Intelligent Online Math Tutorial

User Manual

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1. Introduction

This tutorial is an Intelligent Online Math tutorial based on semantic-web technology. It gives provision for the user to understand and solve problems in Mathematics by providing feedback based on the actions of the user. It also tracks the user's actions and performance in order to judge the user's competency level in terms of understanding the concepts behind the problems.

2. Login

The Login page provides a brief description about the Math tutor and allows the user to enter his registered username and password. On clicking the submit button, the user is redirected to the "Choosing Problem Type" page. In case wrong authentication details are provided the user is redirected to the same page.

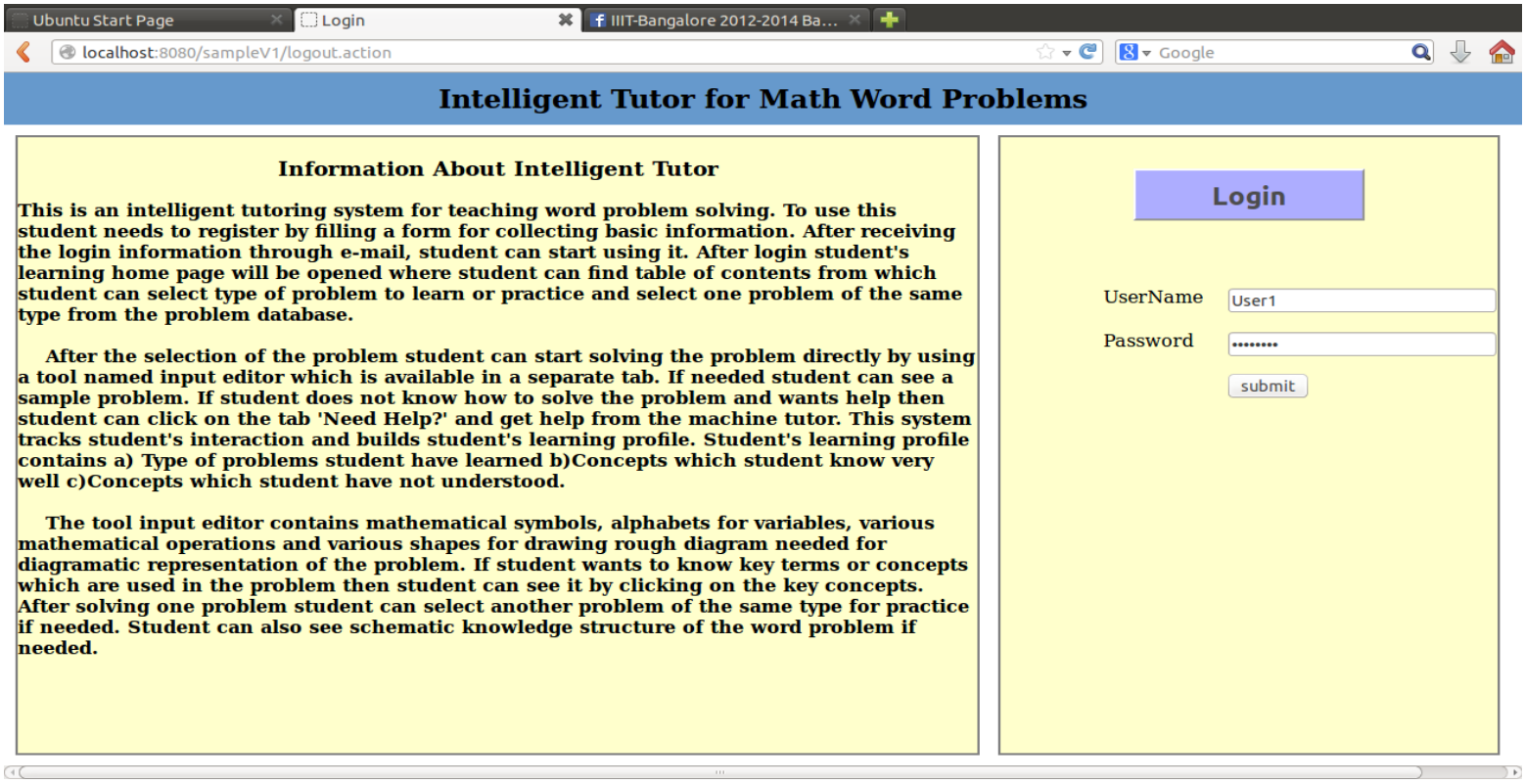

Fig. 1 Login page

3. Choosing Problem Type

This page lets the user pick the category of problems he wants to work on. This selection includes choosing the type of problem and the level of difficulty as shown in the snapshot(s) below. Once the submit button is pressed, the “Choosing the Mode” page is obtained with the problem statement belonging to the selected problem type.

