A Proposed Arena for the OpenMath Context Registry

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The OpenMath Context Registry

The OpenMath context registry aims to serve as a focal point for the collaborative creation, maintenance and archival of OpenMath contexts.

Goals

- Allow for the collaborative creation and maintenance of OpenMath contexts in a secure fashion
- Serve as a public archive of OpenMath contexts
- Supply up to date context information
- Provide a cross-platform implementation so as to reach the largest possible audience

Target Audience

- Researchers interested in forming or joining a group to develop/modify OpenMath contexts
- Developers of OpenMath compliant applications

An Arena for Context Registry

Our proposed arena for realizing the OpenMath context registry is a World Wide Web based client/server application.

- Contexts are accessed and maintained through a Java coded OpenMath context registry server
- Access to the server is accomplished via either a Java registry client applet or a stand-alone Java registry client

Context Organization

- Official - stable
- On-Track - due soon to be converted to "official" status
- Unofficial - no guarantees about stability

The OpenMath Context Registry Server

- Listen for requests on a dedicated port
- Fetch OpenMath contexts
- Provide a user and group level ”accounting” system for sensitive transactions
- Implement secure context removal and archival
- Oversee collaborative context creation and maintenance (group level)
- Implement a context locking mechanism

The OpenMath Context Registry Client

- Allow for automatic and manual registry connection
- Provide a mechanism for OpenMath context browsing
  - Retrieve a list of available contexts
  - Context fetch and display
  - Follow "hyper-links" referring to other contexts
- Allow for user/group authentication
- Enact a context authoring environment
  - Provide a mechanism for syntactically correct insertion/deletion of context entries
  - Display participants and their respective context control properties
  - Provide a "chat pad" for collaborative context development
- Implement a secure method of context removal and archival
- Allow for context file up-load and down-load (stand-alone version)

Additional Functionality

The OpenMath consortium could maintain several registries residing in different geographical locations.

- Alleviates potential network congestion
- Initialy, a mirror site would be a copy of the registry which does not support any updating operations
- Functionality could be extended to include several ”principal” sites

In light of the potential danger of stale context versions, a user could utilize the registry home page to declare his/her ”interest” to a particular list contexts. The registry would keep track of updates and inform the interested parties via email.

The Prototype Context Registry

Our prototypical ”OpenMath Context Registry” home page can be reached via the following URL :

`http://www2.cs.rpi.edu/projects/OpenMath/`

The contexts currently archived are intended to demonstrate our prototype‘s functionality and context syntax. This prototype implements a subset of the previously outlined registry specifications.

The Prototype Registry Server

The OpenMath Registry Server maintains and protects the OpenMath context archive.

- Listens for requests on a dedicated port
- Handles each request as a separate thread
- Requires session authentication for sensitive transactions
- Enacts context fetch, store and delete operations, as well as, the registry directory operation

The Prototype Registry Client

The OpenMath registry client is intended to provide a graphical front end to the OpenMath registry server.

- Provides a restricted context authoring mechanism - one can sequentially add ”syntactically correct” context entries

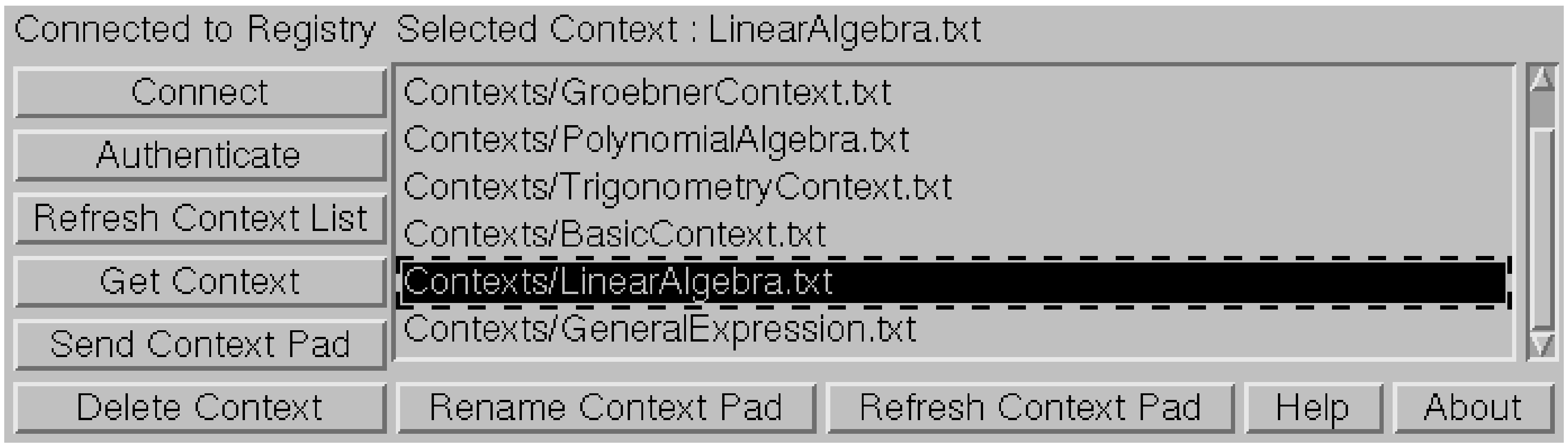
- Allows for both non-authenticated transactions (context fetch, registry directory listing) and authenticated interchange (context save, delete)

