A Language for Geometry

--COMS 4115 Project Proposal

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Description:

Our Language is actually a programming language for geometry calculation. With our Language, a user can calculate certain attributes of a geometry figure and relationship between several figures in a convenient way, also the user can verify his/her speculations on geometry rules and witness how the other attributes will change as certain conditions vary.

Purpose:

This Language is supposed to be used by students who are studying geometry. Students may sometimes find it is abstract to predict attributes of a concrete geometry figure and it is even more difficult to make clear the relationship between several figures. In order to help users have a better idea of geometry, we propose this "A Language for Geometry (ALG)" language and make the study for geometry more enjoyable!

Features:

- ALG language focuses mostly on geometry and makes the study of geometry easier.
- The Language will judge whether a value for a certain geometry type is valid or not (e.g. To judge whether the user's input of points of a certain polygon can compose a valid geometry figure or not)
- The same operator could be used by many data types (e.g. The compiler will handle differently with a certain operator when the operands of it differ)
- The same functions could be used by various input arguments (e.g. The compiler will handle differently with a function when the arguments of it differ)

A Representative Program

```
Test()
{
Polygon T={{0,0},{1,0},{0.5,1}};
//Three points for Polygon T makes T a triangle

!!Test Triangles//comment
If(A= = B)
{
   Print("Triangle A and B are congruent");
}
```

```
Else if(A~=B)
{
   Print(“Triangle A and B are similar”);
}

!!Test operator ^
Ellipse C1={{0,0},{2,0},1,3},C2={{1,0},{3,0},1,3};
Line L=C1^C2;//L is the tangent of C1 and C2, if C1 and C2 are not tangential to each other, L=nop
Line L1,L2;
Point P=L1^L2;//P is the intersection point of L1 and L2


!!Test built-in functions
A(A);//Area
P(B);//Perimeter

!!To find out how a triangle’s area will changed with the variation of its perimeters
Polygon A[3];
      i from 3 to 1
       {A[i]={{0,0},{i,0},{0,i}};
            Print(S(A[i]));
      }
}
```

Syntax

Data Type

Data Type	Format of Value Examples
Point	{0,0}
Line	{{0,0},{1,1}}//line segment
Polygon	{{0,0},{1,2},{4,6}……} //points correspond to vertexes
Ellipse	{{-2,0},{2,0},1,3}
Array	{A, A, A……} //A represents a certain data type
Boolean	True or false

Note: All the numbers are treated as float type.

Operator

Operator	Example
== !=	Judge whether two figures are the same (without considering the location)
~=	Judge whether twoPolygons are similar
^	Calculate the intersecting point of two lines or tangent line of two ellipses/circles
=	Assignment operator
//	Judge whether two lines are parallel
+-	Addition and subtraction
*/	Multiplication and division
<< >>	Compare areas of two figures of the same type
<< >>	Compare perimeters of two figures of the same type

Built-In Function

Operator	Example
S()	Calculate the area of a figure
P()	Calculate the Perimeter of a figure
GC()	Calculate the Center of Gravity of the figure
Print()	Output the result