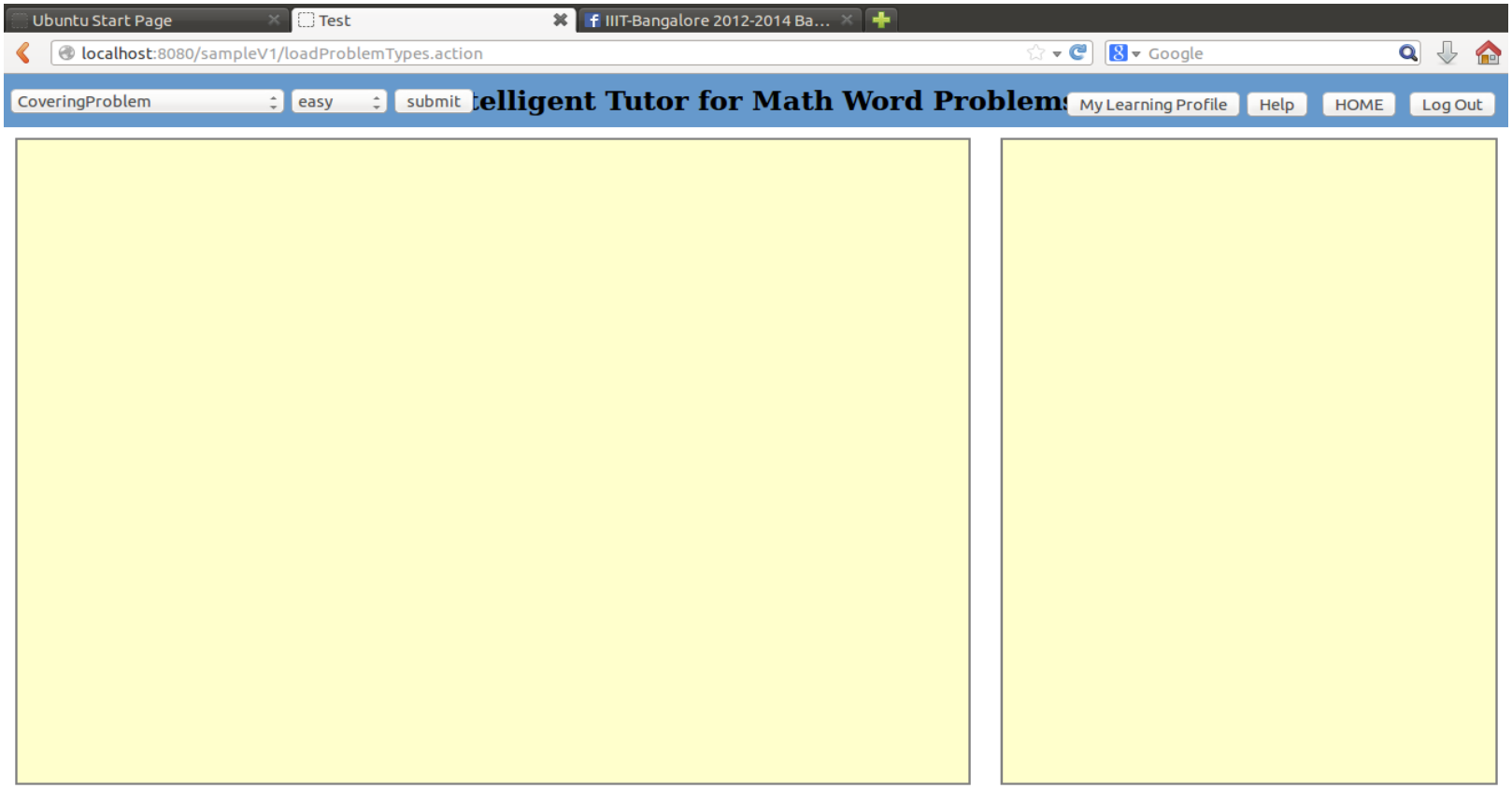

Fig. 2 Choosing Problem Type

4. Choosing the Mode

On this page, the problem type which was chosen in the previous page is displayed on the top left and the problem statement is given. Two buttons are provided for the user to choose the mode he intends to work on. Learning Mode helps the user to understand the given problem

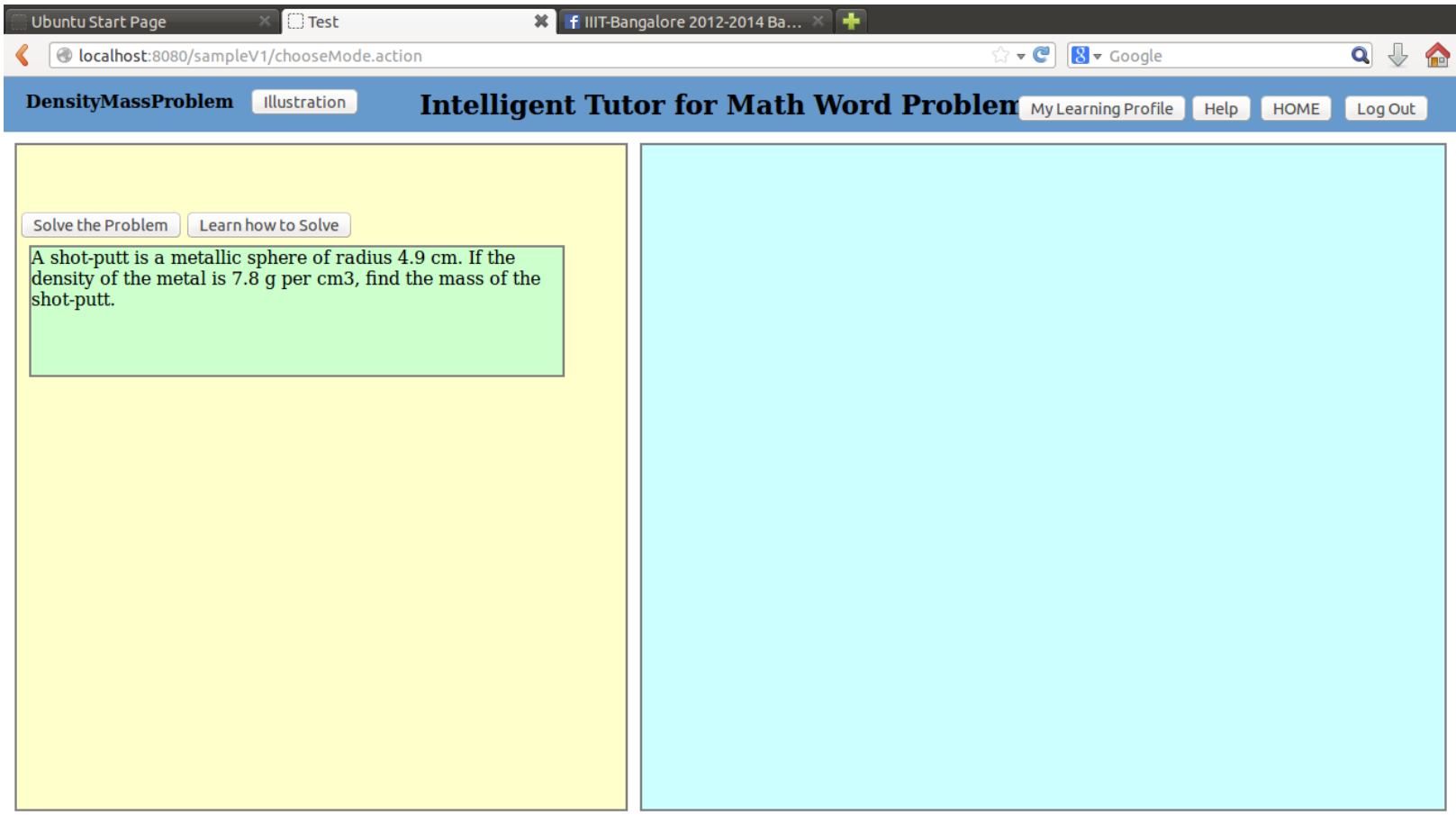

Fig. 3 Choose Mode

by answering a set of questions in a step by step manner. The feedback provided for each answer selected by the user aids the user in correcting his mistakes and gaining better knowledge of the problem concepts. Solving mode on the other hand, gives provision for the user himself to enter the solution steps for the given problem and arrive at the answer. Here too, feedback is provided for each and every line statement that the user enters.

"HOME" button is used to go back to the Choosing Problem Type page.

5. Learning Mode

On this page, the problem statement is displayed on the left half of the screen and the right

half contains the question and the corresponding answer choices. The user has to pick an answer based on his level of understanding of the given problem. On clicking the submit button, if correct answer has been selected by the user then the feedback “Correct! You can proceed for the next question” is displayed and the next question and its answer choices get loaded with the problem statement remaining the same.The question and the corresponding orrect answer gets added to the Questions Learned Till Now box. If the user has picked a wrong answer, the corresponding feedback gets displayed and the same page with the same question gets loaded again.

Once the user answers all the questions correctly, he is automatically directed to the Solving Mode of the same problem. The user can also choose to go to the solving mode page in the middle of the learning mode by using the button “Solve the Problem”. In case the user switches back to learning mode while performing solving mode, he is allowed to continue from the point that he had stopped without having to redo from the beginning.

