from vibration measurements)

2. Sources:

(a) Original owners of database:

F. Bergadano, A. Giordana, L. Saitta, M. Botta

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F. Bracadori, D. De Marchi

Sogesta, Localita' Crocicchio, Urbino, Italy

(b) Donor of database: Enichem (Eni), Ravenna through Sogesta (Eni), Urbino.

(c) Date received: June 1990

3. Past Usage:

(a) F. Bergadano, A. Giordana, L. Saitta, F. Brancadori, D. De Marchi:

"Integrated Learning in a real Domain"

Proc. VII ML Conference, Austin TX, 1990

(b) Indication of what attribute(s) were being predicted: class.

(c) Indication of study's results: results are described in the paper.

4. Relevant Information Paragraph:

we could not put one instance per line because

every instance contains many components, every

components has 8 attributes, and the number of

components varies. Every instance

is then given in a separate file.

5. Number of Instances: 209

6. Number of Attributes for every example component: 8

7. Attributes:

0 - dummy (always 1) - used for numbering - ignore

1 - class - classification (1..6, the same for components of one example)

2 - # - component number (integer)

3 - sup - support in the machine where measure was taken (1..4)

4 - cpm - frequency of the measure (integer)

5 - mis - measure (real)

6 - misr - earlier measure (real)

7 - dir - filter, type of the measure and direction:

{vo=<no filter, velocity, horizontal>,

va=<no filter, velocity, axial>,

vv=<no filter, velocity, vertical>,

ao=<no filter, amplitude, horizontal>,

aa=<no filter, amplitude, axial>,

av=<no filter, amplitude, vertical>,

io=<filter, velocity, horizontal>,

ia=<filter, velocity, axial>,

iv=<filter, velocity, vertical>}

8 - omega - rpm of the machine (integer,

the same for components of one example)

8. Missing Attribute Values: none (when measures are

missing, the corresponding component will not be included

in the example, but for components that are included,

all attributes are given)

9. Class Distribution: 69 69 14 13 16 28

However, this classification is sometimes wrong because of

the requirement that only one class per example be given.

If a learning system can handle multiple classifications,

the "class" attribute should be changed according to the

information given in the file "trueclass".

10. The file THEORY contains a Horn feature theory that has been

used by ml-smart to generate the results reported in

"learn08.ambi (ambiguity), learn08.err (error rate) , learn08.mat

(confusion matrix)" for the learning set.

The analogous files "test08.ambi, test08.err and test08.mat" report

the results for the test set.

11. The files "predicates.fr , semantics.fr" contains the operational

definition of the predicates, how they can be deduced from the

original relation obj containing all the learning set.

In order to make the data set usable from a system FOIL like

the predicates have been posed in extensional form.

The files contained in the directory LEARN corresponds to such

extensions for the learning set, whereas the ones in TEST

are the same for the test set.

Be aware that ML-SMART can learn numerical constants.

Here, the extension have been generated using the dfault values

suggested by the teacher !!!!!

12. The format of the tuple in the relation is as follows:

(a) F the identifier of the sample (see file obj).

(b) mu

the truth degree of the assertion. This value can range from 0.5

to 1.0. Here probably the values are just boolean (1.0).

(c) X1, X2, ...

The numerical identifiers of the items (components of the

example F to which the variables in the predicate are bound.

distribution/THEORY 664 1356 1356 10106 5045016144 7676 (destroyctx 'abs3)

context abs3 nil

(v\_pericolose\_motore $x1) <- (vibr\_pericolosa\_A $x1)

(obj $x2)(vibr\_pericolosa\_B $x2)

(diff $x1 $x2);

(v\_pericolose\_motore $x1) <- (vibr\_pericolosa\_B $x1)

(obj $x2)(vibr\_pericolosa\_A $x2)

(diff $x1 $x2);

(v\_pericolose\_pompa $x1) <- (vibr\_pericolosa\_C $x1)

(obj $x2)(vibr\_pericolosa\_D $x2)

(diff $x1 $x2);

(v\_pericolose\_pompa $x1) <- (vibr\_pericolosa\_D $x1)

(obj $x2)(vibr\_pericolosa\_C $x2)

(diff $x1 $x2);

(v\_pericolose\_giunto $x1) <- (vibr\_pericolosa\_B $x1)

(obj $x2)(vibr\_pericolosa\_C $x2)

(diff $x1 $x2);

(v\_pericolose\_giunto $x1) <- (vibr\_pericolosa\_C $x1)

