Info: Fig1-eps-converted-to.pdf used on input line
23 100.
24 (pdftex.def) Requested size: 420.75302pt x 325.04265pt.
25 LaTeX Font Info: Font shape `U/lasy/b/n' in size <8.5> not available
26 (Font) Font shape `U/lasy/m/n' tried instead on input line
27 101.
28 LaTeX Font Info: Font shape `U/lasy/b/n' in size <5.94997> not
29 available
30 (Font) Font shape `U/lasy/m/n' tried instead on input line
31 101.
32 LaTeX Font Info: Font shape `U/lasy/b/n' in size <4.25> not available
33 (Font) Font shape `U/lasy/m/n' tried instead on input line
34 101.
35 [1{c:/TeXLive/2015/texmf-var/fonts/map/pdftex/updmap/pdftex.map}
36
37
38
39
40 ]
41 Underfull \vbox (badness 10000) has occurred while \output is active []
42
43 Package epstopdf Info: Source file: <Fig2.eps>
44 (epstopdf) date: 2017-12-01 23:56:51
45 (epstopdf) size: 125295 bytes
46 (epstopdf) Output file: <Fig2-eps-converted-to.pdf>
47 (epstopdf) date: 2017-12-01 23:57:15
48 (epstopdf) size: 126768 bytes
49 (epstopdf) Command: <repstopdf --outfile=Fig2-eps-converted-
50 to.pdf
51 Fig2.eps>
52 (epstopdf) \includegraphics on input line 118.
53 Package epstopdf Info: Output file is already uptodate.
54 <Fig2-eps-converted-to.pdf, id=16, 663.47874pt x 478.78876pt>
55 File: Fig2-eps-converted-to.pdf Graphic file (type pdf)
56 <use Fig2-eps-converted-to.pdf>
57 Package pdftex.def Info: Fig2-eps-converted-to.pdf used on input line
58 118.
59 (pdftex.def) Requested size: 173.25302pt x 125.02275pt.
60
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[2]
Underfull \vbox (badness 10000) has occurred while \output is active []

Underfull \vbox (badness 2828) has occurred while \output is active []

[3 <./Fig1-eps-converted-to.pdf> <./Fig2-eps-converted-to.pdf>]
Underfull \vbox (badness 10000) has occurred while \output is active []

[4]
Package epstopdf Info: Source file: <Fig3.eps>
(epstopdf)                date: 2017-12-01 23:56:51
(epstopdf)                size: 49232 bytes
(epstopdf)                Output file: <Fig3-eps-converted-to.pdf>
(epstopdf)                date: 2017-12-01 23:57:19
(epstopdf)                size: 39004 bytes
(epstopdf)                Command: <repstopdf --outfile=Fig3-eps-converted-
to.pdf
Fig3.eps>
(epstopdf)                \includegraphics on input line 166.
Package epstopdf Info: Output file is already uptodate.
<Fig3-eps-converted-to.pdf, id=39, 478.78876pt x 438.63875pt>
File: Fig3-eps-converted-to.pdf Graphic file (type pdf)
<use Fig3-eps-converted-to.pdf>
Package pdftex.def Info: Fig3-eps-converted-to.pdf used on input line
166.
(pdfteX.def)                Requested size: 238.96417pt x 218.92393pt.
[5 <./Fig3-eps-converted-to.pdf>]
Package epstopdf Info: Source file: <Fig4.eps>
(epstopdf)                date: 2017-12-01 23:56:51
(epstopdf)                size: 411428 bytes
(epstopdf)                Output file: <Fig4-eps-converted-to.pdf>
(epstopdf)                date: 2017-12-01 23:57:22
(epstopdf)                size: 798504 bytes
(epstopdf)                Command: <repstopdf --outfile=Fig4-eps-converted-
to.pdf
Fig4.eps>
(epstopdf)                \includegraphics on input line 222.
Package epstopdf Info: Output file is already uptodate.
<Fig4-eps-converted-to.pdf, id=55, 1314.9125pt x 736.7525pt>
File: Fig4-eps-converted-to.pdf Graphic file (type pdf)
<use Fig4-eps-converted-to.pdf>
Package pdftex.def Info: Fig4-eps-converted-to.pdf used on input line
222.
(pdfteX.def)                Requested size: 569.25363pt x 299.59726pt.
[6] [7 <./Fig4-eps-converted-to.pdf>]
LaTeX Font Info: Try loading font information for U+bbm on input line
291.
(c:/TeXLive/2015/texmf-dist/tex/latex/bbm-macros/ubbm.fd
File: ubbm.fd 1999/03/15 V 1.2 Font definition for bbm font - TH
) [8]

LaTeX Font Warning: Font shape `U+bbm/m/n' in size <8.5> not available
(Font)                size <8> substituted on input line 328.

