A. Parallaxis Language Definition

System	=	**SYSTEM** sys_ident ";" Declarations sys_ident ".".
Declarations	=	{ ConstantDecl | TypeDecl | ConfigDecl | ConnectDecl | VariableDecl | ProcedureDecl} block.
ConstantDecl	=	**CONST** { ident "=" ConstExpr ";" }.
TypeDecl	=	**TYPE** { ident "=" type ";" }.
ConfigDecl	=	**CONFIGURATION** config ";" { config ";" }.
config	=	conf_ident IntRange { "," IntRange }.
IntRange	=	"[" range "]".
range	=	int_ConstExpr [".." int_ConstExpr].
ConnectDecl	=	**CONNECTION** ({ TransferFunc ";" } | ";").
TransferFunc	=	out_direction ":" conf_ident "[" source { "," source } "]" ("->" | "<->") destination { "," destination }.
direction	=	ident ["(" integer ")"].
source	=	ident | integer.
destination	=	[discriminant] conf_ident "[" DestExprList "]" "." in_indirection.
discriminant	=	"{" bool_expr "}".
DestExprList	=	DestExpr { "," DestExpr }.
DestExpr	=	expr | int_ConstExpr ".." int_ConstExpr.
VariableDecl	=	(**SCALAR** | **VECTOR**) { ident { "," ident } ":" type ";" }.
ProcedureDecl	=	**PROCEDURE** proc_ident [FormalParams] ";"Declarations proc_ident ";".
FormalParam	=	"(" [parameters { ";" parameters }] ")"[":" (**SCALAR** | **VECTOR**) function_type].
parameters	=	(**SCALAR** | **VECTOR**) [**VAR**] ident { "," ident } ":" type.
block	=	**BEGIN** StatementSeq **END**.
StatementSeq	=	statement { ";" statement }.
statement	=	[assignment | ProcedureCall | IfSelection | CaseSelection | WhileLoop | RepeatLoop | LoopStatement | ForLoop | WithStatement | **EXIT** | **RETURN** [expr] | ParallelExec | Propagate | Send | Receive | Load | Store].
ParallelExec	=	**PARALLEL** selection StatementSeq **ENDPARALLEL**.
selection	=	[conf_ident] ["[" entry "]" { "," "[" entry "]" }].
entry	=	range { "," range } | expr [".." expr] | "*".
Propagate	=	**PROPAGATE** "." out_dirvar ["^" (integer | ident)]["." in_dirvar] "(" [vector_expr ","] vector_designator ")"[**REDUCE** "." operator_i-dent].
dirvar	=	ident ["(" expr ")"].

Load = **LOAD** selection "(" vector_designator "," scalar_designator["," length_designator] ")".

Store = **STORE** selection "(" vector_designator "," scalar_designator["," length_designator] ")".

Send = **SEND** port "(" vector_expr ")" **TO** port "(" vector_ident ")" [**REDUCE** "." operator_ident].

Receive = **RECEIVE** port "(" vector_designator ")" **FROM** port "(" vector_ident ")" [**REDUCE** "." operator_ident].

port = conf_ident "." dirvar.

Reduce = **REDUCE** "." operator_ident selection "(" expr ")".

assignment = designator ":=" expr.

designator = ident { "[" ExprList "]" | "." ident | "^" }.

ProcedureCall = proc_ident ["(" ExprList ")"].

FunctionCall = proc_ident "(" [ExprList] ")".

IfSelection = **IF** bool_expr **THEN** StatementSeq{ **ELSIF** bool_expr **THEN** StatementSeq }[**ELSE** StatementSeq] **END**.

CaseSelection = **CASE** expr **OF** case { "|" case } [**ELSE** StatementSeq] **END**.

case = CaseLabelList ":" StatementSeq.

CaseLabelList = CaseLabels { "," CaseLabels }.

CaseLabels = ConstExpr [".." ConstExpr].

WhileLoop = **WHILE** bool_expr **DO** StatementSeq **END**.

RepeatLoop = **REPEAT** StatementSeq **UNTIL** bool_expr.

LoopStatement = **LOOP** StatementSeq **END**.

ForLoop = **FOR** ident ":=" expr **TO** expr [**BY** ConstExpr] **DO** StatementSeq **END**.

WithStatement = **WITH** designator **DO** StatementSeq **END**.

type = SimpleType | ArrayType | RecordType | SetType | PointerType.

SimpleType = type_ident | enumeration | subrange.

enumeration = "(" const_ident { "," const_ident } ")".

subrange = "[" ConstExpr [".." ConstExpr] "]".