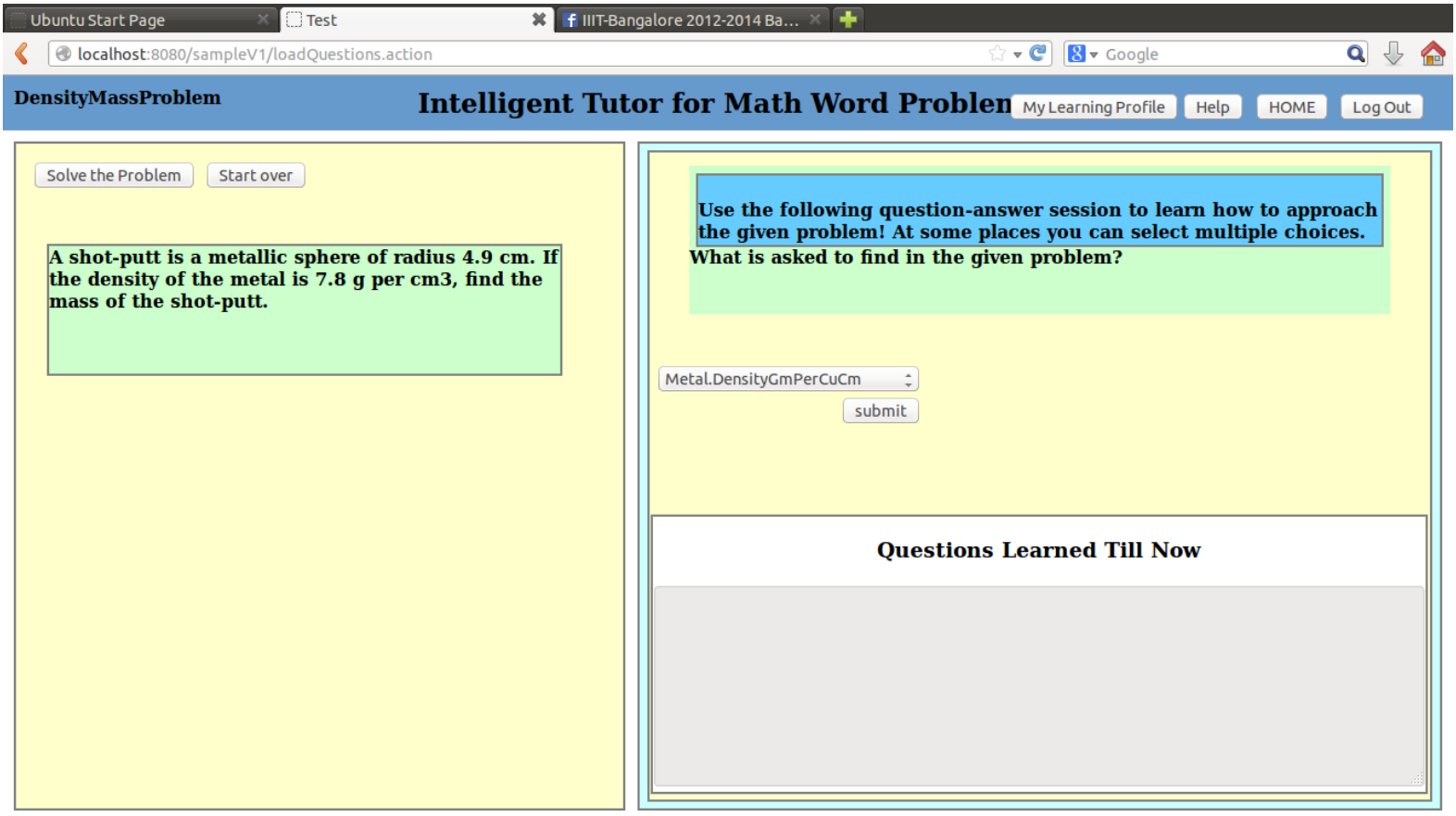

Fig. 4 Learning Mode

5.1. Start Over

While proceeding with the learning mode of a problem, if a user wants to redo the learning mode of the same problem from the beginning, he can use the start over button. Clicking this button takes him to the first question of the same problem and allows him to redo it.

6. Solving Mode

While learning mode checks the level of understanding of a problem by asking questions and giving answer choices, solving mode enables him to find the solution for the problem on his own. The page for Solving Mode is shown below. The user should enter the given data in the text box under “Given” label in this format: Object.ParameterUnit = Value Unit

For example: WoodenBox.LengthCm = 80 Cm

If the entered given statement is in the correct format and also matches with the actual data given in the problem, then it is printed in the text area below the text box.

Similarly the user has to fill the text box under the “To Find” label in the following format:
Object.Parameter = ?
For example: SquareSheets.Number = ?

For entering the steps in the Solution text box, user has to follow this format:
Object.ParameterUnit = Formula Unit

or

Object.ParameterUnit = Substituted_numerical_values_for_a_formula Unit

For example:

SquareSheet.AreaSqCm = (SquareSheet.Side)*(SquareSheet.Side)
SqCm SquareSheet.AreaSqCm = (40*40) SqCm
WoodenBox.TSASqCm = (2*((80*40)+(40*20)+(20*80)) SqCm

It is to be noted that there should not be any space between the expression for the formula or the substitution of numerical values for the formula. Also only parentheses are allowed for sequencing of operations in a formula expression. Symbols like [], {}, or <> are not allowed for this purpose. The well-formedness of the entered statement and the correctness of the statement according to the problem are checked and then printed into the Solution text area. In case it is wrong, corresponding feedback is provided to the user. If the user enters all the steps correctly and completes the problem, a “Well Done Probles is successfuly Completed” message is displayed to the user. Then the user can use the “HOME” button to work on another problem of the same or of different problem type.

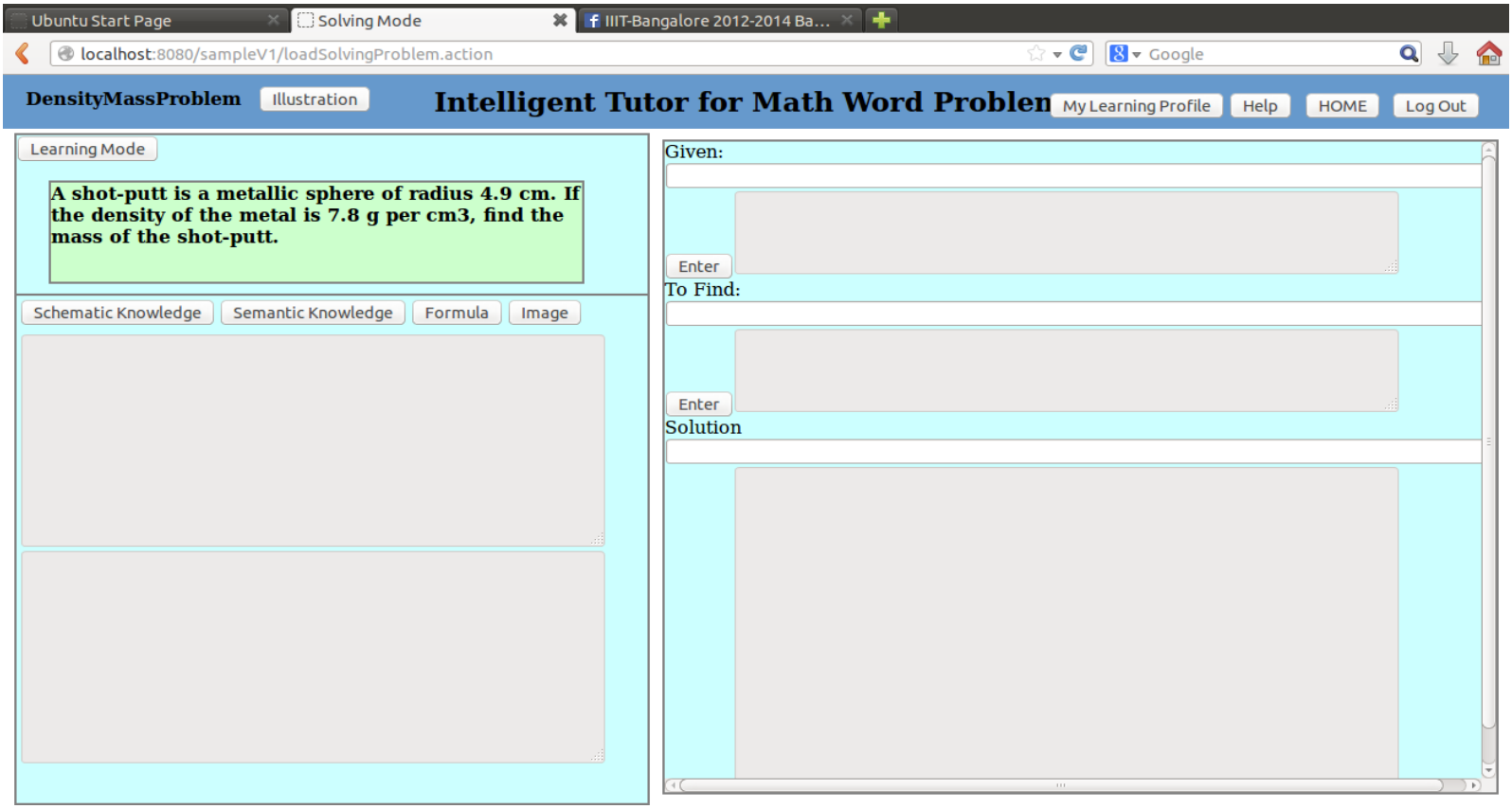

Fig. 5 Solving Mode

6.1 **Schematic Knowledge**

Clicking the “Schematic Knowledge” button displays the schematic structure of the problem in terms of the objects used in the problem and their parameters like area, volume etc.

