

**Tele Action Objects
for**

Prototyping of

**Distributed
Multimedia**

Applications

Outline

- **Overview of TAO formalism**
- **Symbol-Relation Grammar for Teleaction Objects**
- **Visual Tools for a Multimedia IC Development Environment (MICE)**

- **Conclusions and Future Research**

References

H.J. Chang, T.Y. Hou, A. Hsu, S.K. Chang, "The Management and Application of Tele-Action Objects", *ACM Multimedia Systems J.*, Vol. 3, No. 5-6, 1995, pp. 204-216.

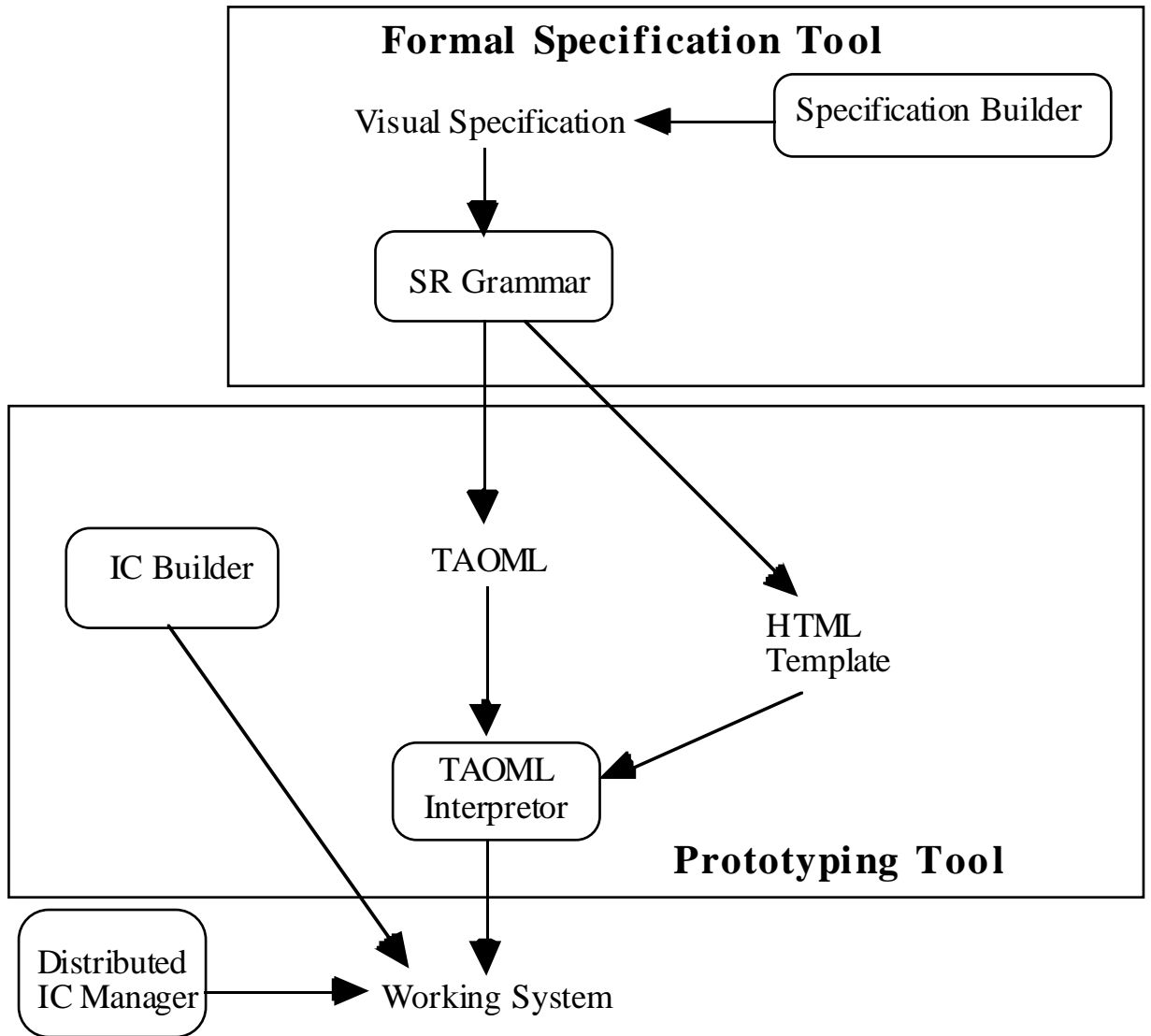
T. Arndt, A. Cafiero, A. Guercio, "Multimedia Languages for Teleaction Objects", *Proceedings of 1997 IEEE Symposium on Visual Languages*, pp. 318-327, September 1997.