(obj $x2)(vibr\_pericolosa\_B $x2)

(diff $x1 $x2);

(v\_pericolose\_multiple $x1) <- (v\_pericolose\_motore $x1) ;

(v\_pericolose\_multiple $x1) <- (v\_pericolose\_pompa $x1) ;

(v\_pericolose\_multiple $x1) <- (v\_pericolose\_giunto $x1) ;

(sospetto\_motore $x1) <- (supporto\_sospetto\_A $x1)

(obj $x2) (supporto\_sospetto\_B $x2)

(diff $x1 $x2) ;

(sospetto\_motore $x1) <- (supporto\_sospetto\_B $x1)

(obj $x2) (supporto\_sospetto\_A $x2)

(diff $x1 $x2) ;

(sospetto\_pompa $x1) <- (supporto\_sospetto\_C $x1)

(obj $x2)(supporto\_sospetto\_D $x2)

(diff $x1 $x2) ;

(sospetto\_pompa $x1) <- (supporto\_sospetto\_D $x1)

(obj $x2)(supporto\_sospetto\_C $x2)

(diff $x1 $x2) ;

(sospetto\_giunto $x1) <- (supporto\_sospetto\_B $x1)

(obj $x2)(supporto\_sospetto\_C $x2)

(diff $x1 $x2) ;

(sospetto\_giunto $x1) <- (supporto\_sospetto\_C $x1)

(obj $x2)(supporto\_sospetto\_B $x2)

(diff $x1 $x2) ;

(v\_pericolosa $x1) <- (v\_alta $x1)(velin $x1) ;

(v\_pericolosa $x1) <- (v\_molto\_alta $x1)(velin $x1) ;

(v\_pericolosa $x1) <- (v\_altissima $x1)(velin $x1) ;

(vibr\_pericolosa $x1) <- (v\_pericolosa $x1)

(obj $x2) (sospetto\_out $x2)

(eqsup $x1 $x2);

(vibr\_pericolosa\_A $x1) <- (v\_pericolosa $x1)

(suppA $x1)

(obj $x2)

(supporto\_sospetto\_A $x2) ;

(vibr\_pericolosa\_B $x1) <- (v\_pericolosa $x1)

(suppB $x1)

(obj $x2)

(supporto\_sospetto\_B $x2) ;

(vibr\_pericolosa\_C $x1) <- (v\_pericolosa $x1)

(suppC $x1)

(obj $x2)

(supporto\_sospetto\_C $x2) ;

(vibr\_pericolosa\_D $x1) <- (v\_pericolosa $x1)

(suppD $x1)

(obj $x2)

(supporto\_sospetto\_D $x2) ;

(massimo\_alto $x1) <- (v\_alta $x1)

(max $x2)

(diff $x1 $x2) ;

(massimo\_falte $x1) <- (falte $x1)

(max $x2)

(diff $x1 $x2) ;

(massimo\_f123 $x1) <- (frpm1\_2\_3 $x1)

(max $x2)

(diff $x1 $x2) ;

(massimo\_fm $x1) <- (fm $x1)

(max $x2)

(diff $x1 $x2) ;

(massimo\_ab $x1) <- (lato\_motore $x1)

(max $x2)

(diff $x1 $x2) ;

(massimo\_bc $x1) <- (lati\_giunto $x1)

(max $x2)

(diff $x1 $x2) ;

(massimo\_cd $x1) <- (lato\_pompa $x1)

(max $x2)

(diff $x1 $x2) ;

(a\_a\_alta\_out $x1) <- (ampout $x1)

(axial $x1)

(abbastanza\_alto\_out $x1) ;

(a\_r\_alta\_out $x1) <- (ampout $x1)

(rad $x1)

(abbastanza\_alto\_out $x1) ;

(v\_a\_alta\_out $x1) <- (velout $x1)

(axial $x1)

(abbastanza\_alto\_out $x1) ;

(v\_r\_alta\_out $x1) <- (velout $x1)

(rad $x1)

(abbastanza\_alto\_out $x1) ;

(sospetto\_out $x1) <- (velin $x1)

(a\_a\_alta\_out $x2)

(eqsup $x1 $x2);

(sospetto\_out $x1) <- (velin $x1)

(a\_r\_alta\_out $x2)

(eqsup $x1 $x2);

(sospetto\_out $x1) <- (velin $x1)

(v\_a\_alta\_out $x2)

(eqsup $x1 $x2);

(sospetto\_out $x1) <- (velin $x1)

