

# TJHSST Computer Systems Lab Senior Research Project tjTalk School Question Forum 2008-2009

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June 10, 2009

2

## Abstract

**Keywords:** artificial intelligence, tree searching, keyword generation All students have had that evening when they dont understand how a carbon lattice works, or they need a succinct efficient explanation of Riemann sums. What is worse, is the class chemistry or calculus whiz may not be available to call upon at that moment. This results in long nights spent trying to ask friends, parents, and whoever else to try to get some satisfactory response... which is sadly sometimes unsuccessful. tjTalk aims to connect the questioners and the whizzes. Using a tree-based structure to focus on specific subject matters, it provides a way for students to ask questions and get quick answers from other students or teachers. The project creates an information sharing community that will encourage collaboration and peer education forward. For efficiency and ease of use, tjTalk also bypasses the troubled students have to go through to put their question in the right place, and for the knowledgeable students to look for the question. The questions asked are automatically filed in the system by AI-generated keywords, and are assigned quickly to a person who has a particularly high score in that part of the forum. tjTalk is built on the SchoolTool school administration system, and will also provide teachers with informa-

tion about the students level of knowledge in their classes, based on peer ratings of answers to questions.

## 1 Introduction - Elaboration on the problem statement, purpose, and project scope

### 1.1 Scope of Study

The result of this project is a web service available on the Zope development platform. It is written in Python and configured in ZCML (Zope Configuration Markup Language - an extension of XML). It features an intuitive user interface, and easy asking and sorting of questions. The structure is a large tree, branching into subjects, classes, and other mini-topics for the efficient delivery of question to responder. The answers are easy to rate up and down, and the question asker and the teachers will not have more weight in grading the answers than the other users - to provide the best possible estimate of the quality of answers, and to promote actual sharing of knowledge beyond the course curriculum. The answers will not appear in order of date submitted, but rather in order of rating, and, as a tiebreaker, the scores of the authors of the answers. The authors will get the same score boosts that the answers get. Artificial Intelligence methods will stand

behind all of the transactions required to get tjTalk to be an intelligent product.

This project is also an experiment in the application of eXtreme Programming, normally a programming technique for programming teams of two or more, in an environment where there is only a single coder.

This project will be machine tested for objective accuracy in object functions (using Zope unit tests) and also machine tested for proper webpage rendering (using Zope functional tests). I will also require one or more alpha and beta user bases to test the user friendliness and usefulness of the features I code. I also will stick by the concept of eXtreme Programming, always open to new user stories and bug reports. These will be tracked via Launchpad.

## 2 Background and review of current literature and research

There is no previous research directly pertinent to this project, because it is written in a fringe way: artificial intelligence for a web server with an object-oriented database. Methods will be adapted from previous research on artificial intelligence and machine learning on other applications, or on relational databases.

### 2.1 Type of research

This project will be almost purely user-centric application of development methods to provide a stable product which takes advantage of open source methodologies and artificial intelligence in the form of fast tree navigation.

## 3 Procedures and Methodology

First quarter was dedicated to getting a bootstrapped SchoolTool instance set up and running, and to the start of development on the basic interface and functionality of a question

forum. Second quarter was dedicated to writing more advanced features, such as notifications of answers to questions, question assignment, intelligent question placement, and scoring. Third and fourth quarter were dedicated to implementing these, and to actual deployment and testing of tjTalk.

tjTalk is written on on the Zope 3 application server. Hence, it uses the Python programming language for the main code, ZCML for the configuration files, and ZPT (Zope Page Templates) to render pages or other on-the-fly resources. It will get to the user in the form of a website with HTML, Javascript, and CSS.

During the process of writing it, a parallel development was the release of Python versions 2.6 and 3.0, and the consequent dropping of support for Python 2.4. To facilitate the future transfer of Zope and SchoolTool to the more recent releases of Python, tjTalk was modified to use Python 2.6 and 3.0 syntax and libraries, sacrificing backwards compatibility with Python 2.4.

## 4 Final Features

The list of current tjTalk features is:

- Object-oriented tree-based forum structure - the root tjTalk object contains “question container” objects (representing topics of discussion), which in turn can recursively contain either objects of the same type (representing subtopics) or “question” objects.

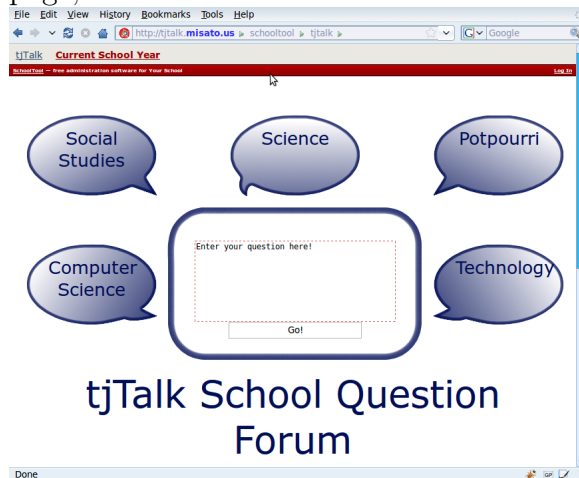
Intuitive and stylish page templates for all pages, in order for the server-generated information to be comprehensive while also look good and inviting

- Questions and answers - Question objects contain Answer objects in no particular order - the order is determined at the time of display in order of “helpfulness”: sorting by score (highest first), then by date.
- Voting - any user can view the questions and answers, but authenticated users are

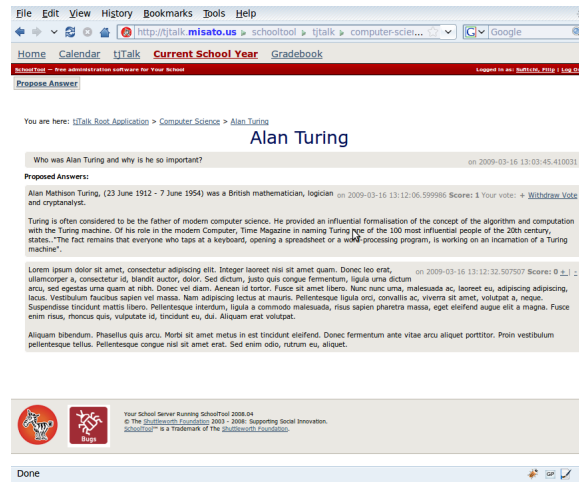
granted 1 vote per answer: positive or negative. The vote counts towards the answer's score, and the cumulative person score of the answer's author

- Voting security - no double votes, voting for your own answers, etc
- Ability to follow questions for updates (bookmarks)
- Lists of the most recently asked and recently answered questions - updated every time one of these events happen via a recursive method of continuously calling a parent object's questionAsked or questionAnswered method.
- Search functionality - word counts propagated through the questionAsked and questionAnswered methods - allows, for example, the "Computer Science" category know the word "java" is mentioned more in it than in "English". Therefore, if the word "java" is found in the search query, there will be more weight on returning results from inside "Computer Science" than from in "English".

An alpha-version view of the root tjTalk page, rendered in the Firefox 3 web browser:



An alpha-version view of a question in tjTalk:



## 5 Future Work

The user story request of being able to transform user scores for specific categories into participation grades for the class will be addressed this summer, when tjTalk will be fully incorporated into SchoolTool as a default feature - probably shedding its name and just becoming the SchoolTool Collaborative Question System.