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6 LaTeX Font Warning: Font shape `U/bbm/m/n' in size <4.25> not available
7 (Font) size <5> substituted on input line 328.
8
9
10 Package epstopdf Info: Source file: <Fig5.eps>
11 (epstopdf) date: 2017-12-01 23:56:51
12 (epstopdf) size: 310438 bytes
13 (epstopdf) Output file: <Fig5-eps-converted-to.pdf>
14 (epstopdf) date: 2017-12-01 23:57:27
15 (epstopdf) size: 83448 bytes
16 (epstopdf) Command: <repstopdf --outfile=Fig5-eps-converted-
17 to.pdf
18 Fig5.eps>
19 (epstopdf) \includegraphics on input line 345.
20 Package epstopdf Info: Output file is already uptodate.
21 <Fig5-eps-converted-to.pdf, id=74, 1144.275pt x 418.56375pt>
22 File: Fig5-eps-converted-to.pdf Graphic file (type pdf)
23 <use Fig5-eps-converted-to.pdf>
24 Package pdftex.def Info: Fig5-eps-converted-to.pdf used on input line
25 345.
26 (pdftex.def) Requested size: 238.9604pt x 93.20837pt.
27 Package epstopdf Info: Source file: <Fig6.eps>
28 (epstopdf) date: 2017-12-01 23:56:51
29 (epstopdf) size: 6490402 bytes
30 (epstopdf) Output file: <Fig6-eps-converted-to.pdf>
31 (epstopdf) date: 2017-12-01 23:57:32
32 (epstopdf) size: 337764 bytes
33 (epstopdf) Command: <repstopdf --outfile=Fig6-eps-converted-
34 to.pdf
35 Fig6.eps>
36 (epstopdf) \includegraphics on input line 351.
37 Package epstopdf Info: Output file is already uptodate.
38 <Fig6-eps-converted-to.pdf, id=75, 1927.2pt x 542.025pt>
39 File: Fig6-eps-converted-to.pdf Graphic file (type pdf)
40 <use Fig6-eps-converted-to.pdf>
41 Package pdftex.def Info: Fig6-eps-converted-to.pdf used on input line
42 351.
43 (pdftex.def) Requested size: 495.0pt x 139.21115pt.
44 [9 <./Fig5-eps-converted-to.pdf>]
45 Package epstopdf Info: Source file: <Fig7.eps>
46 (epstopdf) date: 2017-12-01 23:56:51
47 (epstopdf) size: 34226 bytes
48 (epstopdf) Output file: <Fig7-eps-converted-to.pdf>
49 (epstopdf) date: 2017-12-01 23:57:36
50 (epstopdf) size: 10330 bytes
51 (epstopdf) Command: <repstopdf --outfile=Fig7-eps-converted-
52 to.pdf
53 Fig7.eps>
54 (epstopdf) \includegraphics on input line 384.
55 Package epstopdf Info: Output file is already uptodate.
56 <Fig7-eps-converted-to.pdf, id=82, 682.55pt x 371.3875pt>
57 File: Fig7-eps-converted-to.pdf Graphic file (type pdf)
58 <use Fig7-eps-converted-to.pdf>
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4 Package pdftex.def Info: Fig7-eps-converted-to.pdf used on input line
5 384.
6 (pdftex.def) Requested size: 450.45181pt x 245.0995pt.
7 [10 <./Fig6-eps-converted-to.pdf>]
8 Overfull \hbox (1.40538pt too wide) in paragraph at lines 394--395
9 $[]$OT1/cmr/m/n/10 (-20) : In the sec-ond phase of train-ing, the
10 blending-
11 []
12
13
14
15 Underfull \vbox (badness 3291) has occurred while \output is active []
16
17 Package epstopdf Info: Source file: <Fig8.eps>
18 (epstopdf) date: 2017-12-01 23:56:51
19 (epstopdf) size: 193852 bytes
20 (epstopdf) Output file: <Fig8-eps-converted-to.pdf>
21 (epstopdf) date: 2017-12-01 23:57:39
22 (epstopdf) size: 215176 bytes
23 (epstopdf) Command: <repstopdf --outfile=Fig8-eps-converted-
24 to.pdf
25 Fig8.eps>
26 (epstopdf) \includegraphics on input line 417.
27 Package epstopdf Info: Output file is already uptodate.
28 <Fig8-eps-converted-to.pdf, id=92, 716.6775pt x 541.02126pt>
29 File: Fig8-eps-converted-to.pdf Graphic file (type pdf)
30 <use Fig8-eps-converted-to.pdf>
31 Package pdftex.def Info: Fig8-eps-converted-to.pdf used on input line
32 417.
33 (pdftex.def) Requested size: 415.79819pt x 313.8916pt.
34 [11 <./Fig7-eps-converted-to.pdf>]