T. Arndt, A. Cafiero, A. Guercio, "Symbol Relation Grammars for Teleaction Objects", Technical Report, Dipartimento di Informatica ed Applicazioni, University of Salerno, 1997.

T. Arndt, S.K. Chang, A. Guercio, "Visual Tools for a Multimedia IC Development Environment (MICE)", submitted to *1998 IEEE Symposium on Visual Languages*.

T. Arndt, S.K. Chang, A. Guercio, “Formal Specification and Prototyping of Multimedia Applications”, to be submitted.

Multimedia Application Development using TAO



TAOML

- An extended form of HTML
- Contains special TAO-related tags
- Translated into standard HTML to allow browser-based protoyping

TAOML - BNF

TAO_HTML ::= <TAO> TAO_BODY </TAO>

TAO_BODY ::= NAME_PART TYPE_PART P_PART
LINK_PART IC_PART SENSI_PART DATA_PART

NAME_PART ::= <TAO_NAME> "name" </TAO_NAME>

TYPE_PART ::= <TAO_TYPE> TYPE_SET </TAO_TYPE>

TYPE_SET ::= [image, text, audio, motion_graph, video, mixed]

P_PART ::= <TAO_TEMPLATE> "template_name"
</TAO_TEMPLATE>

LINK_PART ::= empty | <TAO_LINKS> LINK_BODY
</TAO_LINKS> LINK_PART

LINK_BODY ::= name = "link_name", type = LINK_TYPE, obj =
"link_obj"

LINK_TYPE ::= [spatial, temporal, structural]

IC_PART ::= empty | <TAO_IC> flag=FLAG ic_type="a_string"
ic_id_list="a_string" cgi_pgm="a_string" message_type="a_string"
content="a_string" </TAO_IC>

