

Implementation of Knowledge-Based Tutoring System

CO4, CO5 S3

PROBLEM STATEMENT

Students often struggle with understanding foundational concepts in mathematics due to lack of personalized guidance. A knowledge-based tutoring system can simulate expert reasoning to provide tailored explanations and feedback.

AIM

To develop a Python-based intelligent tutoring system that guides users through basic math problems using rule-based logic and interactive feedback.

OBJECTIVE

- Simulate expert tutoring behavior using conditional logic.
- Provide step-by-step guidance for arithmetic operations.
- Offer feedback based on user responses.
- Demonstrate the feasibility of rule-based AI in education.

DESCRIPTION

This system acts as a virtual tutor for basic arithmetic (addition, subtraction, multiplication, division). It uses a knowledge base of rules to evaluate user input, provide hints, and explain concepts. The system is interactive and adapts its responses based on the learner's answers.

ALGORITHM

1. Start the tutoring session and greet the user.
2. Present a math problem based on selected topic.
3. Accept user input as an answer.
4. Compare the answer with the correct solution.
5. If correct, praise the user and offer a new problem.
6. If incorrect, provide hints and re-ask the question.
7. Repeat until the user solves the problem or exits.

PROGRAM

```
def tutor():

    import random

    print("👋 Welcome to the Knowledge-Based Math Tutor!")

    print("Choose a topic: 1. Addition 2. Subtraction 3. Multiplication 4. Division")

    choice = input("Enter your choice (1-4): ")

    operations = {

        "1": ("Addition", lambda x, y: x + y),

        "2": ("Subtraction", lambda x, y: x - y),

        "3": ("Multiplication", lambda x, y: x * y),

        "4": ("Division", lambda x, y: round(x / y, 2) if y != 0 else "undefined")

    }

    if choice not in operations:

        print("❌ Invalid choice. Please restart.")

        return

    topic, operation = operations[choice]

    print(f"\n📖 Topic selected: {topic}")

    print("Type 'exit' anytime to quit.\n")

    while True:

        x = random.randint(1, 20)

        y = random.randint(1, 10)

        correct_answer = operation(x, y)
```

```
print(f"🧠 Solve: {x} {topic.lower()} {y} = ?")

user_input = input("Your answer: ")

if user_input.lower() == "exit":

    print("👋 Thanks for learning with us!")

    break

try:

    user_answer = float(user_input)

    if user_answer == correct_answer:

        print("✅ Correct! Great job!\n")

    else:

        print(f"❌ Incorrect. Hint: Try breaking it down step-by-step.")

        print(f"Correct answer was: {correct_answer}\n")

except ValueError:

    print("⚠️ Please enter a valid number.\n")

tutor()
```

OUTPUT

```
IDLE Shell 3.14.0
File Edit Shell Debug Options Window Help
Python 3.14.0 (tags/v3.14.0:ebf955d, Oct 7 2025, 10:15:03) [MSC v.1944 64 bit (AMD64)] on win32
Enter "help" below or click "Help" above for more information.
>>>
===== RESTART: C:/Users/SRIKARREDDY/OneDrive/Desktop/VTU25754/task12.py =====
🤖 Welcome to the Knowledge-Based Math Tutor!
Choose a topic: 1. Addition 2. Subtraction 3. Multiplication 4. Division
Enter your choice (1-4): 2

📁 Topic selected: Subtraction
Type 'exit' anytime to quit.

🤖 Solve: 17 subtraction 2 = ?
Your answer: 15
✅ Correct! Great job!

🤖 Solve: 19 subtraction 6 = ?
Your answer: 13
✅ Correct! Great job!

🤖 Solve: 8 subtraction 7 = ?
Your answer: 1
✅ Correct! Great job!

🤖 Solve: 12 subtraction 4 = ?
Your answer: 8
✅ Correct! Great job!

🤖 Solve: 16 subtraction 5 = ?
Your answer: exit
🤖 Thanks for learning with us!
>>> |
```

CONCLUSION

This Python-based knowledge tutoring system demonstrates how rule-based logic can simulate expert guidance in basic math. It provides interactive feedback, encourages learning through hints, and showcases the potential of AI in education. Future enhancements could include natural language processing, adaptive difficulty, and multi-topic support.