(v\_r\_alta\_out $x2)

(eqsup $x1 $x2);

(supporto\_sospetto\_A $x1) <- (suppA $x1)

(sospetto\_out $x1) ;

(supporto\_sospetto\_B $x1) <- (suppB $x1)

(sospetto\_out $x1) ;

(supporto\_sospetto\_C $x1) <- (suppC $x1)

(sospetto\_out $x1) ;

(supporto\_sospetto\_D $x1) <- (suppD $x1)

(sospetto\_out $x1) ;

(v\_pericolosa $x1) <- (v\_alta $x1)(velin $x1) ;

(v\_pericolosa $x1) <- (v\_molto\_alta $x1)(velin $x1) ;

(v\_pericolosa $x1) <- (v\_altissima $x1)(velin $x1) ;

(vibr\_pericolosa $x1) <- (v\_pericolosa $x1)

(obj $x2) (sospetto\_out $x2)

(eqsup $x1 $x2);

(vibr\_pericolosa\_A $x1) <- (v\_pericolosa $x1)

(suppA $x1)

(obj $x2)

(supporto\_sospetto\_A $x2) ;

(vibr\_pericolosa\_B $x1) <- (v\_pericolosa $x1)

distribution/attributes.fr 664 1356 1356 2020 5045016252 11434 (

(sup (order (value 0))

(c\_name (value) (comment "is the internal name for the database"))

(type (value) (default short)) (i\_type (value) (default i2)))

(cpm (order (value 1))

(c\_name (value) (comment "is the internal name for the database"))

(type (value long) (default short))

(i\_type (value i8) (default i2)))

(mis (order (value 2))

(c\_name (value) (comment "is the internal name for the database"))

(type (value) (default float)) (i\_type (value) (default f8)))

(misr (order (value 3))

(c\_name (value)

(comment "is the internal name for the database"))

(type (value) (default float)) (i\_type (value) (default f8)))

(fea (order (value 4))

(c\_name (value) (comment "is the internal name for the database"))

(type (value char)) (i\_type (value c))

(length (value) (default 3)))

(reg (order (value 5))

(c\_name (value) (comment "is internal name for the database"))

(type (value long) (default short))

(i\_type (value i8) (default i2)))

)

(eqsup $x1 $x2);

(sospetto\_out $x1) <- (velin $x1)

(v\_a\_alta\_out $x2)

(eqsup $x1 $x2);

(sospetto\_out $x1) <- (velin $x1)

(v\_r\_alta\_out $x2)

(eqsup $x1 $x2);

(supporto\_sospetto\_A $x1) <- (suppA $x1)

(sospetto\_out $x1) ;

(supporto\_sospetto\_B $x1) <- (suppB $x1)

(sospetto\_out $x1) ;

(supporto\_sospetto\_C $x1) <- (suppC $x1)

(sospetto\_out $x1) ;

(supporto\_sospetto\_D $xdistribution/learn08.ambi 664 1356 1356 573 5045017354 11017

ERROR RATES

Correct classifications : 156 70.59 %

Wrong classifications : 27 12.22 %

Ambiguities among two classes : 30 13.57 %

Ambiguities among three classes : 5 2.26 %

Ambiguities among four classes : 1 0.45 %

Ambiguities among five classes : 2 0.90 %

(value) (comment "is the internal name for the database"))

(type (value) (default float)) (i\_type (value) (default f8)))

(misdistribution/learn08.err 664 1356 1356 407 5045017421 10666

ERROR RATES

Correct classifications : 156 70.59 %

Wrong classifications : 27 12.22 %

Non-classified (with correct class) : 35 15.84 %

Non-classified (without correct class) : 3 1.36 %

Ambiguities among four classes : 1 0.45 %

Ambiguities among five classes : 2 0.90 %

(value) (comment "is the internal name for the database"))

(type (value) (default float)) (i\_type (value) (default f8)))

(misdistribution/learn08.mat 664 1356 1356 433 5045017354 10663

RISULTATI CLASSIFICATORE

1 2 3 4 5 6

1 53 11 3 16 16 2

2 1 67 3 1 1 2

3 0 4 8 0 0 4

4 2 1 1 19 1 0

5 8 0 1 1 14 0

6 0 1 1 0 0 30

ur classes : 1 0.45 %

Ambiguities among five classes : 2 0.90 %

(value) (comment "is the internal name for the database"))

(type (value) (default float)) (i\_type (value) (default f8)))

