**Language Design Proposal: pOOP Improved Syntax**

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**Language Name: pOOP Improved Syntax**

**Target Language:** JavaScript

**Language Description:** (Pathetic) object-oriented programming. The goal is for me to better understand how object-oriented programming languages work. I want to implement a Java-like language with classes and subclasses. Unlike pOOP base, this version effectively cheats and compiles to JavaScript, and has a much more intuitive syntax.

**Key Features**: Objects + methods with class-based inheritance, subtyping, checking if a variable is initialized before use, checking if void is used as a value, checking that a function returning non-void always returns, non-S-expression-based syntax.

**Planned Restrictions:** No optimizations.

**Suggested Scoring and Justification:**

* **Lexer**: 10%. Only support for reserved words, identifiers, and integers. No comments.
* **Parser**: 20%. Does not use S-expressions.
* **Typechecker:** 40%. Handles subtyping and method overloading, checking if a variable is initialized before use, checking if void is used as a value, checking that a function returning non-void always returns.
* **Code Generator:** 30%. Needs to work with JavaScript's prototype-based inheritance, which isn't quite one-to-one, but still pretty close.

**Concrete** **Syntax:**

var is a variable

classname is the name of a class

methodname is the name of a method

str is a string

i is an integer

type ::= `Int` | `Boolean` | `Void`| **Built-in types**

classname **class type; includes Object and String**

comma\_exp ::= [exp (`,` exp)\*]

primary\_exp ::=

var | str | i | **Variables, strings, and integers are**

**expressions**

`(` exp `)` | **Parenthesized expressions**

**`**this` | **Refers to my instance**

`true` | `false` | **Booleans**

`println` `(` exp `)` | **Prints something to the terminal**

`new` classname `(` comma\_exp `)` **Creates a new object**

call\_exp ::= primary\_exp (`.` methodname `(` comma\_exp `)`)\*

mult\_exp ::= call\_exp ((`\*` | `/`) call\_exp)\*

add\_exp ::= mult\_exp ((`+` | `-`) mult\_exp)\*

exp ::= add\_exp

vardec ::= type var

stmt ::= exp `;` | **Expression statements**

vardec `;` | **Variable declaration**

var `=` exp `;` | **Assignment**

`while` `(` exp `)` stmt | **while loops**

`break` `;` | **break**

`return` [exp] `;` | **return, possibly void**

**if with optional else**

`if` `(` exp `)` stmt [`else` stmt] |

`{` stmt\* `}` **Block**

comma\_vardec ::= [vardec (`,` vardec)\*]

methoddef ::= `method` methodname `(` comma\_vardec `)` type

`{` stmt\* `}`

constructor ::= `init` `(` comma\_vardec `)` `{`

[`super` `(` comma\_exp `)` `;` ]

stmt\*

`}`

classdef ::= `class` classname [`extends` classname] `{`

(vardec `;`)\*

constructor

methoddef\*

`}`

program ::= classdef\* stmt+ **stmt+ is the entry point**

**Example (animals with a speak method):**

class Animal {

init() {}

method speak() Void { return println(0); }

}

class Cat extends Animal {

init() { super(); }

method speak() Void { return println(1); }

}

class Dog extends Animal {

init() { super(); }

method speak() Void { return println(2); }

}

Animal cat;

Animal dog;

cat = new Cat();

dog = new Dog();

cat.speak();

dog.speak();