For example:
Has_Dimension_Of_Object_
With_Density
Has_Object_With_Density

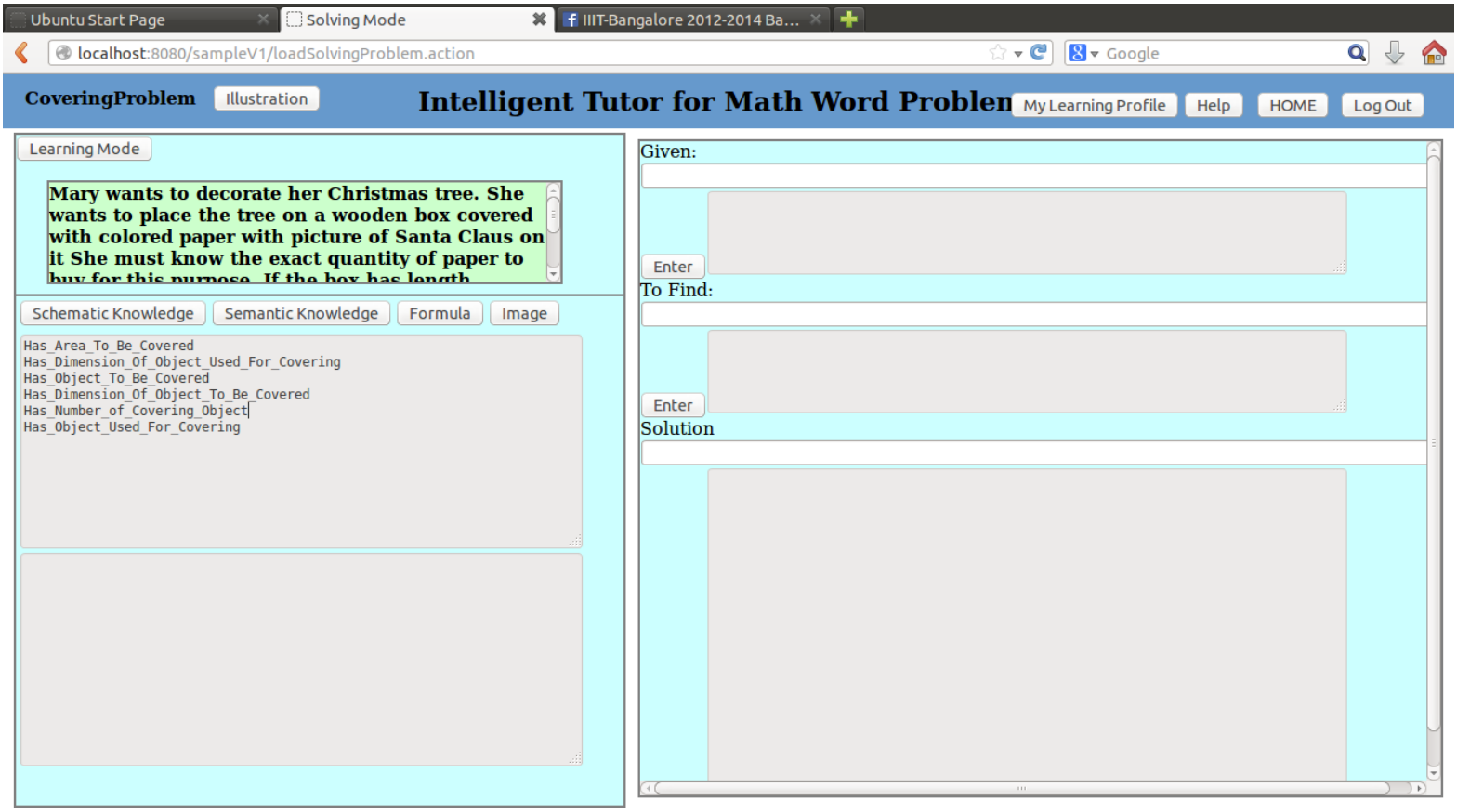

Fig. 6 Schematic Knowledge loaded

6.2 Semantic Knowledge

Semantic Knowledge button is used to obtain further details about the problem schema. The schematic structure along with the actual name of the object referred to by the schematic structure is displayed.

For example:
Has_Object_To_Be_Covered : WoodenBox(Cuboid)

Has_Object_To_Be_Covered is part of the problem's schematic structure. The above example denotes that WoodenBox is the object to be covered and it is an instance of the shape cuboid as per the problem statement given.