(misdistribution/predicates.fr 664 1356 1356 43016 5045016252 11423 (

(obj (akindof (value predicate)) (form (value (obj x1)))

(constraints (value))

(semantics (value obj-sem))

(use\_for (value ))

(subsume (value))

(family (value obj))

(name\_int (value p0)))

(diff (akindof (value predicate)) (form (value (diff x1 x2)))

(constraints (value))

(semantics (value diff-sem))

(use\_for (value ))

(family (value eqvar))

(subsume (value))

(lisp\_c (value not-different))

(name\_int (value p1)))

(eql (akindof (value predicate)) (form (value (eql x1 x2)))

(constraints (value))

(semantics (value eql-sem))

(use\_for (value ))

(family (value eqvar))

(subsume (value))

(lisp\_c (value not-different))

(name\_int (value p2)))

(velin (akindof (value predicate)) (form (value (velin x1)))

(constraints (value (or (v\_pericolosa x1)

(vibr\_pericolosa x1)

(vibr\_pericolosa\_A x1)

(vibr\_pericolosa\_B x1)

(vibr\_pericolosa\_C x1)

(vibr\_pericolosa\_D x1))))

(semantics (value velin-sem))

(family (value gran)) (use\_for (value ))

(subsume (value)) (name\_int (value p3)))

(velout (akindof (value predicate)) (form (value (velout x1)))

(constraints (value (or (sospetto\_out x1)

(supporto\_sospetto\_A)

(supporto\_sospetto\_B)

(supporto\_sospetto\_C)

(supporto\_sospetto\_D))))

(semantics (value velout-sem))

(family (value gran)) (use\_for (value ))

(subsume (value)) (name\_int (value p4)))

(ampout (akindof (value predicate)) (form (value (ampout x1)))

(constraints (value (or (sospetto\_out x1)

(supporto\_sospetto\_A)

(supporto\_sospetto\_B)

(supporto\_sospetto\_C)

(supporto\_sospetto\_D))))

(semantics (value ampout-sem))

(family (value gran)) (use\_for (value ))

(subsume (value)) (name\_int (value p5)))

(max (akindof (value predicate)) (form (value (max x1)))

(constraints (value (velin x1)))

(semantics (value max-sem))

(family (value maxpri))

(use\_for (value ))

(subsume (value))

(name\_int (value p6)))

(abbastanza\_alto\_out (akindof (value predicate))

(form (value (abbastanza\_alto\_out x1)))

(constraints (value (or (ampout x1) (velout x1))))

(semantics (value abbastanza\_alto\_out-sem))

(family (value v\_out))

(use\_for (value ))

(subsume (value))

(name\_int (value p7)))

(axial (akindof (value predicate)) (form (value (axial x1)))

(constraints (value (velin x1) ))

(semantics (value axial-sem))

(family (value dirfam))

(use\_for (value ))

(subsume (value ))

(name\_int (value p8)))

(rad (akindof (value predicate)) (form (value (rad x1)))

(constraints (value (velin x1)))

(semantics (value rad-sem))

(family (value dirfam))

(use\_for (value ))

(subsume (value ))

(name\_int (value p9)))

(hor (akindof (value predicate)) (form (value (hor x1)))

(constraints (value (and (velin x1) (rad x1))))

(semantics (value hor-sem))

(family (value dirhv))

(use\_for (value ))

(subsume (value rad))

(name\_int (value p10)))

(ver (akindof (value predicate)) (form (value (ver x1)))

(constraints (value (and (velin x1)(rad x1))))

(semantics (value ver-sem))

(family (value dirhv))

(use\_for (value ))

(subsume (value rad))

(name\_int (value p11)))

(v\_bassa (akindof (value predicate)) (form (value (v\_bassa x1 k1)))

(constraints (value (or (frpm1 x1) (frpm2 x1))))

(semantics (value v\_bassa-sem))

(family (value v\_in))

(use\_for (value ))

(subsume (value frpm1))

(name\_int (value p24)))

(v\_alta (akindof (value predicate)) (form (value (v\_alta x1 k1)))

(constraints (value (velin x1) ))

(semantics (value v\_alta-sem))

(family (value v\_in))

(use\_for (value ))

(subsume (value velin))

(name\_int (value p25)))

(v\_molto\_alta (akindof (value predicate)) (form (value (v\_molto\_alta x1 k1)))

(constraints (value (velin x1) ))

(semantics (value v\_molto\_alta-sem))

(family (value v\_hin))

(use\_for (value ))

(subsume (value velin))

