Domaines Discrets

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HyperRectDomain

- templated by a SpaceND
- constructed from two points

```
typedef SpaceND<3> TSpace;
TSpace::Point a(1, 1, 1);
TSpace::Point b(5, 5, 5);
typedef HyperRectDomain<TSpace> TDomain;
TDomain domain(a,b);
```

Iterate through HyperRectDomain

thanks to `Range` concept

- types `ConstIterator` and `ReverseConstIterator`
- methods `begin()` and `end()`
- methods `rbegin()` and `rend()`

`ConstRange` class

`ConstRange` : range through the whole domain
Inner class of HyperRectDomain

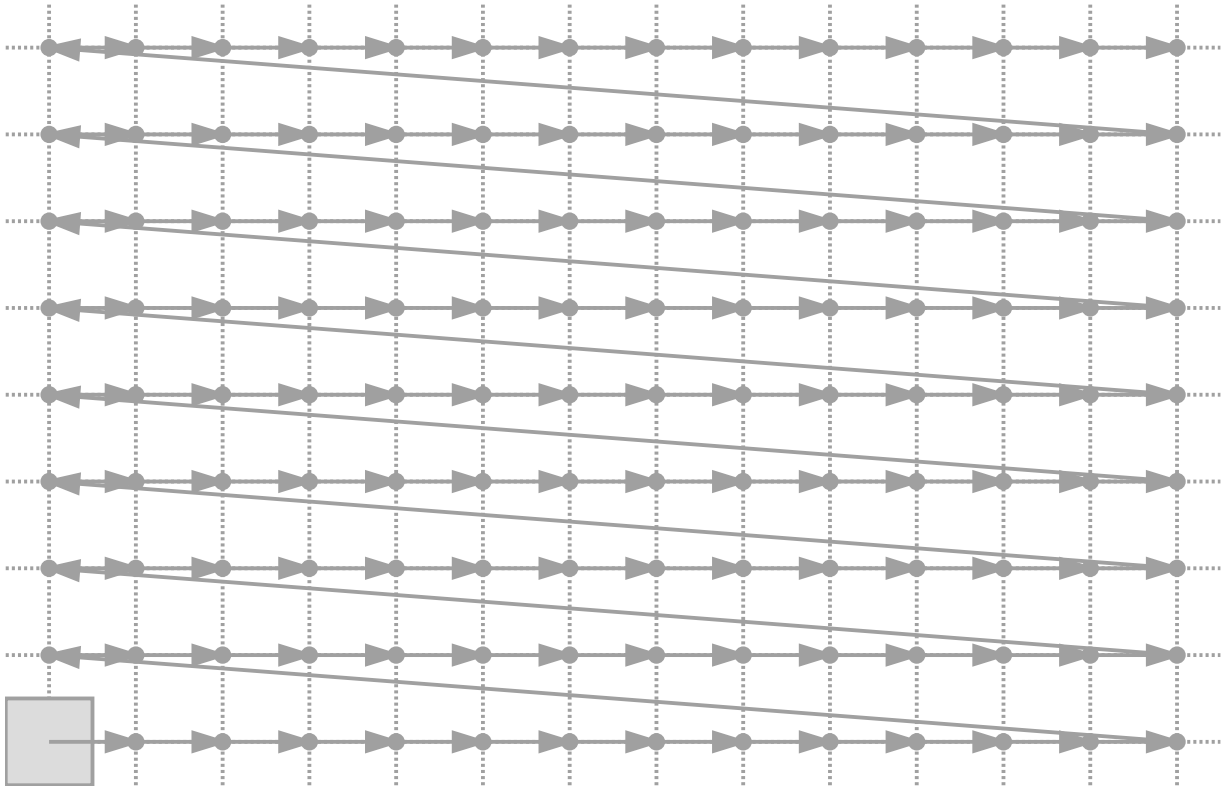
```
struct ConstRange
  {
    ConstRange(const HyperRectDomain<TSpace>& adomain);
    const ConstIterator& begin() const;
    const ConstIterator& end() const;
    ConstIterator begin(const Point& aPoint) const;
  };
const ConstRange& range() const;
```

idem for `rbegin/rend` and `ReverseConstIterator`

Example 1

```
typedef HyperRectDomain<Space> MyDomain;
Point a(-3,-4);
Point b(10,4);
MyDomain domain(a,b);
for( MyDomain::ConstIterator it = domain.range().begin(),
    itend = domain.range().end();
    it != itend; ++it)
  ...
```

