6.945 Term Paper Proposal

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Title: Interactive Interface for Numeric and Symbolic Math and Physics

Our system will be a generic user interface for visualization and exploration of mathematical procedures and objects. The intent is to generate a user interface from a set of interaction widgets and visualization methods appropriate to any supplied procedure or expression. For example, a list or vector of value pairs would be plotted in two dimensions and have statistical properties calculated on demand. An n-artity procedure returning a tuple of values could be numerically evaluated for a given set of inputs, have it's symbolic derivatives returned, etc. The unique aspect is that the user would not have to specify the context of interaction for each object, a single generic 'explore' procedure will determine and generate the appropriate interface and handle computations in parallel (aka separate process threading for interface and computation, with possible compilation).

The user interface will include a command line REPL interface for debugging and either a GTK GUI or web interface.

Features that will be interesting to implement will be:

- Halting and restarting of evaluation with continuations
- Determination of the algebraic properties of functions

Bryan will be responsible for backend components and evaluation control structures while Laura will be responsible for the generic front end interface and interaction control.