

Virtual World Development

CLASS PROJECT

The class project is to build a collection of tools (disembodied machines) for a virtual environment. The tools will be expressed in the following language.

LANGUAGE

Logic:

```
constants = { true false }
operators = { if-then-else and or not equivalent }
```

Rational numbers:

```
constants = { 0 1 2 ... }
operators = { + - * / ^ mod }
relations = { = > < }
```

Function theory:

```
base case = function(ground) = whatever
recur case = function(variable)
              = whatever and function(smaller-variable)
```

Data structures:

```
Set { a b ... }
List [ a b ... ]
Stream [ a, b, ... ]
```

Database theory:

```
Get(pattern)
Put(pattern)
Copy(pattern)
```

Virtual World Development

Control theory:

sequential unary apply

$$f(\{ a b \dots \}) = \{ f(a) f(\{ b \dots \}) \}$$

sequential binary apply

$$f(\{ a b c d \dots \}) = f(\{ f(a b) f(\{ c d \dots \}) \})$$

parallel unary apply

$$f(\{ a b \dots \}) = \{ f(a) f(b) \dots \}$$

parallel binary apply

$$f(\{ a b c d \dots \}) = f(\{ f(a b) f(c d) \dots \})$$

parallel nary apply

$$f(\{ a b \dots \}) = f(a b \dots)$$

Some Examples

Factorial:

$$\text{fac}(1) = 1$$

$$\text{fac}(n_) = (n * \text{fac}(n - 1))$$

$$\text{fac}(n_) = *\{ 1 .. n \}$$

sequential
parallel

Move an entity:

$$\text{Move}(\emptyset) = \text{entity-position}$$

$$\text{Move}(1) = \text{entity-position} + 1$$

$$\text{Move}(n_) = \text{Move}(1) \text{ and } \text{Move}(n - 1)$$

$$\text{Jack}(\text{place}_) = (\text{entity-position} = \text{place-position})$$

sequential