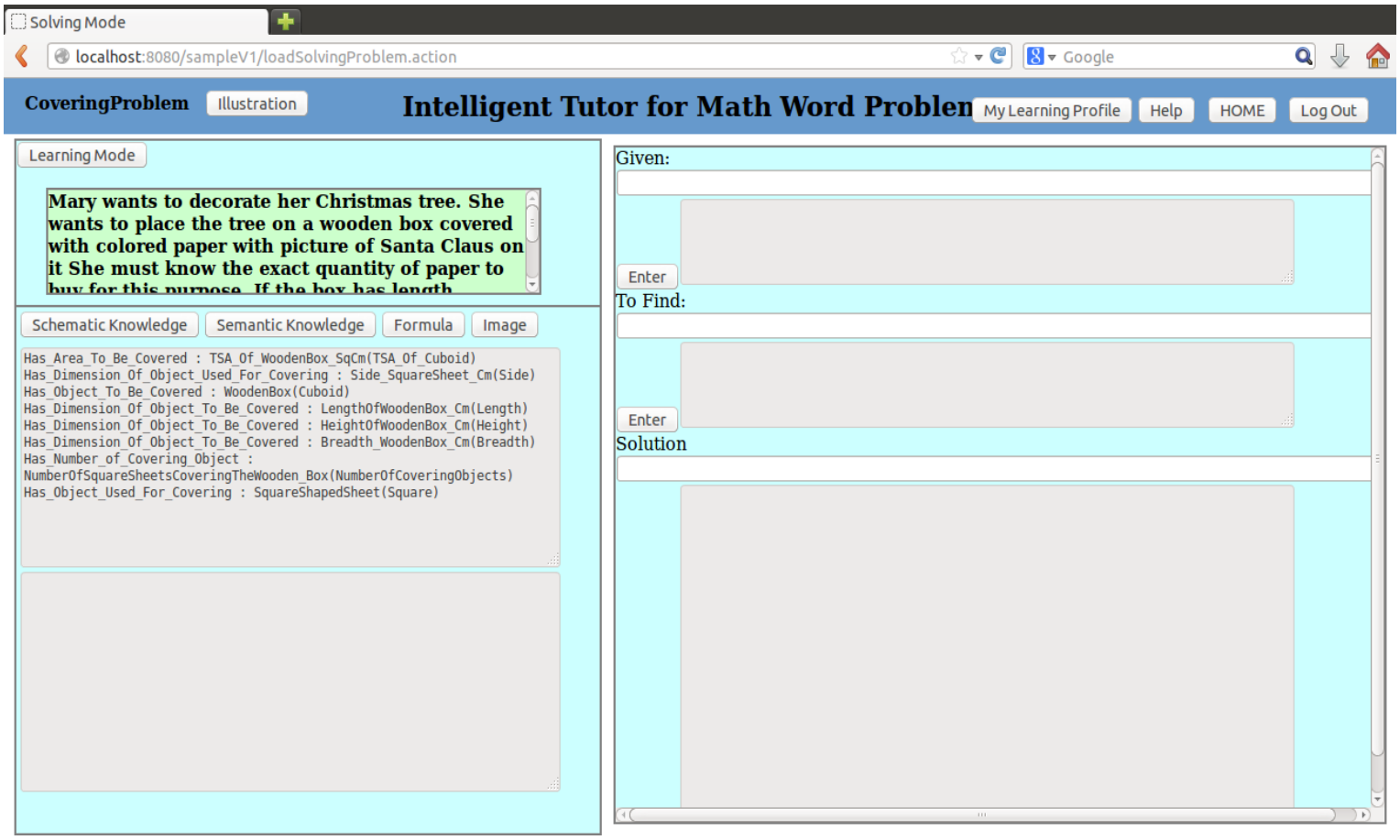

Fig. 7 Semantic Knowledge loaded

6.3 Formula

When the user is doubtful about certain formulas and needs to refer to them as a hint in order to proceed with the problem, he can use the Formula button.The formula specific to the problem are shown.

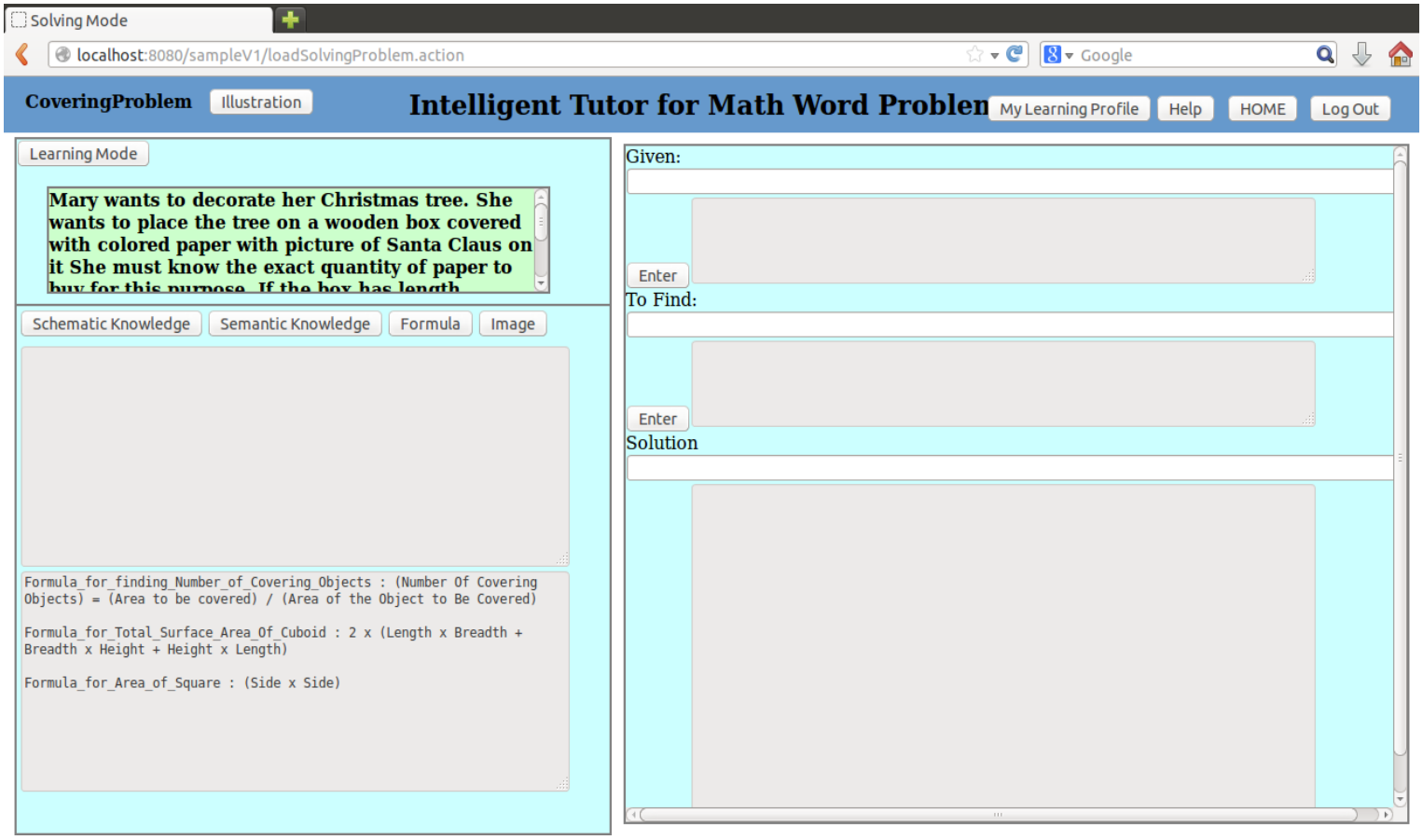

Fig. 8 Solving Mode page with Formulae loaded

6.4 Image

On clicking the Image button the diagramatic representation of the problem is displayed.