(name\_int (value p26)))

(v\_altissima (akindof (value predicate)) (form (value (v\_altissima x1 k1)))

(constraints (value (velin x1) ))

(semantics (value v\_altissima-sem))

(family (value v\_hin))

(use\_for (value ))

(subsume (value velin))

(name\_int (value p27)))

(eqdir (akindof (value predicate)) (form (value (eqdir x1 x2)))

(constraints (value))

(semantics (value eqdir-sem))

(family (value eqdf))

(use\_for (value ))

(subsume (value))

(name\_int (value p28)))

(eqsup (akindof (value predicate)) (form (value (eqsup x1 x2)))

(constraints (value))

(semantics (value eqsup-sem))

(family (value eqdf))

(use\_for (value ))

(subsume (value))

(name\_int (value p29)))

(frpm (akindof (value predicate)) (form (value (frpm x1)))

(constraints (value (velin x1)))

(semantics (value frpm-sem))

(family (value freq))

(use\_for (value ))

(subsume (value))

(name\_int (value p30)))

(frpm1 (akindof (value predicate)) (form (value (frpm1 x1)))

(constraints (value (velin x1)))

(semantics (value frpm1-sem))

(family (value freq))

(use\_for (value ))

(subsume (value))

(name\_int (value p31)))

(frpm2 (akindof (value predicate)) (form (value (frpm2 x1)))

(constraints (value (velin x1)))

(semantics (value frpm2-sem))

(family (value freq))

(use\_for (value ))

(subsume (value))

(name\_int (value p32)))

(frpm3 (akindof (value predicate)) (form (value (frpm3 x1)))

(constraints (value (velin x1)))

(semantics (value frpm3-sem))

(family (value freq))

(use\_for (value ))

(subsume (value))

(name\_int (value p33)))

(frpm4 (akindof (value predicate)) (form (value (frpm4 x1)))

(constraints (value (velin x1)))

(semantics (value frpm4-sem))

(family (value freq))

(use\_for (value ))

(subsume (value))

(name\_int (value p34)))

(frpm5 (akindof (value predicate)) (form (value (frpm5 x1)))

(constraints (value (velin x1)))

(semantics (value frpm5-sem))

(family (value freq))

(use\_for (value ))

(subsume (value))

(name\_int (value p35)))

(fm (akindof (value predicate)) (form (value (fm x1)))

(constraints (value (velin x1)))

(semantics (value fm-sem))

(family (value freq))

(use\_for (value ))

(subsume (value))

(name\_int (value p36)))

(fbasse (akindof (value predicate)) (form (value (fbasse x1)))

(constraints (value (velin x1)))

(semantics (value fbasse-sem))

(family (value freq))

(use\_for (value ))

(subsume (value))

(name\_int (value p37)))

(falte (akindof (value predicate)) (form (value (falte x1 k1)))

(constraints (value (velin x1)))

(semantics (value falte-sem))

(family (value freq))

(use\_for (value ))

(subsume (value))

(name\_int (value p38)))

(f\_molto\_alte (akindof (value predicate)) (form (value (f\_molto\_alte x1 k1)))

(constraints (value (velin x1)))

(semantics (value f\_molto\_alte-sem))

(family (value freq))

(use\_for (value ))

(subsume (value))

(name\_int (value p39)))

(frpm2\_fm (akindof (value predicate)) (form (value (frpm2\_fm x1)))

(constraints (value (velin x1)))

(semantics (value frpm2\_fm-sem))

(family (value freq))

(use\_for (value ))

(subsume (value))

(name\_int (value p41)))

(frpm1\_2 (akindof (value predicate)) (form (value (frpm1\_2 x1)))

(constraints (value (velin x1)))

(semantics (value frpm1\_2-sem))

(family (value freq))

(use\_for (value ))

(subsume (value))

(name\_int (value p42)))

(frpm1\_2\_3 (akindof (value predicate)) (form (value (frpm1\_2\_3 x1)))

(constraints (value (velin x1)))

(semantics (value frpm1\_2\_3-sem))

(family (value freq))

(use\_for (value ))

(subsume (value))

(name\_int (value p43)))

(suppA (akindof (value predicate)) (form (value (suppA x1)))

(constraints (value))

(semantics (value suppA-sem))

(family (value supfam))

(use\_for (value ))

(subsume (value))

(name\_int (value p44)))

(suppB (akindof (value predicate)) (form (value (suppB x1)))

(constraints (value))

(semantics (value suppB-sem))

(family (value supfam))