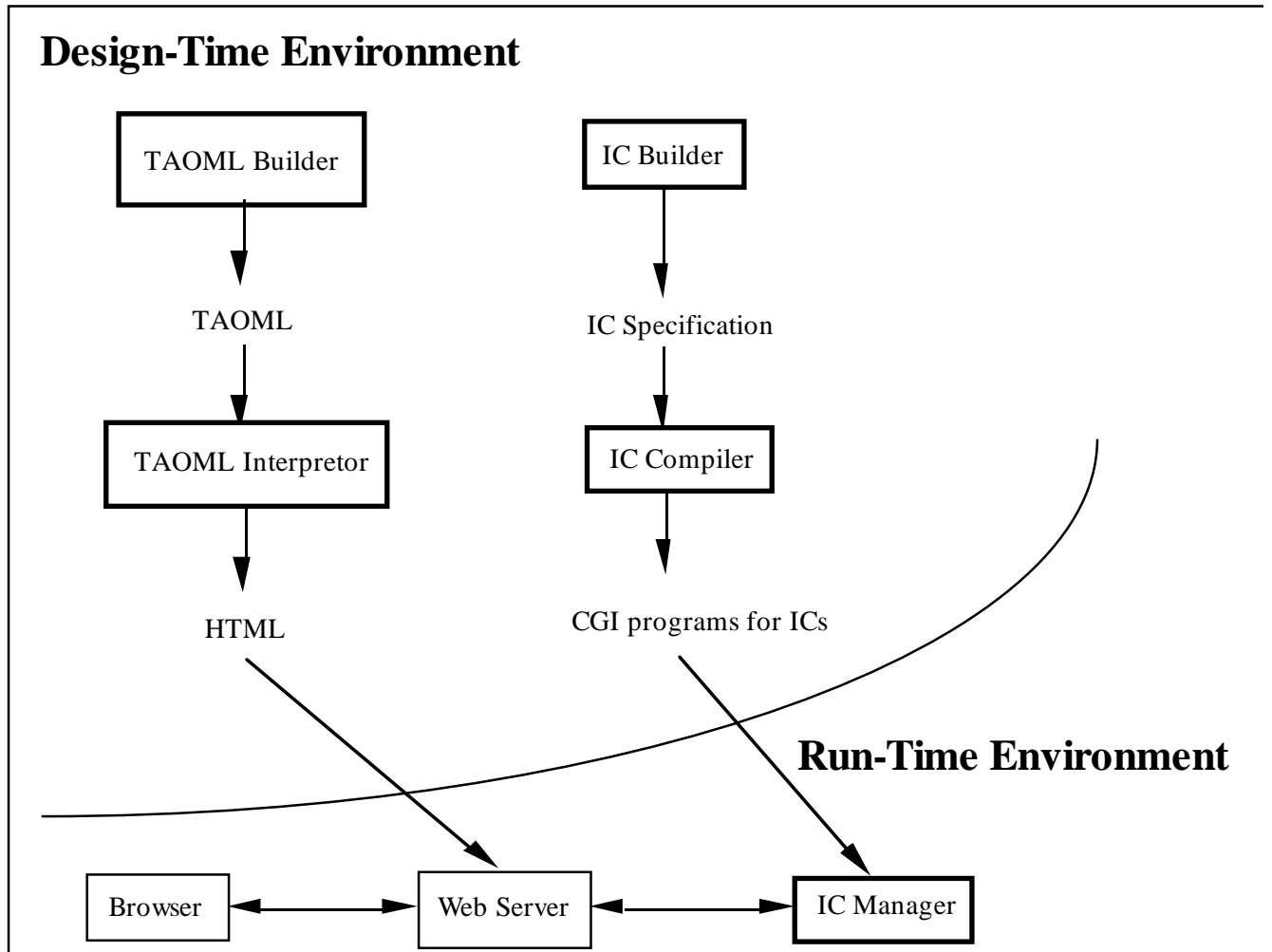
FLAG ::= [old, new]

SENSI_PART ::= empty | <TAO_SENSI> SENSITIVITY
</TAO_SENSI>

SENSITIVITY ::= [location, content, time]

DATA_PART ::= empty | <TAO_DATA> "database_name"
</TAO_DATA>

MICE Tools



TAOML Builder

- a visual tool for MICE application developers
- allows users to specify structure of a TAO as a hypergraph representing multimedia objects and relations between these objects
- automatically generates the TAOML corresponding to the visually specified TAO
- output is then used by the TAOML Interpreter
- TAOML Builder is based on the underlying multidimensional grammar previously described