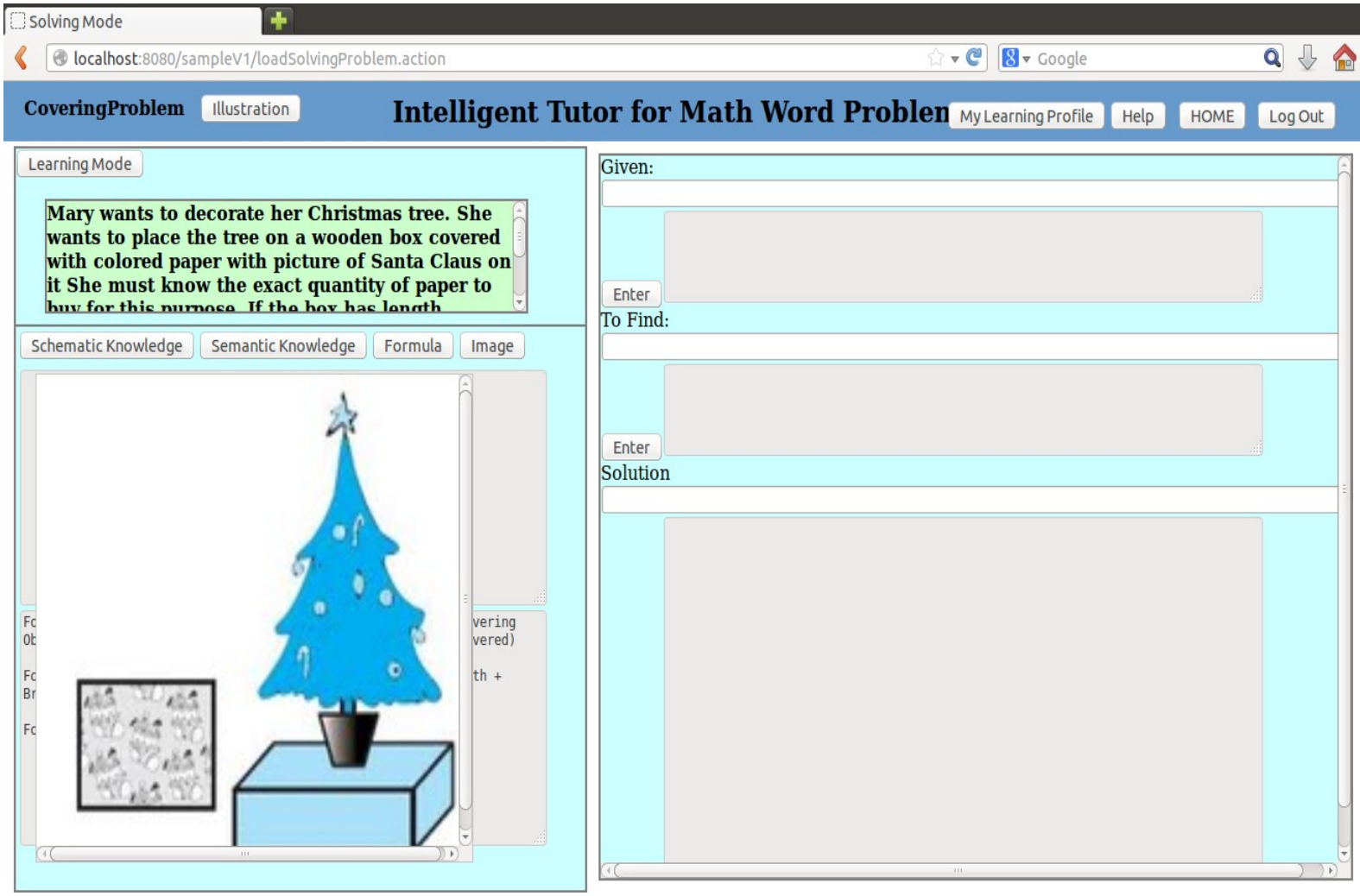

Fig 9. Diagramatic representation of the problem

7. Learning Profile

The learning profile is used to track the overall activity done by the uer on the system. It keeps track of the progress the user has made,the missconceptions that he had while solving,time taken to learn and solve the problems,concepts learned and so on.

7.1 Problem Solving Progress

Problem solving progress is in general for all problem types in which you can see how many problems of each level you have solved for each problem type and the percentage of its correctness. Also, it combines all percentage of correctness of all the three levels and shows overall percentage of correctness. This correctness is calculated based on the list of tasks you complete correctly while solving a problem correctly.

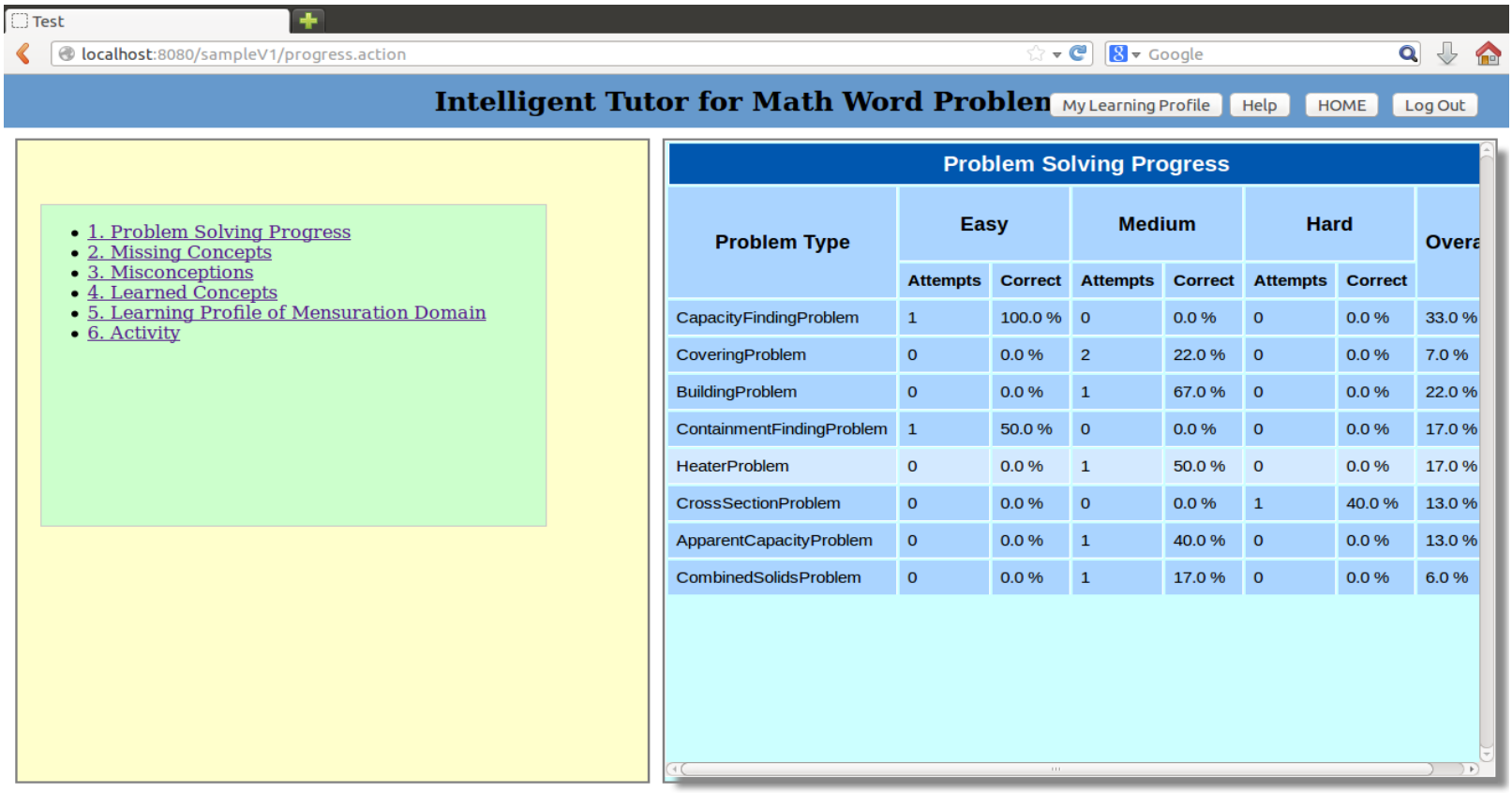

Fig 10. Problem Solving Progress

7.2 Missing Concepts and Misconceptions

Misconceptions and Missing Concepts are captured from your Learning mode interaction and solving mode interaction. These are captured commonly for all problems. The information displayed shows the percentage of resolving and remedial feedback for the same. If the percentage is more means you are progressing towards removing the misconception and the missing concept which is captured during the interaction.