(use\_for (value ))

(subsume (value))

(name\_int (value p45)))

(suppC (akindof (value predicate)) (form (value (suppC x1)))

(constraints (value))

(semantics (value suppC-sem))

(family (value supfam))

(use\_for (value ))

(subsume (value))

(name\_int (value p46)))

(suppD (akindof (value predicate)) (form (value (suppD x1)))

(constraints (value))

(semantics (value suppD-sem))

(family (value supfam))

(use\_for (value ))

(subsume (value))

(name\_int (value p47)))

(lato\_motore (akindof (value predicate)) (form (value (lato\_motore x1)))

(constraints (value))

(semantics (value lato\_motore-sem))

(family (value supfam))

(use\_for (value ))

(subsume (value))

(name\_int (value p48)))

(lato\_pompa (akindof (value predicate)) (form (value (lato\_pompa x1)))

(constraints (value))

(semantics (value lato\_pompa-sem))

(family (value supfam))

(use\_for (value ))

(subsume (value))

(name\_int (value p49)))

(lati\_giunto (akindof (value predicate)) (form (value (lati\_giunto x1)))

(constraints (value))

(semantics (value lati\_giunto-sem))

(family (value supfam))

(use\_for (value ))

(subsume (value))

(name\_int (value p50)))

(a\_a\_alta\_out (akindof (value predicate))

(form (value (a\_a\_alta\_out x1)))

(constraints (value))

(semantics (value a\_a\_alta\_out-sem))

(family (value out-f))

(use\_for (value (abstraction)))

(subsume (value))

(name\_int (value)))

(a\_r\_alta\_out (akindof (value predicate))

(form (value (a\_r\_alta\_out x1)))

(constraints (value))

(semantics (value a\_r\_alta\_out-sem))

(family (value out-f))

(use\_for (value (abstraction)))

(subsume (value))

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(name\_int (value)))

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(constraints (value (velin x1)))

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(use\_for (value (abstraction)))

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(name\_int (value)))

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(form (value (massimo\_falte x1)))

(constraints (value (velin x1)))

(semantics (value massimo\_falte-sem))

(family (value maxcpm))

(use\_for (value (abstraction)))

(subsume (value))

(name\_int (value)))

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(constraints (value (velin x1)))

(semantics (value massimo\_f123-sem))

(family (value maxcpm))

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(subsume (value))

(name\_int (value)))

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(constraints (value (velin x1)))

(semantics (value massimo\_fm-sem))

(family (value maxcpm))

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(subsume (value))

(name\_int (value)))

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(name\_int (value)))

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(form (value (massimo\_bc x1)))

(constraints (value (velin x1)))

(semantics (value massimo\_bc-sem))

(family (value maxsup))

(use\_for (value (abstraction)))

(subsume (value))

(name\_int (value)))

(massimo\_cd (akindof (value predicate))

(form (value (massimo\_cd x1)))

(constraints (value (velin x1)))

(semantics (value massimo\_cd-sem))

(family (value maxsup))

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(name\_int (value)))

)

ue supfam))

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(or

(streq (x1 fea) ao)

(streq (x1 fea) av)

(streq (x1 fea) aa))

(fuzzy (5.0 20.0 1000 1000 1) (x1 mis)))

(and

(or

(streq (x1 fea) vo)

(streq (x1 fea) vv)

(streq (x1 fea) va))

(fuzzy (1.0 6.0 1000 1000 1) (x1 mis)))))))

(velout-sem (akindof (value semantic)) (form (value (velout x1)))

(formula (value (or

(streq (x1 fea) va)

(streq (x1 fea) vo)

(streq (x1 fea) vv)))))

(ampout-sem (akindof (value semantic)) (form (value (ampout x1)))

(formula (value (or

(streq (x1 fea) aa)

(streq (x1 fea) ao)

(streq (x1 fea) av)))))

(velin-sem (akindof (value semantic)) (form (value (velin x1)))

(formula (value (or

(streq (x1 fea) ia)

(streq (x1 fea) io)

(streq (x1 fea) iv)))))

(max-sem (akindof (value semantic)) (form (value (max x1)))

(formula (value (streq (x1 fea) ma))))

(axial-sem (akindof (value semantic)) (form (value (ass x1)))

(formula (value (or

(streq (x1 fea) ia)

(streq (x1 fea) va)

(streq (x1 fea) aa)))))

(rad-sem (akindof (value semantic)) (form (value (rad x1)))

(formula (value (or

(streq (x1 fea) io)