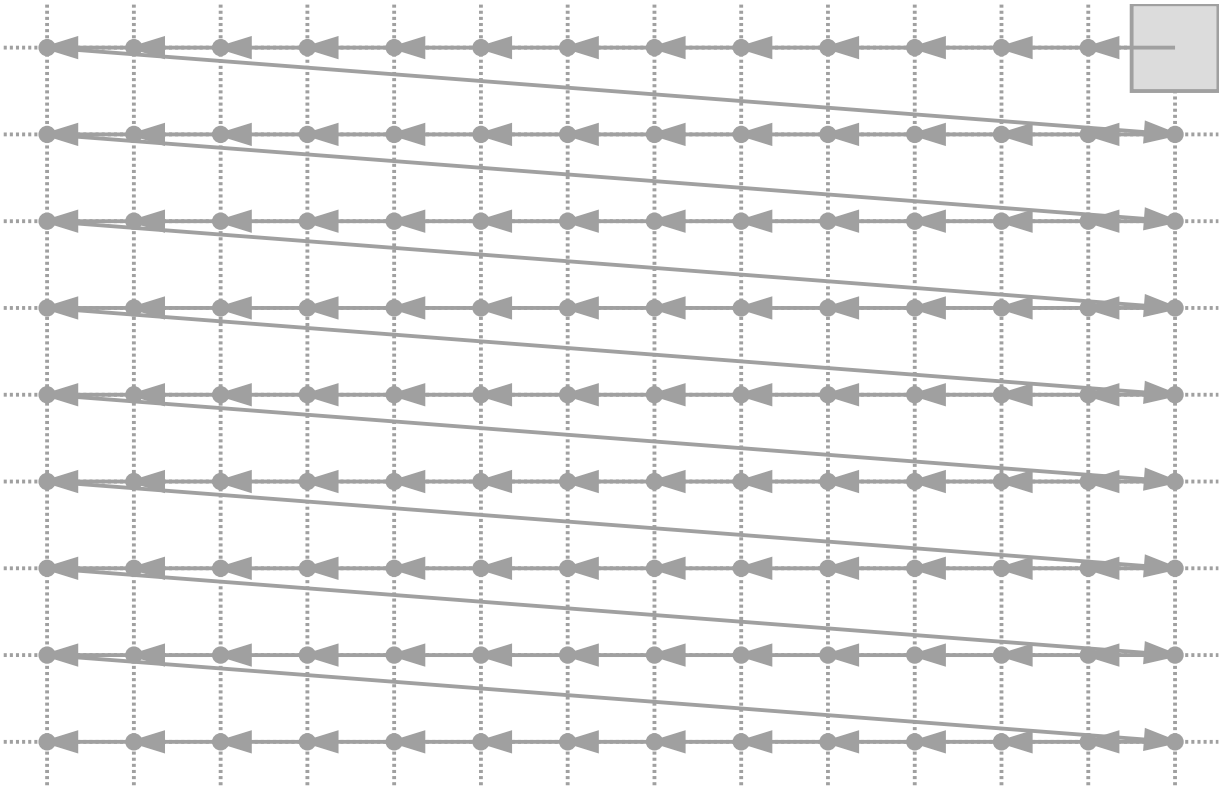
Example 1



Example 2

```
typedef HyperRectDomain<Space> MyDomain;
Point a(-3,-4);
Point b(10,4);
MyDomain domain(a,b);
for( MyDomain::ReverseConstIterator it = domain.range().
    rbegin(),
    itend = domain.range().rend();
    it != itend; ++it)
  ...
```

Example 2



`ConstSubRange` class

`ConstRange` : range through a sub domain
Inner class of HyperRectDomain

```
struct ConstSubRange
  {
    ConstSubRange(const HyperRectDomain<TSpace>& domain,
                  const std::vector<Dimension> & permutation,
                  const Point & startingPoint);
    ConstIterator begin() const;
    ConstIterator end() const;
    ConstIterator begin(const Point& aPoint) const;
  };
ConstSubRange subRange(const std::vector<Dimension> &
                       permutation) const;
ConstSubRange subRange(const std::vector<Dimension> &
                        permutation,
                        const Point & startingPoint) const;
```

idem for `rbegin/rend` and `ReverseConstIterator`

Example 3

```
typedef SpaceND<3> TSpace;
 TSpace::Point a(1, 1, 1);
 TSpace::Point b(5, 5, 5);
 HyperRectDomain<TSpace> domain(a,b);

 std::vector<TSpace::Dimension> v(2); v[0]=2; v[1]=1;
 TSpace::Point c(3,1,1);
 for( HyperRectDomain<TSpace>::ConstSubRange::
       ReverseConstIterator
       it = domain.subRange(v, c).rbegin(),
       itend = domain.subRange(v, c).rend();
       it != itend; ++it)
 ...
```

Viva C++0X

Same example with C++0X Initializer list

```
typedef SpaceND<3> TSpace;
TSpace::Point a(1, 1, 1);
TSpace::Point b(5, 5, 5);
HyperRectDomain<TSpace> domain(a,b);
TSpace::Point c(3,1,1);

for( HyperRectDomain<TSpace>::ConstSubRange::
       ReverseConstIterator
       it = domain.subRange({2,1}, c).rbegin(),
       itend = domain.subRange({2,1}, c).rend();
       it != itend; ++it)
 ...
```

`ConstSubRange` class

Shortcuts for 1, 2 and 3 parameters

```
ConstSubRange subRange(Dimension adim,
                       const Point & startingPoint) const;
ConstSubRange subRange(Dimension adim1,
                       Dimension adim2,
                       const Point & startingPoint) const;
ConstSubRange subRange(Dimension adim1,
                       Dimension adim2,
                       Dimension adim3,
                       const Point & startingPoint) const;
```

Conclusion

Interest of ranges :

- regroup things
- only one parameter in functions
  $\Rightarrow$simplification + avoid bug
- can factorize some computation/data members
- will be used by the `foreach` c++0x statment

Drawbacks(?) :

- add one indirection due to the inner class

Future works

- extend the concept of range :
  add `size()` and `empty()`
- wrong solution for ConstRange
  `HyperRectDomain` IS A range
  $\Rightarrow$ remove the inner class
  and keep the `begin()` and `end()` methods
- use range concept in other classes