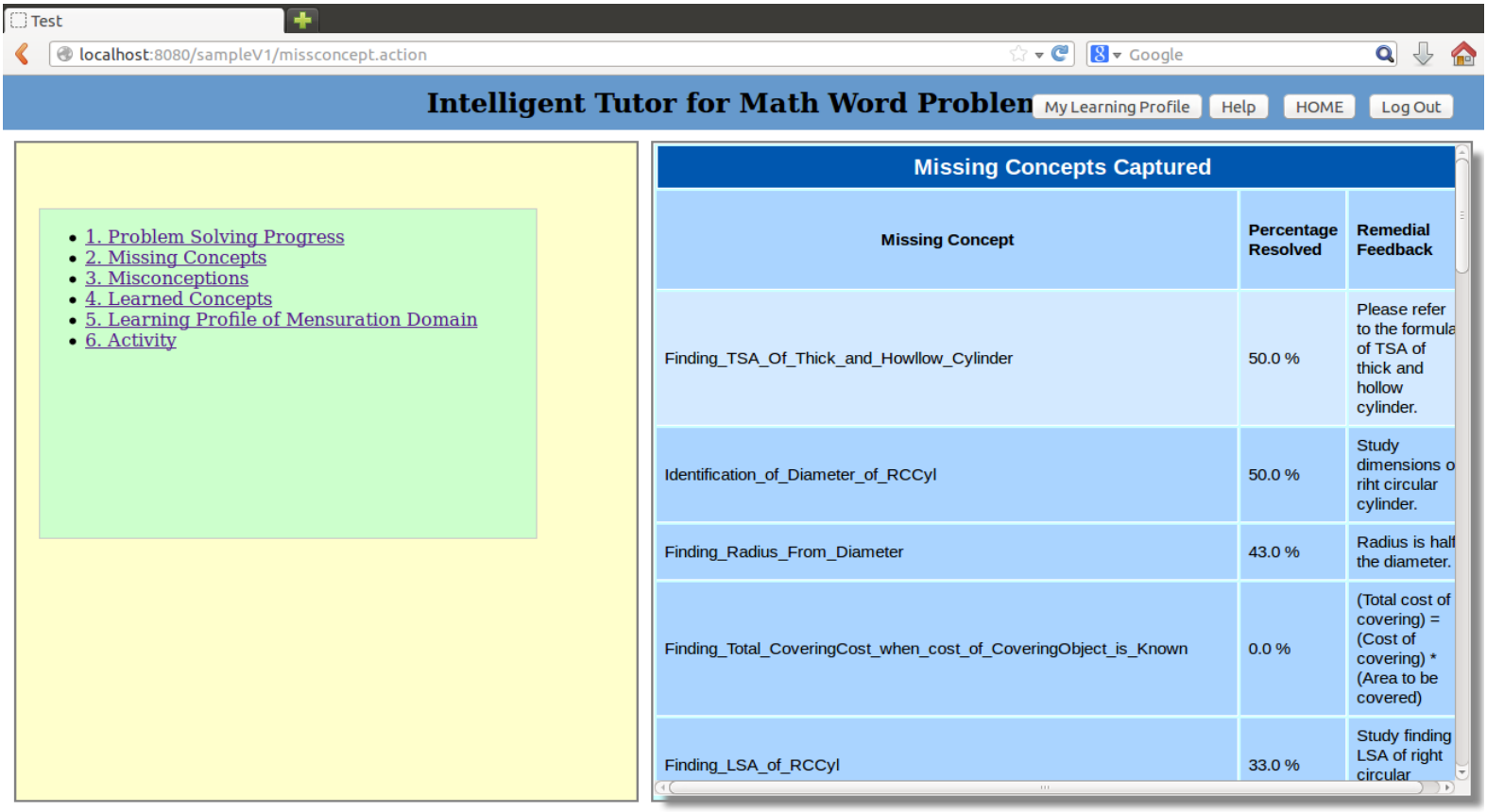

Fig 11. Missing Concepts

7.3 Learned Concepts

Learned concepts displays the information of concepts you have learned for particular problem type in a tabular form where list of concepts and the number of times you have learned that concept are displayed. With the displayed learned concept you can see in the brackets the schematic connection of that particular problem type. Also, the same is showed by using 3D Bar charts

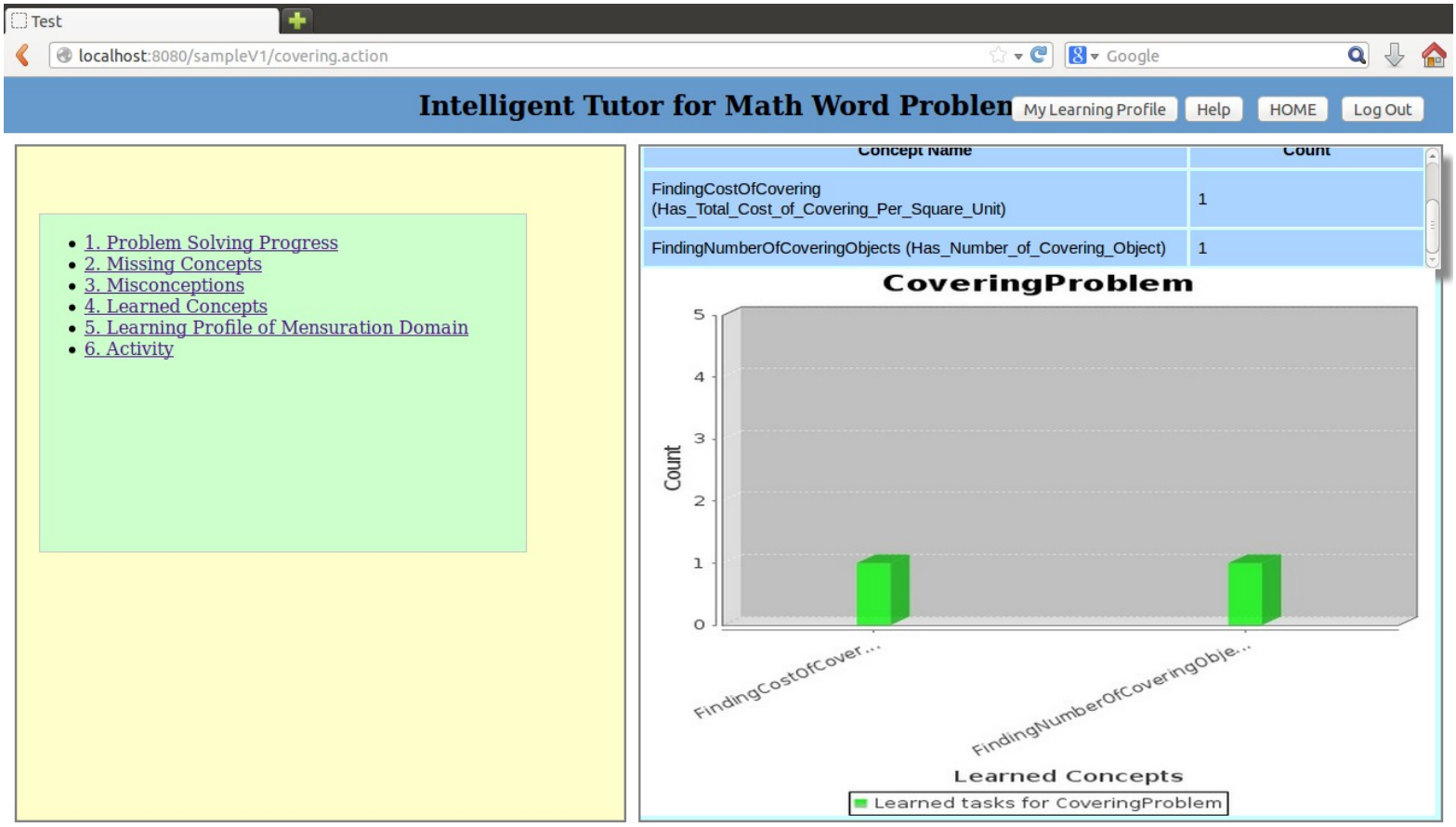

Fig 12. Learned Concepts

7.4 Learning Profile Of Mensuration Domain

Learning profile of mensuration domain shows information about the mensuration problem types you have learned for each shape. For example it displays percentage of TSA problems learned from each shape, percentage of LSA problems learned for each shape, percentage of SA with Less Faces problems learned for each shape and percentage of volume problems learned for each shape.