(streq (x1 fea) iv)

(streq (x1 fea) ao)

(streq (x1 fea) av)

(streq (x1 fea) vo)

(streq (x1 fea) vv)))))

(ver-sem (akindof (value semantic)) (form (value (ver x1)))

(formula (value (or

(streq (x1 fea) iv)

(streq (x1 fea) vv)

(streq (x1 fea) av)))))

(hor-sem (akindof (value semantic)) (form (value (hor x1)))

(formula (value (or

(streq (x1 fea) io)

(streq (x1 fea) vo)

(streq (x1 fea) ao)))))

(v\_bassa-sem (akindof (value semantic))

(form (value (v\_bassa x1 k1)))

(formula (value (fuzzy (-0.1 0.0 k1 (+ k1 (\* k1 0.5)) 1) (x1 mis))))

(k1 (type sn) (mode user) (default (1.6)) (min 0.8) (max 3.5)

(step 0.1) (most\_gen max)))

(v\_alta-sem (akindof (value semantic)) (form (value (v\_alta x1 k1)))

(formula (value

(fuzzy ((- k1 (\* k1 0.3)) k1 1000.0 1000.0 1)

(\* (x1 mis)

(+ 1 (fuzzy (10000.0 35000.0 200000.0 200000.0 1)

(x1 cpm)))))))

(k1 (type sn) (mode user) (default (4.0)) (min 3.0) (max 7.0)

(step 0.1) (most\_gen min)))

(v\_molto\_alta-sem (akindof (value semantic))

(form (value (v\_molto\_alta x1 k1)))

(formula (value (fuzzy ((- k1 (\* k1 0.3)) k1 1000.0 1000.0 1)

(\* (x1 mis)

(+ 1 (fuzzy (10000.0 35000.0 200000.0 200000.0 1)

(x1 cpm)))))))

(k1 (type sn) (mode user) (default (10.0)) (min 7.0) (max 13.0)

(step 0.3) (most\_gen min)))

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(form (value (v\_altissima x1 k1)))

(formula (value (fuzzy ((- k1 (\* k1 0.3)) k1 1000.0 1000.0 1) (x1 mis))))

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(step 0.5) (most\_gen min)))

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(formula (value (or (and (or (streq (x1 fea) aa)

(streq (x1 fea) va)

(streq (x1 fea) ia))

(or (streq (x2 fea) aa)

(streq (x2 fea) va)

(streq (x2 fea) ia)))

(and (or (streq (x1 fea) ao)

(streq (x1 fea) av)

(streq (x1 fea) vo)

(streq (x1 fea) vv)

(streq (x1 fea) io)

(streq (x1 fea) iv))

(or (streq (x2 fea) ao)

(streq (x2 fea) av)

(streq (x2 fea) vo)

(streq (x2 fea) vv)

(streq (x2 fea) io)

(streq (x2 fea) iv)))))))

(eqsup-sem (akindof (value semantic)) (form (value (eqsup x1 x2)))

(formula (value (= (x1 sup) (x2 sup)))))

(frpm-sem (akindof (value semantic)) (form (value (frpm x1)))

(formula (value (or (= (x1 cpm) (x1 reg)) (= (/ (x1 cpm) 2) (x1 reg))

(= (/ (x1 cpm) 3) (x1 reg))

(= (/ (x1 cpm) 4) (x1 reg))

(= (/ (x1 cpm) 5) (x1 reg))

(= (/ (x1 cpm) 6) (x1 reg))

(= (\* (x1 cpm) 2) (x1 reg))

(= (\* (x1 cpm) 4) (x1 reg))))))

(frpm1-sem (akindof (value semantic)) (form (value (frpm1 x1)))

(formula (value (= (x1 cpm) (x1 reg)))))

(frpm2-sem (akindof (value semantic)) (form (value (frpm2 x1)))

(formula (value (= (/ (x1 cpm) 2) (x1 reg)))))

(frpm3-sem (akindof (value semantic)) (form (value (frpm3 x1)))

(formula (value (= (/ (x1 cpm) 3) (x1 reg)))))

(frpm4-sem (akindof (value semantic)) (form (value (frpm4 x1)))

(formula (value (= (/ (x1 cpm) 4) (x1 reg)))))

(frpm5-sem (akindof (value semantic)) (form (value (frpm5 x1)))

(formula (value (= (/ (x1 cpm) 5) (x1 reg)))))

(fm-sem (akindof (value semantic)) (form (value (fm x1)))

