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DARN: PLT Project Proposal

Describe the language that you plan to implement.

The language we plan to implement will be a Java-like matrix / array manipulation language. Named after the first initials of our names, *DARN* will allow for efficient linear algebra calculations. Built into *DARN*'s standard library will be easy access to rows and columns in arrays. In addition, there will be methods that allow for addition, multiplication, and inverse functions. Other features of the standard library could include finding the determinant or the transpose of a matrix. This will all be in addition to the basic features such as printing to standard output, initializing variables, and using for / while loops.

Explain what sorts of programs are meant to be written in your language

This language is meant to allow programmers to write programs that will compute linear algebra computations. For example, programmers will be able to use *DARN* to create a program that finds the eigenvalues and eigenvectors of a matrix. In addition, programmers can write programs to write a linear equation solver.

Additionally, while image processing may prove too difficult to implement, we hope to include (or at least attempt) photo editing functions and geometric operations. For example, a square matrix could represent a linear transformation of a geometric object, like a reflection over the Y-axis. With this in mind, we would want users to be able to use *DARN* and its functions to saturate, desaturate, lighten, color-correct, crop, scale, resize, and rotate images.

Explain the parts of your language and what they do

DARN will have a for loop feature such that you can loop through columns or rows of a matrix. For example, if you have a 2x2 identity matrix, you can iterate through the columns of the matrix such that printing the first iteration will produce a 2x1 matrix containing 1 0, and the second iteration will produce a 2x1 matrix containing 0 1. Programmers will also be able to multiply matrices by constants or by other matrices.

Include the source code for an interesting program in your language

Example 1:

```
// This program will find and return the eigenvalues of a 2x2 matrix
eigen(X) {
    // compute math
    return eigenvalues;
}

main() {
    X = [ 0, 1 | 1, 0 ];    // '|' will indicate the start of a new row
    Y = eigen(X);
    print(Y);              // this will print [1 | 1]
}
```

Example 2:

// this program will return the transposed matrix

```
transpose(X) {
    // make the rows of the matrix into columns
    return transpose(X);
}

main() {
    X = [ 3, 4 | 1, 2];
    Y = transpose(X);
    print(Y);              // should print the transposed matrix [ 3, 1 | 4, 2]
}
```