ArrayType = **ARRAY** SimpleType { "," SimpleType } **OF** type.

RecordType = **RECORD** FieldListSeq **END**.

FieldListSeq = FieldList { ";" FieldList }.

FieldList = [ident { "," ident } ":" type | **CASE** [ident] ":" SimpleType **OF** Variant { "|" Variant }[**ELSE** FieldListSeq] **END**].

Variant = CaseLabelList ":" FieldListSeq.

SetType = **SET OF** SimpleType.

PointerType = **POINTER TO** type.

ExprList = expr { "," expr }.

expr = SimpleExpr { relation SimpleExpr }.

relation = "=" | "<>" | "#" | "<" | ">" | "<=" | ">=" | **IN**.

SimpleExpr	=	["+" | "-"] term { AddOperator term }.
AddOperator	=	"+" | "-" | **OR**.
term	=	power { MulOperator power }.
MulOperator	=	"*" | "/" | **DIV** | **MOD** | **AND** | "&".
power	=	factor { "**" factor }.
factor	=	FunctionCall | Reduce | string | set | number | designator | array | structure | "(" expr ")" | **NOT** factor.
array	=	array_ident "(" ExprList ")".
structure	=	record_ident "(" ExprList ")".
string	=	" ' " { character | ' " ' } " ' " | ' " ' { character | " ' " } ' " '.
set	=	[type_ident] "{" [element { "," element }] "}".
element	=	ConstExpr [".." ConstExpr].
CExprList	=	[ConstExpr { "," ConstExpr }].
ConstExpr	=	SimpleConstExpr { relation SimpleConstExpr }.
SimpleConstExpr	=	["+" | "-"] ConstTerm { AddOperator ConstTerm }.
ConstTerm	=	ConstPower { MulOperator ConstPower }.
ConstPower	=	ConstFactor { "**" ConstFactor }.
ConstFactor	=	const_ident | number | record_ident "(" CExprList ")" |set | array_ident "(" CExprList ")" | "(" ConstExpr ")" | string | stdfct_ident "(" CExprList ")" | NOT ConstFactor.
number	=	integer | real.
integer	=	digit { digit }.
real	=	digit { digit } "." { digit } exponent | { digit } "." digit { digit } exponent.
exponent	=	["E" ["+" | "-"] digit { digit }].
ident	=	letter { letter | digit }.
character	=	letter | digit | "(* all characters but quotes *)".
digit	=	"0" | "..." | "9".
letter	=	"A" | "..." | "Z" | "a" | "..." | "z" | "_".

B. PARZ Language Definition

IntermediateProgram = **START** integer **PE** integer **PORTS** ControlVarDecl LocalVarDecl { Statement ";" [comment] } **STOP** .

ControlVarDecl = **SCALAR** declaration .

LocalVarDecl = **VECTOR** declaration .

declaration = { type integer | integer "(" declaration ")" | **U** "(" declaration { "," declaration } ")" } .

type = **B** | **C** | **I** | **R** .

Statement = [labeldef] stat .

labeldef = label ["!" [integer]] ["R"] ":" .

label = integer .

stat = assignment | computation | movestat | equalstat | **HALT** | **END** | **NOP** | connect | disconnect | gotostat | ifstat | whilestat | callstat | proc | **RETURN** | pushstat | popstat | parallel | propagate | send | receive | load | store | read | write | errorcall | openinput | **CLOSEINPUT** | openoutput | **CLOSEOUTPUT** | GraphFunc | GraphProc | debug | trace | notrace .

assignment = vardesc ":=" ["-" | **NOT**] VarConst | Sca_vardesc ":=" **STATUS** | vardesc ":=" **RANDOM** | vardesc ":=" **NEW** declaration | vardesc ":=" **INITSET** bits .

computation = vardesc ":=" VarConst ArithOperator VarConst | vardesc ":=" VarConst RelOperator VarConst | Sca_vardesc ":=" reduce | Vec_vardesc ":=" connected | vardesc ":=" FuncIdent VarConst | vardesc ":=" **ARCTANT** VarConst VarConst | vardesc ":=" **STRCMP** VarConst_string VarConst_string .

ArithOperator = "+" | "-" | "*" | "/" | "^" | **MOD** | **AND** | **OR** .

RelOperator = "=" | "<>" | "<" | "<=" | ">" | ">=" .

