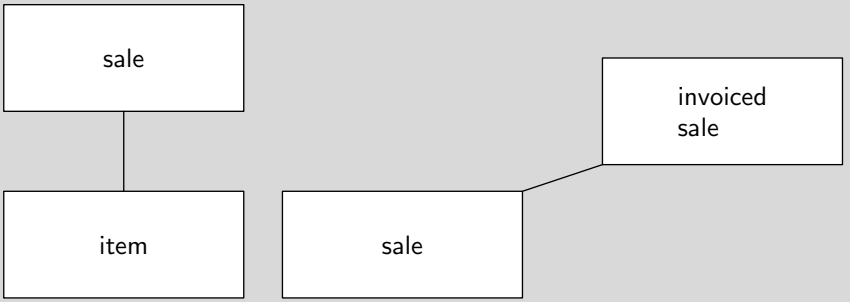
Applying Semantic Principles in a Relational Environment

Xplain Concepts

Xplain supports two types of relationships: aggregation and generalization.



aggregation generalization

Some remarks about the schematic language:

- A rectangle signifies a type.
- Aggregation is represented by a line connecting the centers of two facing rectangles.
- Generalization is represented by a line connecting facing corners.

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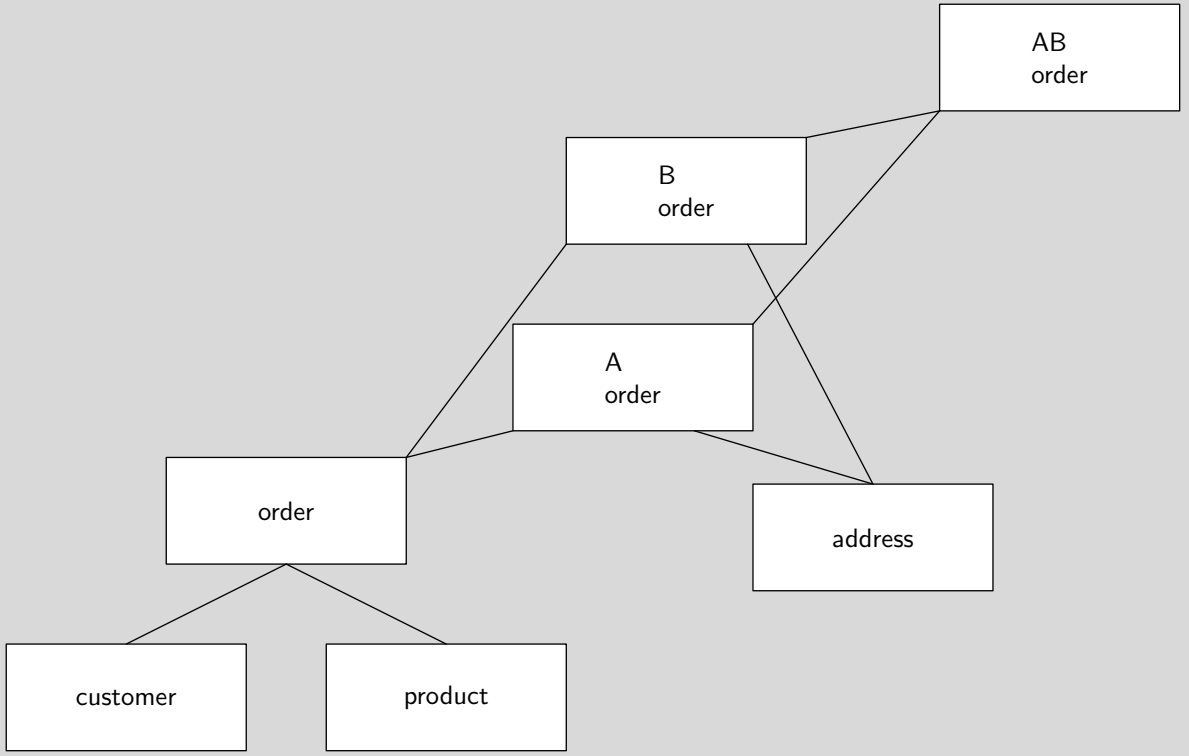
Larger schematic example



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Data definition statements

Xplain supports base types and types.

```
base price (R4,2).
base week (I2) (1..52).

type item (A4) = description, stock, price.
type sale (A4) = week, day, item, number, amount.

init default sale its number = 1.
```

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Data modification statements

Xplain supports the familiar insert, update and delete statements.

```
insert sale "1" its
  week = 10, day = "Mon", item = "I51",
  amount = "49.90".

update item "I51" its
  price = "51.50".

delete item
  where stock = 0.
```

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Data retrieval statements

Data is retrieved with `get`, the `extend` command is unique for Xplain. With `extend` an additional, temporary column is added to a table.

```
extend item with turnover =
  total sale its amount
  per item.

get item its turnover.
```

Xplain's advantages

- Good fit in OO environments: supports same relationships.
- Xplain diagrams are easy to read.
- Xplain is type based, not set based.
- Xplain's language is orthogonal: there's just one way to express a thing.
- Xplain solutions can be reused: no single large query that attempts to everything.

With `xplain2sql`, the Xplain language can be used in relational environments.

`xplain2sql`, written in Eiffel, is available for any platform that supports Standard C.

Conversion of `base`

- Output domains, if domains are enabled and the target SQL implementation supports domains.
- Else, the data representation is remembered and used in `create table` statements.

```
base number (I4).
base day (A3) ("Mon","Tue","Wed","Thu","Fri","Sat").
```

```
create domain Tnumber as smallint;

create domain Tday as character(3) not null
  check (value in ('Mon','Tue','Wed',
                   'Thu','Fri','Sat'));
```

Conversion of `type`

Xplain code:

```
type item (A4) = description, stock, price.
```

InterBase SQL code:

```
create table item (
  id_item character(4) not null primary key,
  description Tdescription not null,
  stock Tstock not null,
  price Tprice not null);
```

Conversion of constraints

Three levels of constraints:

- Inherent constraints: enforced, except exclusive specialization and convertibility.
- Static constraints: not supported, i.e. the `assert` statement. `assert` is hard, database should have before commit transaction triggers.
- Dynamic constraints: `init` supported, `check` not yet supported.

Conversion of `init`

Converting `init` constraints is hard. Ideally:

- The target SQL implementation supports the ANSI SQL `default` constraint, which most do.
- And it should have before-insert triggers.
- And after-insert triggers.

show Xplain code

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Conversion of `extend`

Adding a temporary column to a table requires:

- The SQL implementation should have the notion of a temporary table.
- The SQL implementation should support subqueries.
- The SQL implementation should have a function like coalesce (ANSI-92 standard).

Many SQL implementations do not fulfill these requirements.

Conversion of `extend`: example

Microsoft SQL 7 code:

```
select
  [id_item]
    (coalesce(select sum([sale].[amount])
       from [sale]
       where
         [sale].[id_item] = [access_type].[id_item]
    ), 0)) as [turnover]
  into [#item.turnover]
  from [item] access_type

select [item].[id_item], [turnover]
  from [item]
  join [#item.turnover] on
    [#item.turnover].[id_item] = [item].[id_item]
```

show Xplain code

Conclusion

`xplain2sql` converts most Xplain statements to equivalent SQL, if the target SQL implementation fulfills certain requirements.

In the near future `xplain2sql` will be extended to support the `assert` and `check` statements.

Moreover, we want to bring Xplain style of modeling to XML by generating XML schema's from an Xplain data model.

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