- Automatically establishes an OpenMath registry session

- Permits manual OpenMath registry session initialization

The Control Panel

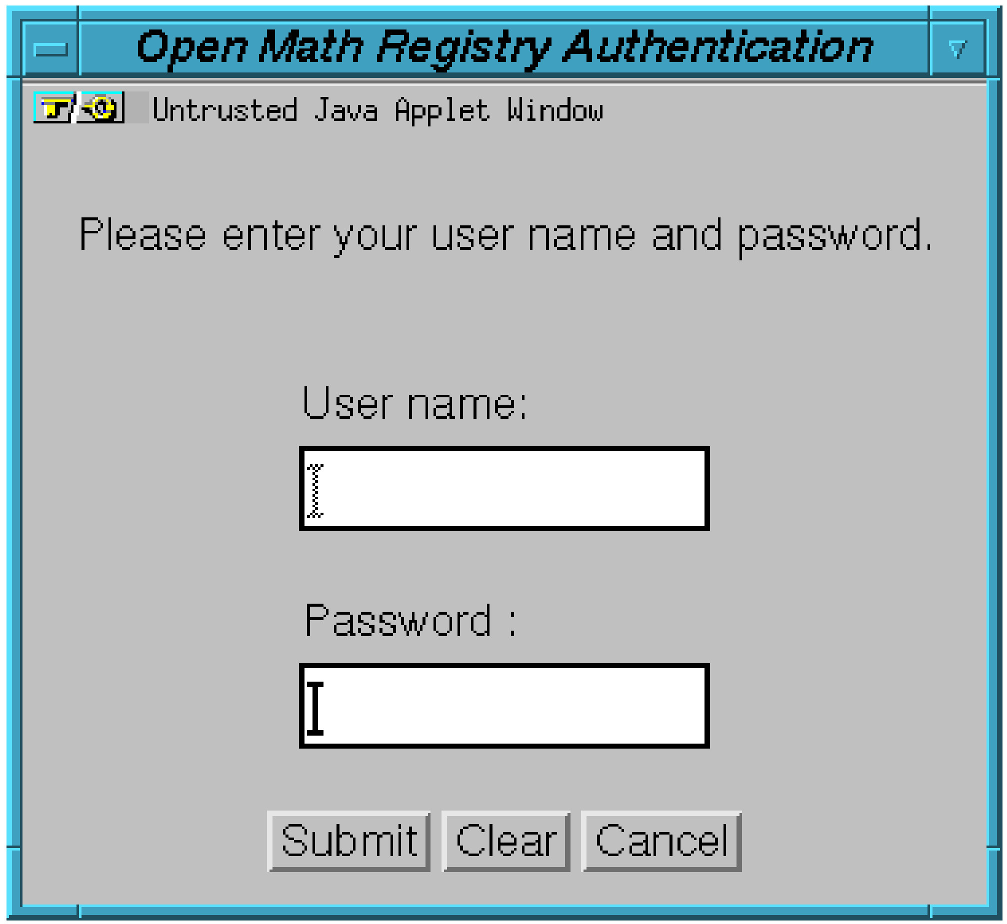
Upon initialization, the registry client reads several ”parameters” specified within the HTML file and attempts to connect to an OpenMath registry server.