FuncIdent = **ABS** | **SQRT** | **EXP** | **LN** | **SIN** | **COS** | **TAN** | **ARCSIN** | **ARCCOS** | **ARCTAN** .

movestat = **MOVE** vardesc **TO** vardesc **AS** declaration .

equalstat = **EQUAL** vardesc vardesc **AS** declaration .

connect = **CONNECT** port **TO** port **AT** VarConst | **BICONNECT** port **TO** port **AT** VarConst .

disconnect = **DISCONNECT** [port] .

gotostat = **GOTO** label .

ifstat = **IF** VarConst [RelOperator VarConst] **CALL** label | **IF** Sca_VarConst [RelOperator Sca_VarConst] **GOTO** label .

whilestat = **WHILE** VarConst [RelOperator VarConst] **CALL** label .

callstat = **CALL** label .

proc = **PROC** integer [ControlVarDecl] [LocalVarDecl] .

pushstat = **PUSHS** Sca_VarConst | **PUSHV** VarConst .

popstat = **POPS** vardesc | **POPV** Vec_vardesc .

parallel	= **PARALLEL** (bits | Sca_VarConst) .
connected	= **CONNECTED IN** port [**OUT** port] | **CONNECTED OUT** port [IN port] .
propagate	= **PROPAGATE** Vec_vardesc **OUT** port **IN** port | **PROPAGATE** VarConst **TO** Vec_vardesc [**REDUCE** (RFuncIdent | label)] .
send	= **SEND** VarConst **TO** Vec_vardesc [**REDUCE** (RFuncIdent | label)] .
receive	= **RECEIVE** Vec_vardesc **FROM** VarConst [**REDUCE** (RFuncIdent | label)] .
load	= **LOAD** Vec_vardesc **WITH** Sca_vardesc [(**PE** integer) | (**AS** declaration)] .
store	= **STORE** Vec_vardesc **TO** Sca_vardesc [(**PE** integer) | (**AS** declaration)] .
reduce	= **REDUCE** (RFuncIdent | label) **OF** Vec_VarConst .
RFuncIdent	= **FIRST** | **LAST** | **SUM** | **PRODUCT** | **MAX** | **MIN** | **AND** | **OR** .
read	= **READ** vardesc [Sca_VarConst] .
write	= (**WRITE** | **WRITELN**) VarConst [Sca_VarConst [Sca_VarConst]] .
errorcall	= **ERROR** string .
openinput	= **OPENINPUT** Sca_Var Const_string .
openoutput	= **OPENOUTPUT** Sca_Var Const_string .
GraphFunc	= Sca_vardesc ":=" **GETPIXEL** Sca_VarConst Sca_VarConst | Sca_vardesc ":=" **OPENW** Sca_Var Const Sca_Var Const .
GraphProc	= **MOVETO** Sca_VarConst Sca_VarConst | **LINETO** Sca_VarConst Sca_Var Const | **SETPIXEL** Sca_VarConst Sca_Var Const | **WSIZE** Sca_vardesc Sca_vardesc | **SETCOLOR** Sca_vardesc | **SELECTW** Sca_VarConst | **CLOSEW** Sca_Var Const .
debug	= **DEBUG** vardesc string **AS** declaration .
trace	= **TRACE** vardesc string **AS** declaration .
notrace	= **NOTRACE** [vardesc] .
VarConst	= vardesc | readable_predec | constant | **ADDR** variable .
Sca_VarConst	= Sca_vardesc | Sca_readable_predec | Sca_constant | **ADDR** ScaVar .
Vec_VarConst	= Vec_vardesc | Vec_readable_predec | Vec_constant .
VarConst_string	= variable | string .
Sca_VarConst_string	= ScaVar | string .
port	= ScaVar | integer .
vardesc	= variable | indirect | writeable_predec .
Sca_vardesc	= ScaVar | Sca_indirect | writeable_predec .
Vec_vardesc	= VecVar | Vec_indirect .
indirect	= Sca_indirect | Vec_indirect .
Sca_indirect	= **S** type [integer ":"] "[" ScaVar "]" .

Vec_indirect = **V** type [integer ":"] "[" variable "]" .

variable = ScaVar | VecVar .

ScaVar = **S** type integer ":" integer .

VecVar = **V** type integer ":" integer .

writeable_predec = **MAXTRANS** .

readable_predec = Sca_readable_predec | Vec_readable_predec .

Sca_readable_predec = **ACTTRANS** | **DONE** | **TERMCH** | **SRESULT** .

Vec_readable_predec = **VRESULT** .

constant = Sca_constant | Vec_constant .

Sca_constant = **TRUE** | **FALSE** | char | **TERMS** | **EOL** | **CHR** "(" integer ")" |integer | **NIL** | **SIZE** "(" declaration ")" | real | string .