Node Properties



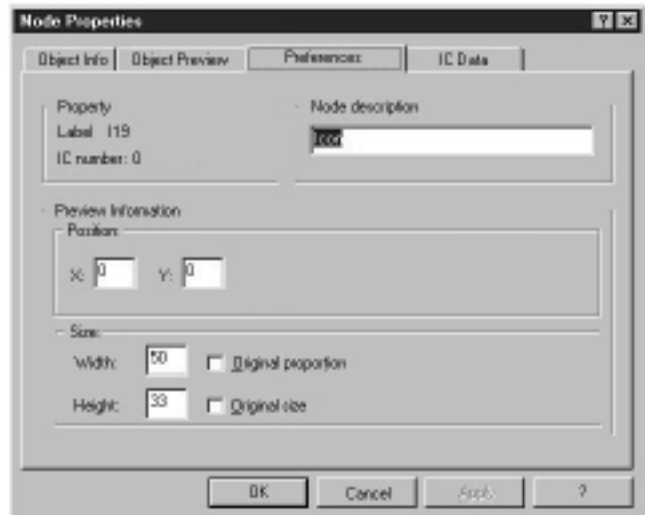
a



b

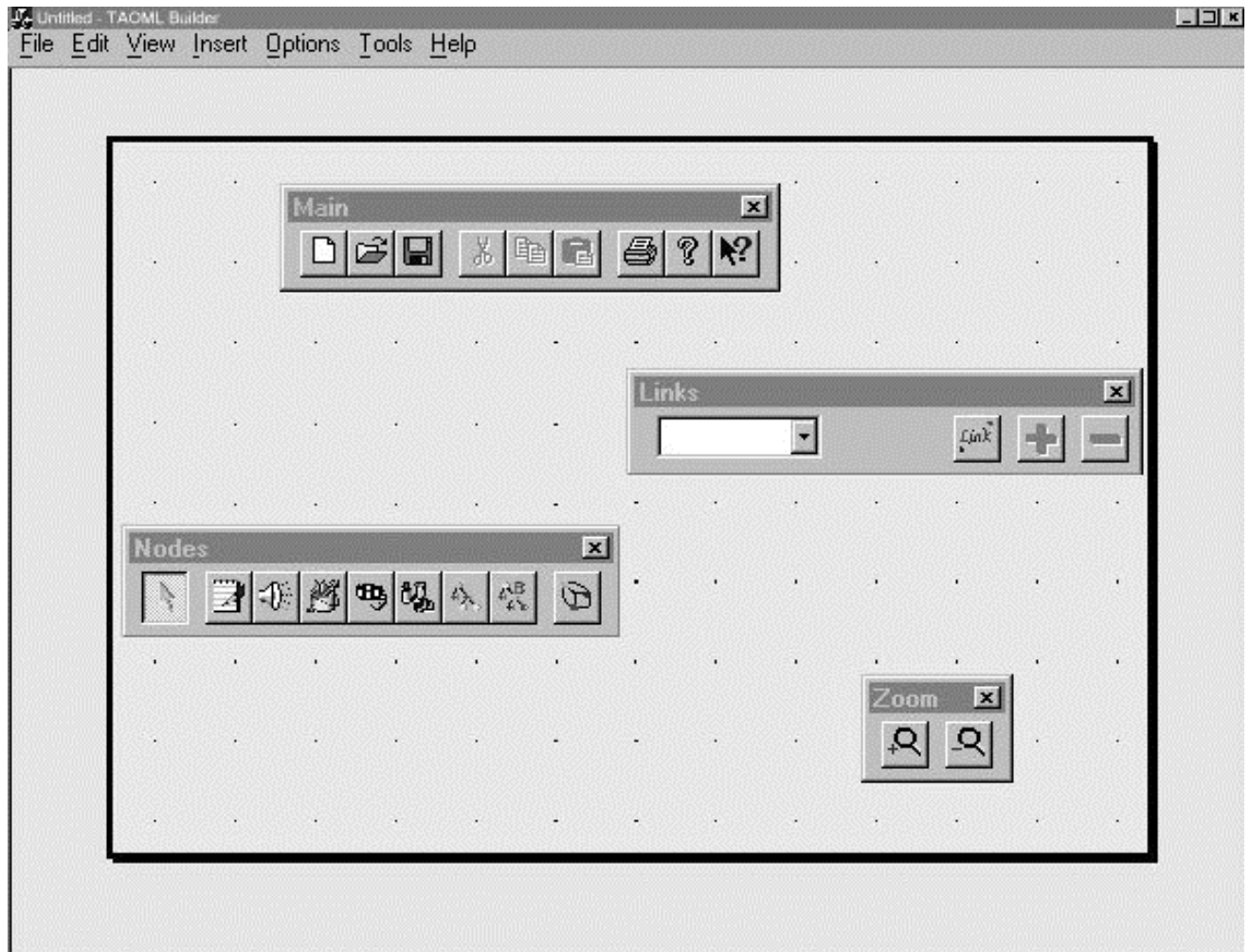


c



d

TAOML Builder Toolbars

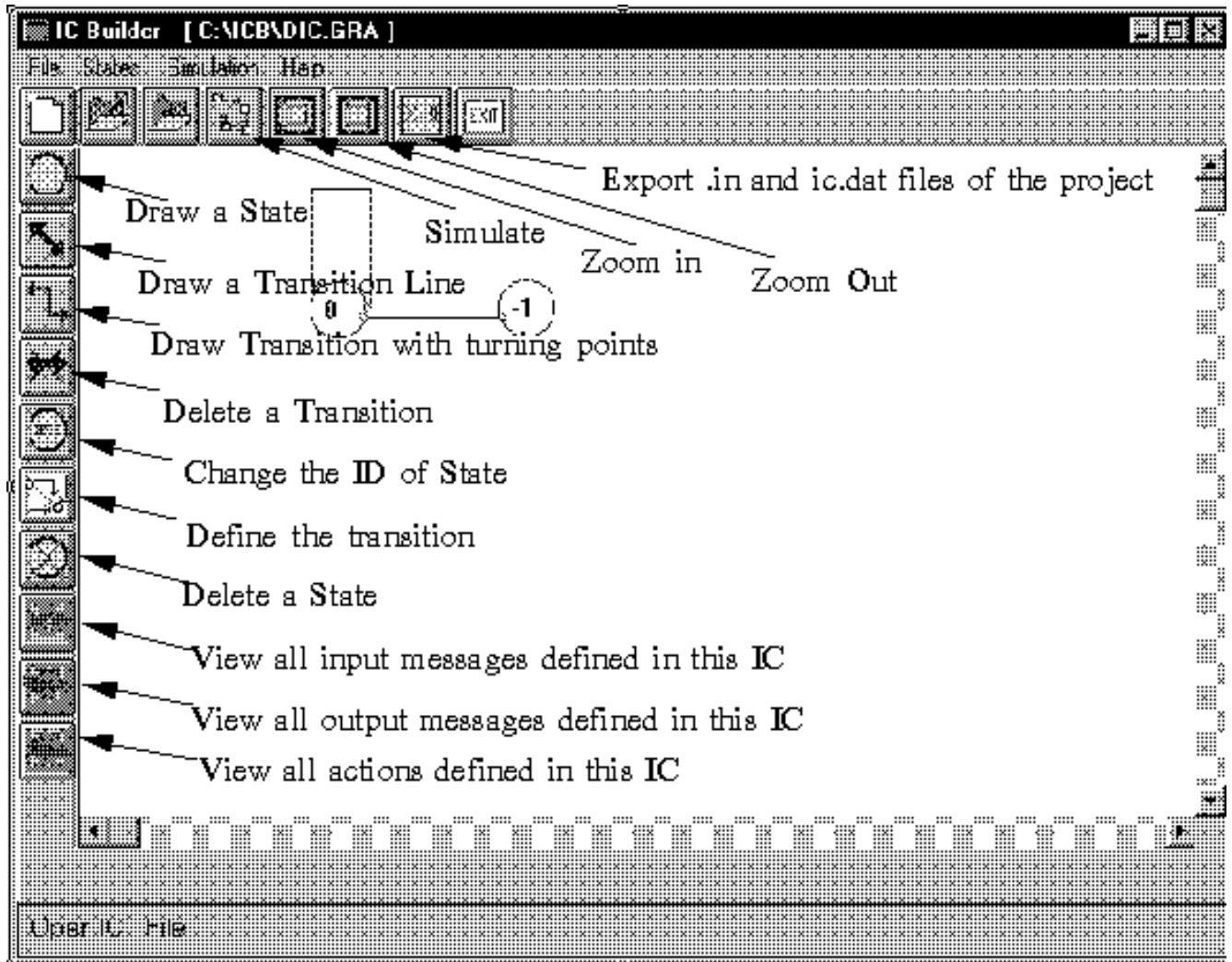


Hypergraph and Matching TAOML

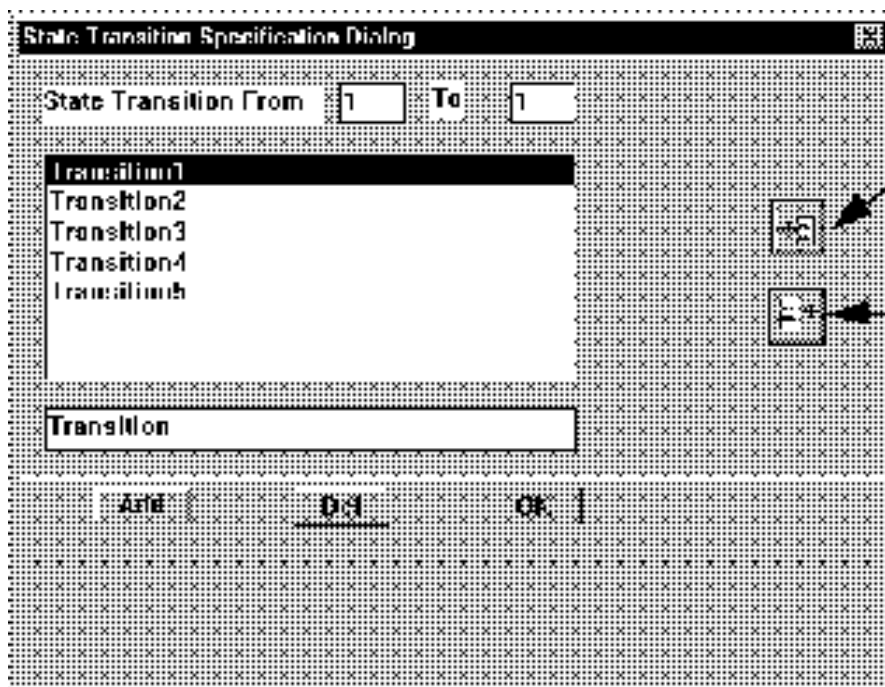
The screenshot displays the Bancoint - TAOML Builder application. The main workspace shows a hypergraph diagram with nodes and edges. The nodes are labeled: Welcome, Display, Body, Travel, Backgroui, Text, Text1, Text, and Text. The edges connect these nodes in a hierarchical structure. A context menu is open over the diagram, with the 