TrML
Triangle Manipulation Language

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Introduction-TrML

- A simple programming language that allows user to express trigonometry concept, and construct/solve complex trigonometry problems.
  - C-like structure
  - Functional language

- Allow programmers to easily express trigonometry concepts and solve trigonometry problems.

TrML Tutorial

- There are two data types in TrML: value and triangle. Value is a floating point number, and triangle is a triangle in 2D plane.

```
@This is a comment
@assign 4.0 to value i
value i 4.0;
@assign three vertex values to triangle ABC
triangle ABC V [(1.1, 2.2),(3.3, 4.4),(5.5,
  6.6)];
@assign three side-length values to triangle DEF
triangle DEF L [4.2, 3.5, 3.6];
```

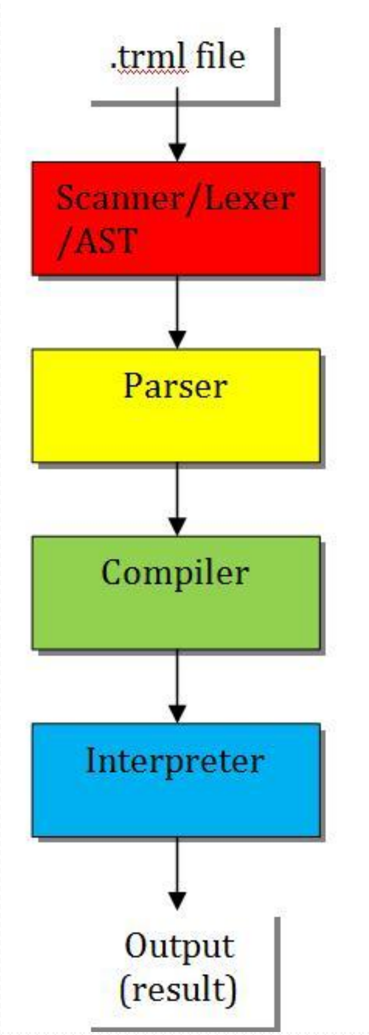
TrML Tutorial

```
@Sample code: “Hello World!”
initialize:

rule:

operation:

prints("Hello \nWorld!\n");
```

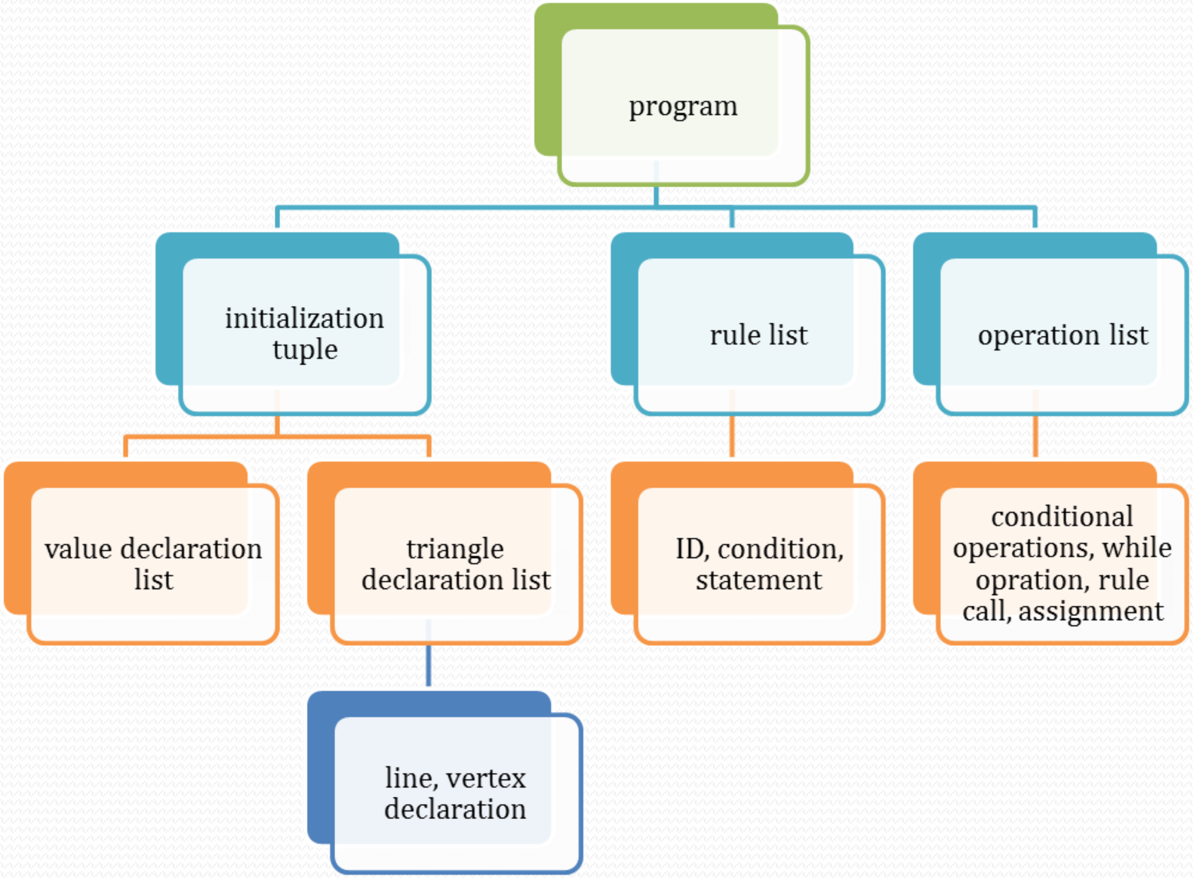
TrML Tutorial

```
initialize:
value i 4.0;
value sum 0.0;
rule:
operation:
while(i > 0){
    sum = sum + i;
       i = i - 1;
}
prints("The sum of ");
printv(i);
prints(" is:")
printv(sum);
@the result should be: The sum of 4.0 is 10.0
```