Vec_constant = **ID** .

comment = < any character sequence until end-of-line > .

char = " ' " (character | " ' ' ") " ' " .

integer = digit { digit } .

real = (integer "." | ([integer] "." integer)) [exponent] | integer exponent .

exponent = ("E" | "e") ["+" | "-"] integer .

string = ' " ' { character \ ' " ' | ' " " ' } ' " ' .

bits = { "0" | "1" | " " | < end-of-line > } .

character = < any character > .

digit = "0" | "1" | "2" | "3" | "4" | "5" | "6" | "7" | "8" | "9" .

C. Execution Recording Structure

Execution recording to a named file may be set by calling the simulator with command-line option -r, or from command level within the simulator.

The record file contains the following information:
program filename:
    program: <name>
change of recording mode:
    mode: <number>
`<number>` =0 : no recording
    1 : short recording
    2 : extended recording

The output for each executed command will be:

1) short recording: `C <num> ;` or
   `Cu <num> ;` during execution of a `REDUCE` operation
   `C` : character identifying command class
   `num` : number of active PEs (for vector commands only)

2) extended recording: `<full_command> <activation> ;`
   `activation`: bitstring (0 and 1) indicating activation of each declared PE, may extend over several lines (for vector commands only)

<u>Summary of Command Characters:</u> (short recording only)

scalar commands:		*vector commands*	
a :	arithmetic command	A :	arithmetic command
b :	move, equal, status, string ass.	B :	move, equal, string assignment
c :	call	-	
d :	debug and trace commands	-	
e :	error-call	-	
f :	procedure / function	-	
g :	goto	-	
h :	halt, end	-	
i :	if_call, if_goto	I :	if_call
-		L :	load, store
-		M :	parallel
n :	new	N :	new
o :	I/O commands	O :	vector I/O
-		P :	propagate
r :	return	R :	return
s :	stack commands (push, pop)	S :	stack commands (push, pop)
-		T :	connect,biconnect,disconnect
-		U :	reduce
v :	comparison	V :	comparison
w :	while_call	W :	while_call
x :	nop (no operation)	-	
z :	assignment	Z :	assignment

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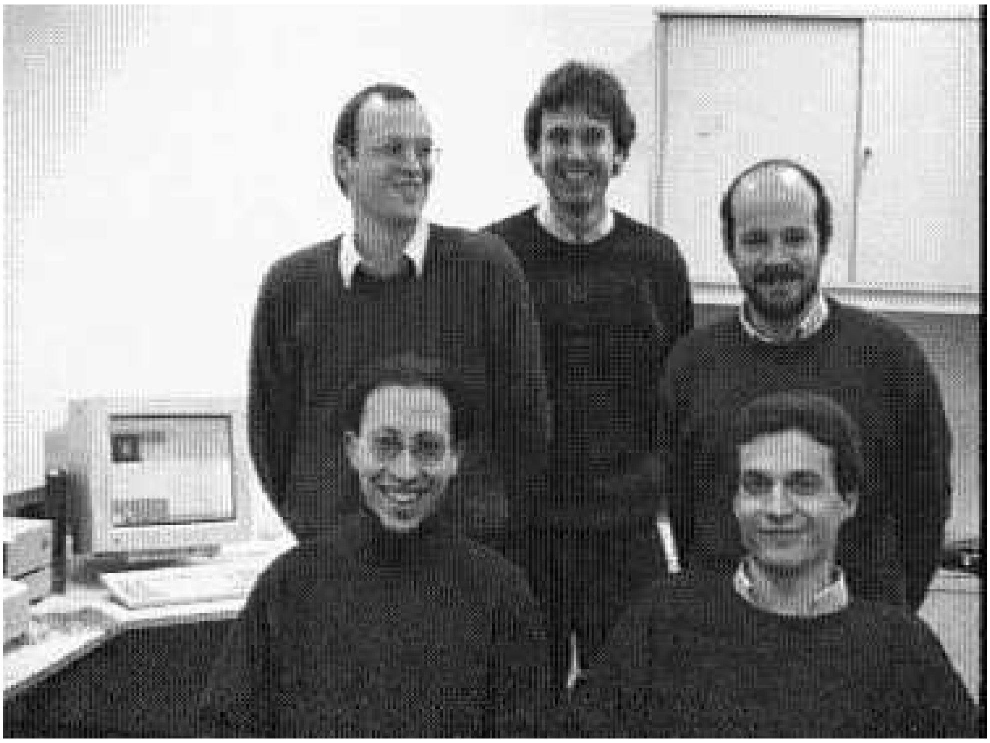
E. About the Team



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