In this example, a connection to the registry has been established and the LinearAlgebra context has been selected from the list of available contexts.

User Authentication

This prototype supports user level authentication. The "Authenticate" action button produces a pop-up user authentication dialog window. Authentication is not required for the context fetch and registry directory operations.



Context Editing Pad

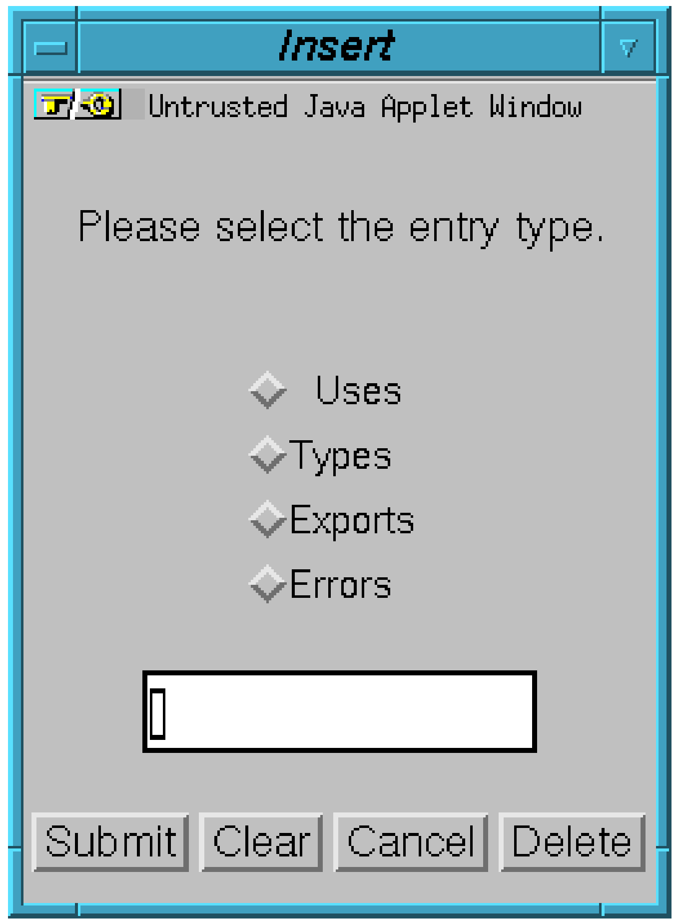
```
Context pad for user <diaz> : LinearAlgebra.txt

context LinearAlgebra( R )
    uses BasicContext
    types
       type Vector( R )
          exports
             add: ( %, % ) -> %        // (x,y) |-> x+y
             crossProduct: ( %, % ) -> %
             dot: ( %, % ) -> R
             element: ( %, BasicContext::NonNegativeInteger() ) -> R
             length: % -> BasicContext::NonNegativeInteger()
             scalarMultiply: ( R, % ) -> %
             subtract: ( %, % ) -> %   // (x,y) |-> x-y
             vector: (R+) -> %         // one or more elements
             zero: BasicContext::NonNegativeInteger() -> %
          attributes
             orientation( enum column, row, unspecified )
             unit
             zero
          errors
             incompatibleLengths
             indexTooLarge
             notLength3
```

In this example, user ”diaz” has down loaded the LinearAlgebra context from the registry. Context key words are displayed in red while context hyperlinks are displayed in blue.

Insert a Context Entry

One would ultimately be able to click on the context pad to initiate a "Context Wizard". The wizard provides the user with all of the possible syntactically correct context entry types at any given point. This prototype only allows the insertion and deletion of context entries and the end of a context document.



The Client Stand-Alone Application

The stand-alone Java registry client enhances the functionality and interface of the Java registry client applet by allowing context file up-load and down-load.