35 Underfull \vbox (badness 1824) has occurred while \output is active []
36
37
38 Package epstopdf Info: Source file: <Fig9.eps>
39 (epstopdf) date: 2017-12-01 23:56:52
40 (epstopdf) size: 2099967 bytes
41 (epstopdf) Output file: <Fig9-eps-converted-to.pdf>
42 (epstopdf) date: 2017-12-01 23:57:44
43 (epstopdf) size: 157574 bytes
44 (epstopdf) Command: <repstopdf --outfile=Fig9-eps-converted-
45 to.pdf
46 Fig9.eps>
47 (epstopdf) \includegraphics on input line 450.
48 Package epstopdf Info: Output file is already uptodate.
49 <Fig9-eps-converted-to.pdf, id=104, 619.31375pt x 257.96375pt>
50 File: Fig9-eps-converted-to.pdf Graphic file (type pdf)
51 <use Fig9-eps-converted-to.pdf>
52 Package pdftex.def Info: Fig9-eps-converted-to.pdf used on input line
53 450.
54 (pdftex.def) Requested size: 396.00151pt x 164.95451pt.
55 [12 <./Fig8-eps-converted-to.pdf>]
56 Package epstopdf Info: Source file: <Fig10.eps>
57 (epstopdf) date: 2017-12-01 23:56:52
58 (epstopdf) size: 28366 bytes
59 (epstopdf) Output file: <Fig10-eps-converted-to.pdf>
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4      (epstopdf)                date: 2017-12-01 23:57:47
5      (epstopdf)                size: 8842 bytes
6      (epstopdf)                Command: <repstopdf --outfile=Fig10-eps-converted-
7      to.pdf
8      Fig10.eps>
9      (epstopdf)                \includegraphics on input line 462.
10     Package epstopdf Info: Output file is already uptodate.
11     <Fig10-eps-converted-to.pdf, id=114, 619.31375pt x 447.6725pt>
12     File: Fig10-eps-converted-to.pdf Graphic file (type pdf)
13     <use Fig10-eps-converted-to.pdf>
14     Package pdftex.def Info: Fig10-eps-converted-to.pdf used on input line
15     462.
16     (pdftex.def)                Requested size: 238.96417pt x 172.73355pt.
17
18
19     LaTeX Warning: `!h' float specifier changed to `!ht'.
20
21     [13]
22     Underfull \hbox (badness 1496) in paragraph at lines 560--562
23     \OT1/cmr/m/n/8.5 (+20) inhibition type neu-ral fields. \OT1/cmr/m/it/8.5
24     (+20)
25     Bi-o-log-i-cal Cy-ber-net-ics
26     []
27
28
29     Package balance Warning: You have called \balance in second column
30     (balance)                Columns might not be balanced.
31
32     [14 <./Fig9-eps-converted-to.pdf> <./Fig10-eps-converted-to.pdf>]
33     Underfull \vbox (badness 10000) has occurred while \output is active []
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37     Underfull \vbox (badness 10000) has occurred while \output is active []
38
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40     Overfull \vbox (0.82639pt too high) has occurred while \output is active
41     []
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44     Overfull \vbox (3.37914pt too high) has occurred while \output is active
45     []
46
47     [15]
48     Overfull \hbox (0.87498pt too wide) in paragraph at lines 804--807
49     \OT1/cmr/m/it/8.5 (-20) IEEE Transactions on Biomedical Engineering
50     \OT1/cmr/m/
51     n/8.5 (-20) 55(8):2050--
52     []
53
54     Missing character: There is no â in font cmr8!
55     Missing character: There is no € in font cmr8!
56     Missing character: There is no æ in font cmr8!
57     Missing character: There is no â in font cmr8!
58     Missing character: There is no € in font cmr8!
59     Missing character: There is no □ in font cmr8!
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[16] (./gopinathargallauro2017 2.aux)
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LaTeX Font Warning: Size substitutions with differences (Font) up to 0.75pt have occurred.