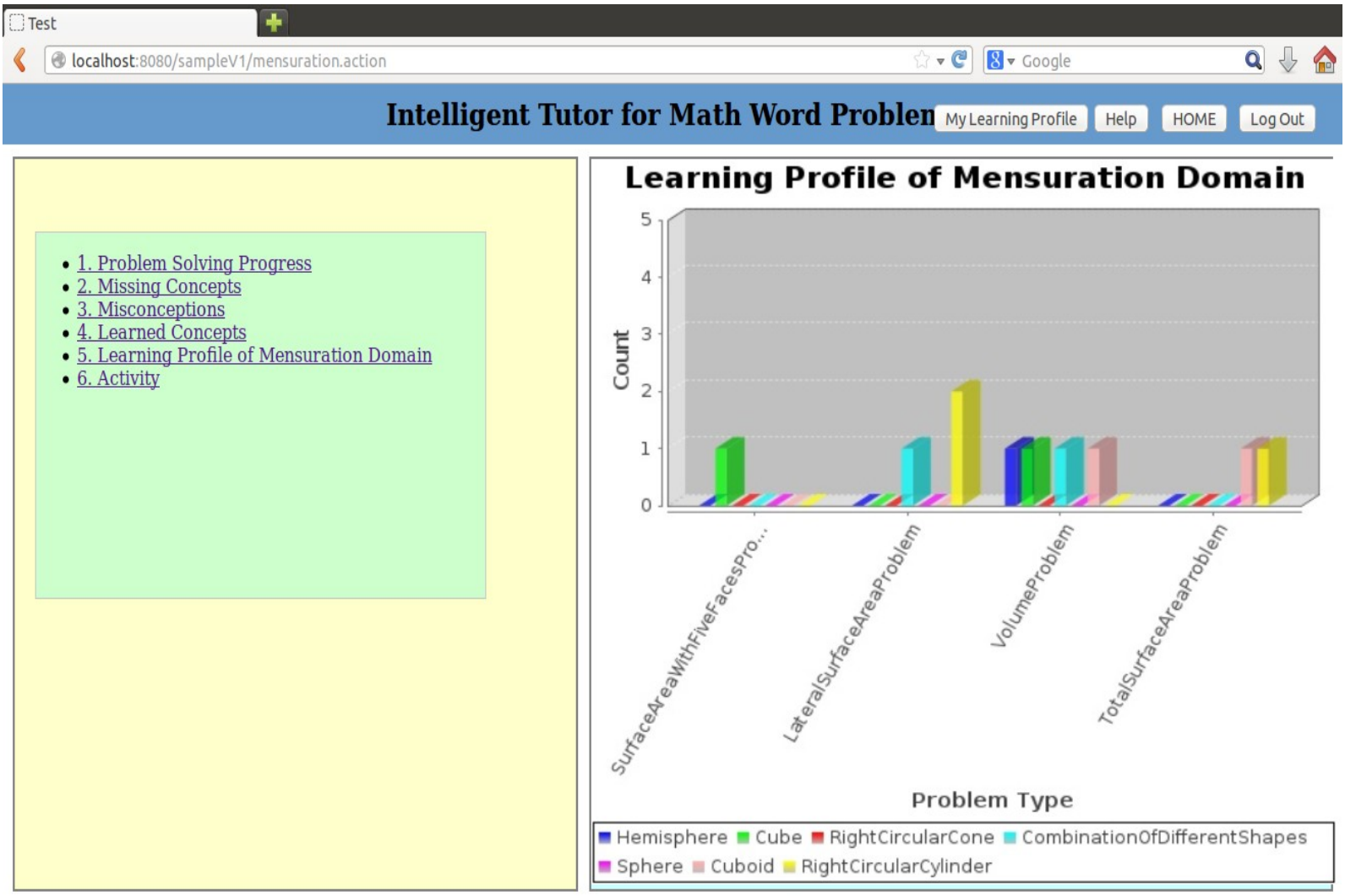

Fig 13 : Learned Concepts Of Mensuration Domain

7.5 Activity

Activity shows that how much time (in seconds) you have spent on Learning Mode and Solving Mode for various problem types.

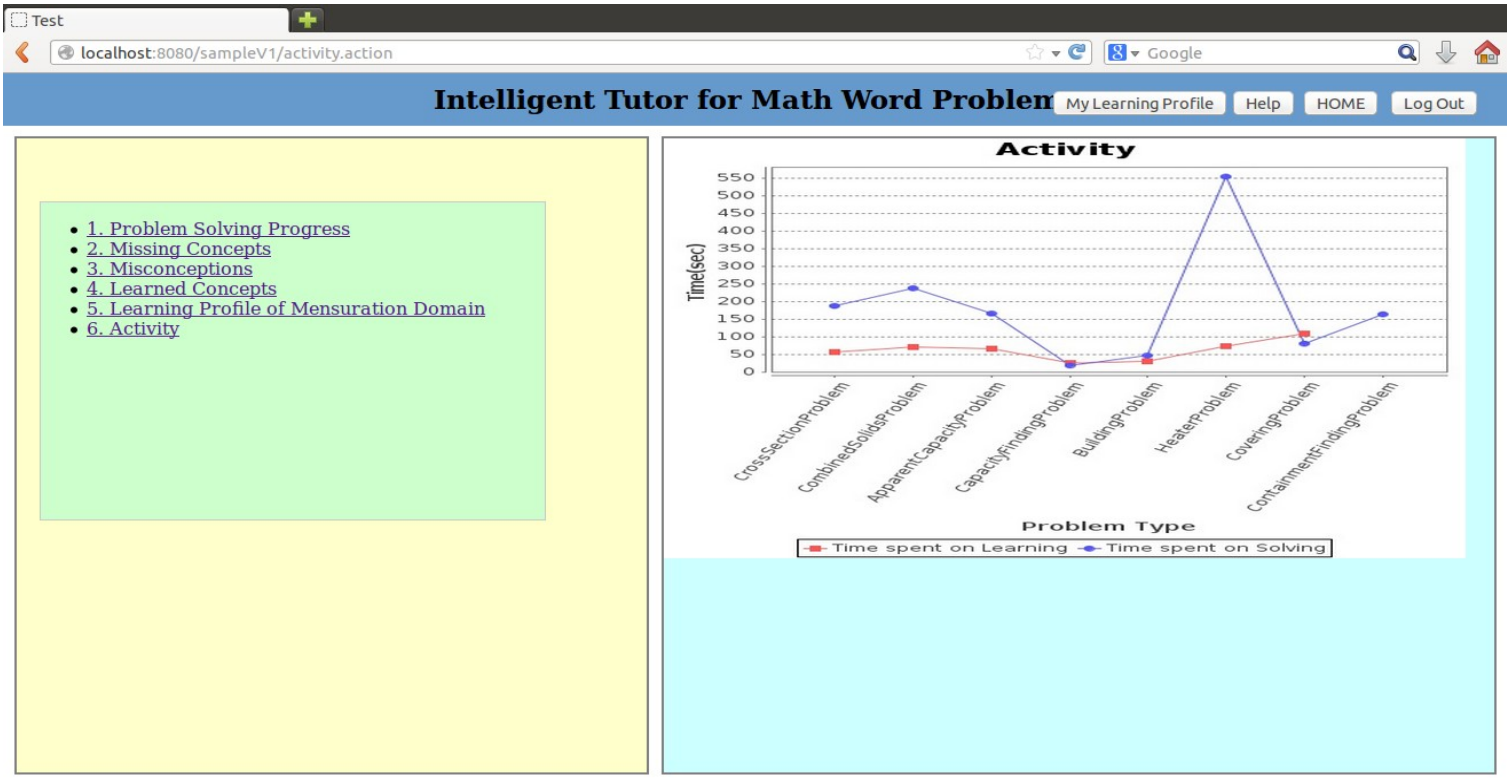

Fig 14: Activity

8. Logout

Logout button ends the user session and takes the user back to the login page.