Implementation and Platform Considerations

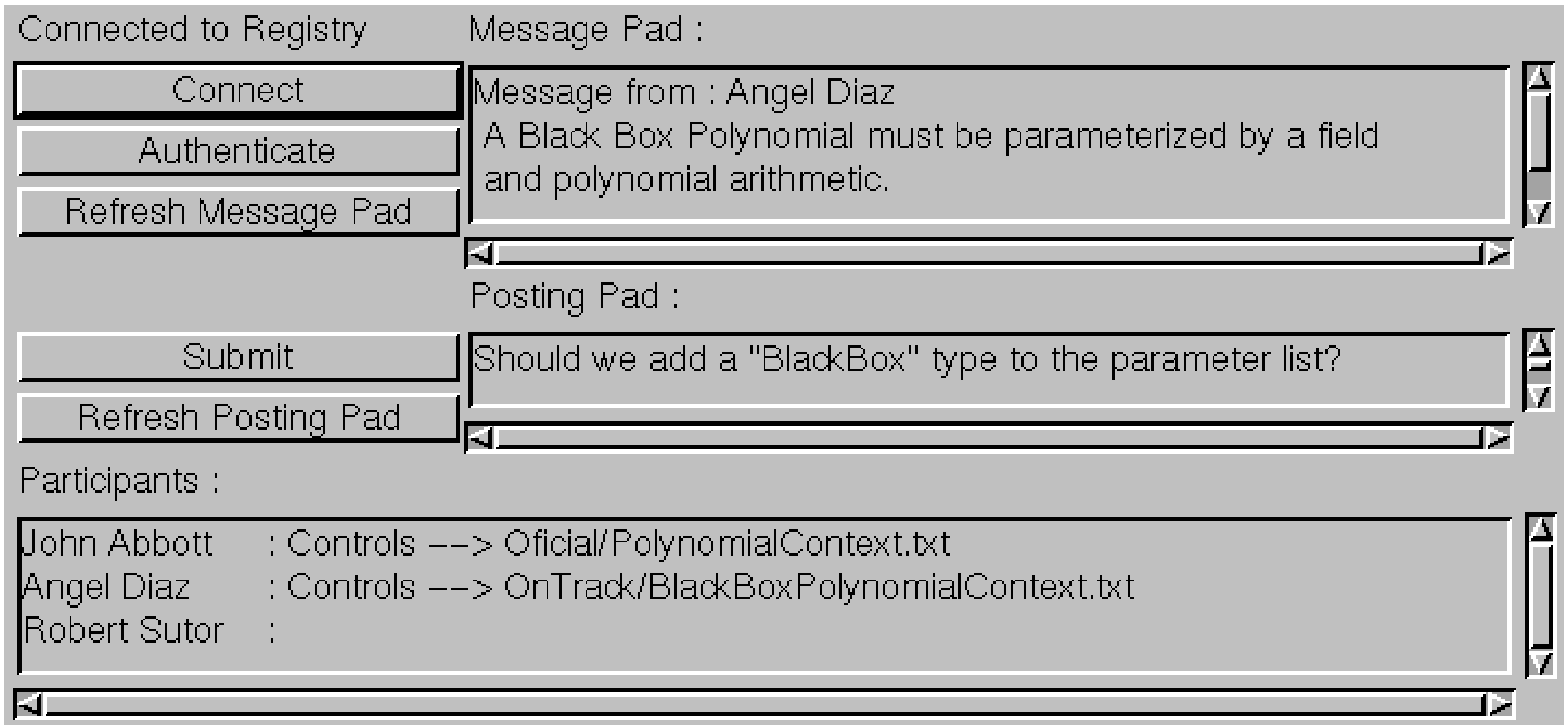
- Applets loaded over the Internet can only establish network connections to the originating host

- Both the OpenMath registry server and stand-alone context registry client require the utilization of a Java interpreter for the purpose of execution
  - Each of the aforementioned applications have been tested using the Java interpreter provided in the JDK 1.0.2 on the following platforms: Microsoft Windows NT/95, Linux 2.0, SPARC/Solaris, x86/Solaris

- The applet form of the registry client requires a Java applet viewer
  - The JDK provides an applet viewer, as well as, Netscape 2.0 or higher, on most platforms
  - Currently, Microsoft Windows NT/95 users can only employ either the JDK applet viewer or the Microsoft Internet explorer 3.0 Beta 1 or higher

Plans For The Future

Our current focus revolves around obtaining a stable definition for the syntax and file format of OpenMath contexts and a concrete specification for the functionality of the OpenMath context registry. It is our hope that this prototype encourages steps in the aforementioned directions.



Plans for the next iteration of our prototype include the full implementation of the previously detailed specifications.

The OpenMath Prototype Registry Home Page

This page provides additional information regarding our current implementation and enables access to our context registry via the context registry client applet. Furthermore, the context registry home page publishes an online user's guide detailing the utilization of the context registry client.

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