[illegible]

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52 (\end occurred when \ifx on line 64 was incomplete)
53
54 Here is how much of TeX's memory you used:
55 15152 strings out of 493027
56 259017 string characters out of 6137679
57 458130 words of memory out of 5000000
58 18210 multiletter control sequences out of 15000+600000
59 27775 words of font info for 203 fonts, out of 8000000 for 9000
60 1141 hyphenation exceptions out of 8191
61
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38i,20n,51p,10406b,592s stack positions out of  
5000i,500n,10000p,200000b,80000s  
<c:/Users/asynch/.texlive20  
15/texmf-  
var/fonts/pk/ljfour/public/bbm/bbm10.600pk><c:/TeXLive/2015/texmf-dist  
/fonts/type1/public/amsfonts/cm/cmbsy10.pfb><c:/TeXLive/2015/texmf-  
dist/fonts/t  
ype1/public/amsfonts/cm/cmbx10.pfb><c:/TeXLive/2015/texmf-  
dist/fonts/type1/publ  
ic/amsfonts/cm/cmbx12.pfb><c:/TeXLive/2015/texmf-  
dist/fonts/type1/public/amsfon  
ts/cm/cmbx8.pfb><c:/TeXLive/2015/texmf-  
dist/fonts/type1/public/amsfonts/cm/cmex  
10.pfb><c:/TeXLive/2015/texmf-  
dist/fonts/type1/public/amsfonts/cm/cmmi10.pfb><c  
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dist/fonts/type1/public/amsfonts/cm/cmmi5.pfb><c:/TeXLive/  
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-dist/fonts/type1/public/amsfonts/cm/cmmi8.pfb><c:/TeXLive/2015/texmf-  
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s/type1/public/amsfonts/cm/cmmib10.pfb><c:/TeXLive/2015/texmf-  
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ic/amsfonts/cm/cmr10.pfb><c:/TeXLive/2015/texmf-  
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fb><c:/TeXLive/2015/texmf-  
dist/fonts/type1/public/amsfonts/cm/cmr8.pfb><c:/TeXL  
ive/2015/texmf-  
dist/fonts/type1/public/amsfonts/cm/cmsy10.pfb><c:/TeXLive/2015/  
texmf-  
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dist/fonts/typ  
e1/public/amsfonts/cm/cmsy8.pfb><c:/TeXLive/2015/texmf-  
dist/fonts/type1/public/  
amsfonts/cm/cmti10.pfb><c:/TeXLive/2015/texmf-  
dist/fonts/type1/public/amsfonts/  
cm/cmti8.pfb><c:/TeXLive/2015/texmf-  
dist/fonts/type1/public/amsfonts/symbols/ms  
bm10.pfb>  
Output written on gopinathargallauro2017\_2.pdf (16 pages, 3797963 bytes).  
PDF statistics:  
212 PDF objects out of 1000 (max. 8388607)  
135 compressed objects within 2 object streams  
0 named destinations out of 1000 (max. 500000)  
14387 words of extra memory for PDF output out of 14400 (max. 10000000)

**Biography – Deepak E. Gopinath**

Deepak E. Gopinath is a third-year doctoral student in the Mechanical Engineering Department at Northwestern University and works with Dr. Brenna Argall in the Assistive and Rehabilitation Robotics Laboratory at the Shirley Ryan AbilityLab in Chicago. He completed his B.Tech in Engineering Physics from IIT Bombay in 2007, after which he moved to Boston, USA to pursue a Professional Diploma in Music at Berklee College of Music majoring in Composition and Jazz Performance. Prior to coming to Northwestern, he completed an M.S in Music Technology at Georgia Tech under Dr. Gil Weinberg where he worked in field of Robotic Musicianship. His current research interests are in developing mathematical formalisms for shared-control architectures for assistive robotic manipulators and information theoretic approaches to characterize human-robot interaction.

## Bio-Dr. Brenna Argall

Brenna Argall is an Associate Professor of Electrical Engineering & Computer Science, Mechanical Engineering and Physical Medicine & Rehabilitation at Northwestern University. She is also a Faculty Research Scientist at the Shirley Ryan AbilityLab, the premier rehabilitation hospital in the United States. She is the director of the assistive & rehabilitation robotics **laboratory (argallab)**. Her research lies in the intersection of robotics, machine learning and human rehabilitation. The mission of the **argallab** is to advance human ability by leveraging autonomy. Dr. Argall is a 2016 recipient of the NSF CAREER award, and her Ph.D. in Robotics (2009) was received from the Robotics Institute at Carnegie Mellon University, as well as her M.S in Robotics (2006) and B.S in Mathematics (2002). Prior to joining Northwestern, she was a postdoctoral fellow (2009-2011) at the École polytechnique fédérale de Lausanne (EPFL), and prior to graduate school she held a Computational Biology position at the National Institutes of Health (NIH).