'Create TAOML' option selected. To the right, a 'TAOML Document' window shows the generated code for the 'Welcome.taoml' document and its template.

```
====TAOML Document [ Welcome.taoml ]====  
<TAO>  
<TAO_NAME>"Welcome"</TAO_NAME>  
<TAO_TYPE>"Video"</TAO_TYPE>  
<TAO_TEMPLATE>"Welcome.tpl"</TAO_TEMPLATE>  
<TAO_LINKS>  
name = "Ref M1", type = structural , obj = "Display.taoml"  
</TAO_LINKS>  
<TAO_IC>  
flag = new  
ic_type = "Welcome"  
ic_id_list = "Display"  
message_type = "Touch screen"  
message_content = "Start system"  
cgi = ""  
</TAO_IC>  
</TAO>  
  
====Document Template [ Welcome.tpl ]====  
<!-- #name = Ref M1= reference -->  
<A HREF = "Display.taoml"> Ref M1</A>  
<!-- #Type=Vicon #File= #X=12 #Y=16 -->
```


IC Builder Main Screen



Defining a Transition



Define Input
Message(f function)

Define Output
Message(g function)

Other Mice Tools

- TAOML Interpreter
- IC Compiler
- IC Manager

Conclusions and Future Research

- **Formal Methodology for Specification of TAOs**
- **Tools for Prototyping of TAO-Based Applications**
- **Syntax-Directed TAO Editor**
- **Grammar-Based Property Proving?**

- **Integration of MICE Tools**
- **TAOML as XML Application**