(formula (value (or

(= (/ (x1 cpm) 3) (x1 reg))

(= (/ (x1 cpm) 4) (x1 reg))

(= (/ (x1 cpm) 5) (x1 reg))

(= (/ (x1 cpm) 6) (x1 reg))))))

(fbasse-sem (akindof (value semantic)) (form (value (fbasse x1)))

(formula (value (and (<> (x1 cpm) (x1 reg))

(<> (/ (x1 cpm) 2) (x1 reg))

(<> (/ (x1 cpm) 3) (x1 reg))

(< (x1 cpm) (\* (x1 reg) 3))))))

(falte-sem (akindof (value semantic)) (form (value (falte x1 k1)))

(formula (value (if

(>= (x1 reg) 3000)

(fuzzy ((- k1 (\* k1 0.2)) k1 100000.0 100000.0 1) (x1 cpm))

(fuzzy ((- k1 (\* k1 0.4)) k1 100000.0 100000.0 1) (x1 cpm)))))

(k1 (type sn) (mode user) (default (21000)) (min 16000) (max 31000)

(step 1000) (most\_gen min)))

(f\_molto\_alte-sem (akindof (value semantic))

(form (value (f\_molto\_alte x1 k1)))

(formula (value (fuzzy ((- k1 (\* k1 0.25)) k1 200000.0 200000.0 1) (x1 cpm))))

(k1 (type sn) (mode user) (default (35000)) (min 33000) (max 45000)

(step 1000) (most\_gen min)))

(frpm2\_fm-sem (akindof (value semantic)) (form (value (frpm2\_fm x1)))

(formula (value (or

(= (/ (x1 cpm) 2) (x1 reg))

(= (/ (x1 cpm) 3) (x1 reg))

(= (/ (x1 cpm) 4) (x1 reg))

(= (/ (x1 cpm) 5) (x1 reg))

(= (/ (x1 cpm) 6) (x1 reg))))))

(frpm1\_2-sem (akindof (value semantic))

(form (value (frpm1\_2 x1)))

(formula (value (or

(= (x1 cpm) (x1 reg))

(= (/ (x1 cpm) 2) (x1 reg))))))

(frpm1\_2\_3-sem (akindof (value semantic))

(form (value (frpm1\_2\_3 x1)))

(formula (value (or

(= (x1 cpm) (x1 reg))

(= (/ (x1 cpm) 2) (x1 reg))

(= (/ (x1 cpm) 3) (x1 reg))))))

(suppA-sem (akindof (value semantic))

(form (value (suppA x1)))

(formula (value (= (x1 sup) 1))))

(suppB-sem (akindof (value semantic))

(form (value (suppB x1)))

(formula (value (= (x1 sup) 2))))

(suppC-sem (akindof (value semantic))

(form (value (suppC x1)))

(formula (value (= (x1 sup) 3))))

(suppD-sem (akindof (value semantic))

(form (value (suppD x1)))

(formula (value (= (x1 sup) 4))))

(lato\_motore-sem (akindof (value semantic))

(form (value (lato\_motore x1)))

(formula (value (or (= (x1 sup) 1)

(= (x1 sup) 2)))))

(lato\_pompa-sem (akindof (value semantic))

(form (value (lato\_pompa x1)))

(formula (value (or (= (x1 sup) 3)

(= (x1 sup) 4)))))

(lati\_giunto-sem (akindof (value semantic))

(form (value (lati\_giunto x1)))

(formula (value (or (= (x1 sup) 2)

(= (x1 sup) 3)))))

(eql-sem (akindof (value semantic)) (form (value (eql x1 x2)))

(formula (value (= (x1) (x2)))))

(diff-sem (akindof (value semantic)) (form (value (diff x1 x2)))

(formula (value (<> (x1) (x2)))))

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(form (value (supporto\_sospetto\_C x1)))

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(supporto\_sospetto\_D-sem (akindof (value semantic))

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(sospetto\_pompa-sem (akindof (value semantic))

(form (value (sospetto\_pompa x1)))

(formula (value (verify sospetto\_pompa (x1)))))

(sospetto\_giunto-sem (akindof (value semantic))

(form (value (sospetto\_giunto x1)))

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(formula (value (verify massimo\_f123 (x1)))))

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(formula (value (verify massimo\_bc (x1)))))

(massimo\_cd-sem (akindof (value semantic))

(form (value (massimo\_cd x1)))

(formula (value (verify massimo\_cd (x1)))))

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lose\_motore-sem))

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