Block Diagram



AST



program
initialization tuple
rule list
operation list
value declaration list
triangle declaration list
ID, condition, statement
conditional operations, while opration, rule call, assignment
line, vertex declaration

Compiler

- Internal structure:
  - Rule table
  - Environment table
  - Operation variable
  - One stack register
- Code structure:
  - Environment variable followed by "rul" followed by rules defination followed by "opt" followed by operations definition

Interpreter

- Java Based
- Two arguments lists
  - Rule Argument, [rule counter]
  - Operation Argument, [operation counter]
- Global variable list
- Register stack
- 30+ instruction sets

Summary

- *Main goals:*
  - Acquire language and compiler design experience
  - Have a coherent design and implement it correctly and in-time

- *Outcome:*
  - TrML is a comprehensive and simple language
  - Implementation was finished before the deadline and the compiler follows the design specification

Summary

Suggestions for the future:

- Getting a head start:

  All group members were on the same page with starting early, but actually coordinating and forming the right pace for the team could still be improved.

- Pick a topic with passion:

  Pick a topic that most members are passionate about will make the experience worthwhile and enjoyable.

Testing code

```
@ keyw||d "initialize:" starts triangle initialization phase
initialize:
@ initialize triangle with 2-D vertex location
triangle ABC V [(1.1, 2.2) , (3.3, 4.4) , (5.5, 6.6)];
@initialize triangle with line segment length
triangle DEF L [4.2, 3.5, 3.6];
value agl 10.0;
value opq 5.0;

@ Keyw||d "rules:" starts rules construction phase
rules:
identical_triangle (triangle Tri_1, triangle Tri_2)
(
[[triangle Tri_1.sideA == triangle Tri_2.sideA ] && [triangle Tri_1. sideB == triangle Tri_2. sideB] && [triangle Tri_1. sideC == triangle Tri_2. sideC]]
|| [[triangle Tri_1.sideA == triangle Tri_2.sideB] && [triangle Tri_1. sideB ==triangle  Tri_2. sideC] && [triangle Tri_1. sideC == triangle Tri_2. sideA]]
|| [[triangle Tri_1. sideA == triangle Tri_2. sideC] && [triangle Tri_1. sideB ==triangle  Tri_2. sideA] &&[triangle Tri_1. sideC == triangle Tri_2. sideB]]
) {true};

@ Explain angleC in terms of sides
@ This is a calculation rule
angle_C (triangle ABC) (true) {arccos((triangle ABC.sideA * triangle ABC.sideA) + (triangle ABC.sideB * triangle ABC.sideB) - (triangle ABC.sideC * triangle ABC.sideC) / 2.0 * triangle ABC.sideA *triangle ABC.sideB)};

@ keyw||d "operations:" starts operation && calculation phase
operations:
agl = rule identical_triangle (triangle ABC, triangle ABC);
opq = 5.0;
printv (value agl);
if (value agl) {
                prints ("ABC and DEF are identical");
}
if (1.0)
{
                prints ("is regular triangle");
}
```

The End