Introduction

- Data visualization lets the scientists to further examine the data
- Visualizations of the data create many images that form a movie
- A visualization program uses components that are connected as a directed graph via input and output channels between them
- These components’ properties can be modified to change the visual aspects of the simulation like the transparency of an object
- During a visualization, some values may change that can be categorized as point of interests that drive the simulation
- These values are important to determine how to visualize the data with the help of visualization

Dynamic Visualization

- Figure above shows how an advl program can be used in Spiegel framework
- Clock component will send out values for the time ranging from a start point to an end point in given intervals of time
- An interpreter component, output interpolator reads the program
- This component will also provide for all the stream connections
- The figure shows one of the connections; location of the camera
- Advl can be used to create those stream connections and achieve interpolation between anchor points

Antlr4 Structure

- Antlr4 is used for parser generation and language recognition
- The syntax for writing a grammar is similar to BNF inside Antlr4
- When grammar is fed into Antlr4, a lexer, a parser, a blank visitor, and context objects are created for each grammar rule
- All the helper classes provided by Antlr4 are written in Java
- A program consists of variable declarations followed by streams
- Functions contain a return type, an identifier, and an optional assignment that is an expression
- A stream contains an identifier, type, and an interpolator type
- A function contains a return type, an identifier, 0 or more parameters, and the function body which is a block of statements
- Statements are variable assignments and declarations, function calls, control structures, and loops, while expressions are function calls, atomic values, boolean operations, binary arithmetic operations and various mathematical expressions

Advl Sample

```c
var {
    const double startTime = 10.0;
    const double deltaTime = 5.0;
    double y = 20.0;
    double z = 20.0;
    double r = 100.0;
    double midX = 10.0;
    double midY = 20.0;
    bool circular = True;
}
stream {
    cameraPos {
        type point;
        interpolator TCB;
    }
    simTime {
        type double;
        interpolator Linear;
    }
    point moveCamera(double x) {
        double xComp = (x - midX) ^ 2;
        if (circular) {
            double y = sqrt(r - compX);
            y += midY;
        }
        return (x, y, z);
    }
    startTime {
        cameraPos = (x, y, z);
        simTime = 10.0;
    }
}
30.0 + deltaTime {
    double x = 5.0;
    for (i = 1 : 20 : 1) {
        cameraPos = moveCam(x+i);
    }
    simTime += deltaTime;
}
```

References